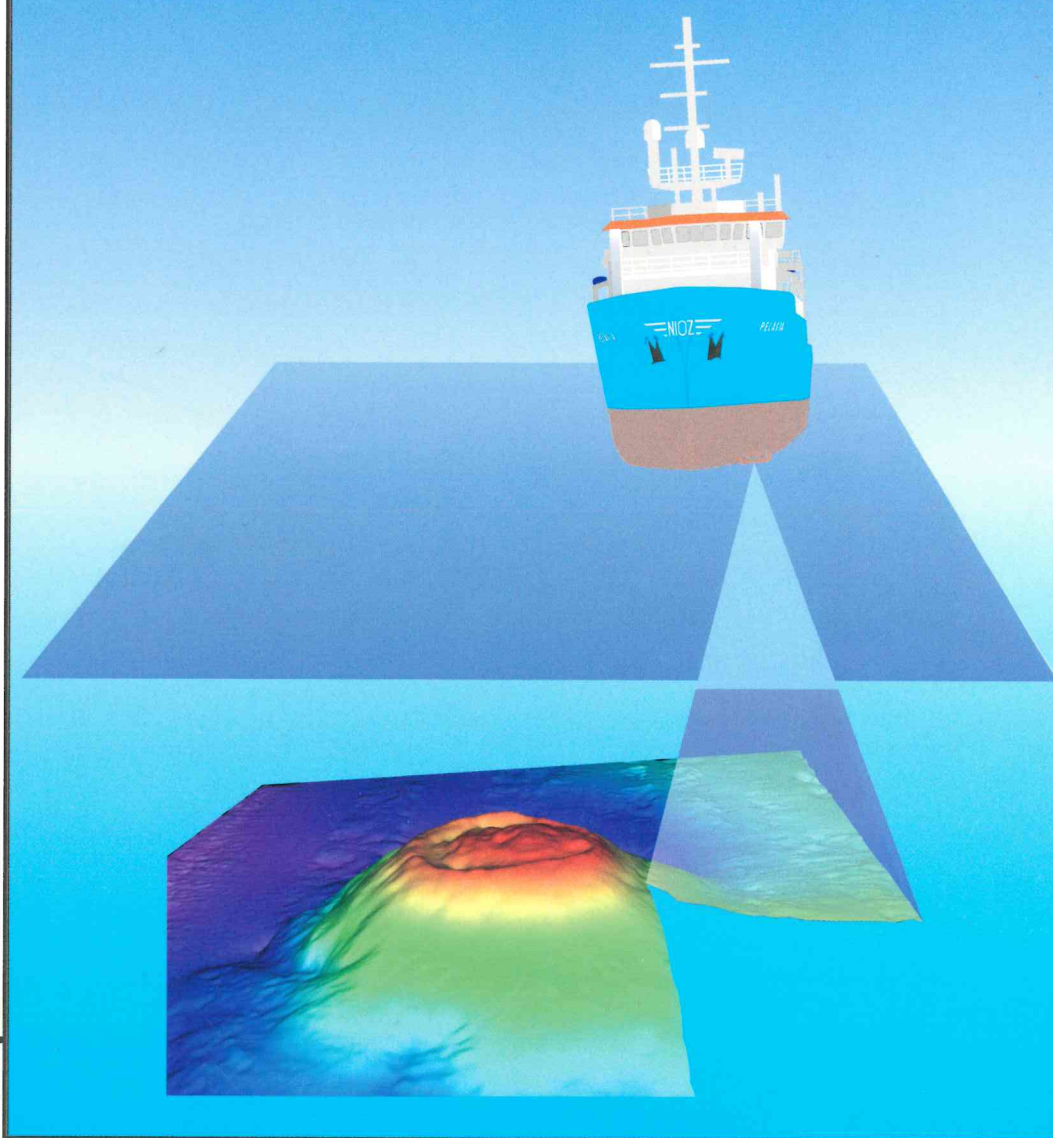


ANNUAL *Report* 2006



ROYAL NETHERLANDS INSTITUTE FOR SEA RESEARCH (NIOZ)

ROYAL NETHERLANDS INSTITUTE FOR SEA RESEARCH ANNUAL REPORT 2006

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Photo cover: In 2006 a multibeam Echo Sounder was installed underneath the Pelagia allowing a detailed mapping of the sea bottom

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ANNUAL REPORT 2006



ROYAL NETHERLANDS INSTITUTE FOR SEA RESEARCH

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INTRODUCTION

NIOZ's mission is to gain the fundamental knowledge of the seas and oceans required to understand and properly manage the largest ecosystem on earth - and one of special importance to the Netherlands. This knowledge is shared with the scientific community worldwide and made available to national and international policy makers and to society at large. Marine science is increasingly needed to ensure the sustainability of our planet and to understand climate change, for the maritime economy and the sustainable use and exploitation of living-and non-living resources from the sea, and for our individual wellbeing. NIOZ has expertise in all the major natural sciences and complements fundamental research with high level strategic research as part of national and international cooperation programmes. NIOZ also stands for impartial advice and assessment at the highest professional standards. In this framework NIOZ is presently discussing the effective monitoring of the Wadden Sea – a unique landscape in Europe - with its partners, the Nederlandse Aardolie Maatschappij (Netherlands Natural Gas Company) NAM, Wageningen-IMARES and several universities and private companies.

SCIENTIFIC OUTPUT

In 2006 the NIOZ scientific output was very strong. In total 169 publications in peer reviewed journals were published, including two in Science, five in Nature and two in Proceedings of the National Academy of Sciences (PNAS). Several prizes were won and four books were published. Especially in elucidating the biodiversity and role of micro-organisms and in the use of biomarkers as proxies for climate change 2006 brought about important advances in knowledge. We mention two articles in Science involving Jaap Sinninghe Damsté and Stefan Schouten on the reconstruction of the outflow of a super river in Europe some 20,000 years ago during the last Ice Age and on the accumulation of carbon dioxide in the same early days in Northern America; three articles in Nature with again Jaap Sinninghe Damsté and Stefan Schouten as co-authors with a reconstruction of sea water temperature based on the TEX₈₆ index developed at NIOZ and showing that Arctic seawater reached about 22°C at the North Pole at the Paleocene/Eocene boundary around 90 million years ago. In the scientific journal PNAS, Jaap Sinninghe Damsté, Stefan Schouten and Gerhard Herndl co-authored a paper showing that Archaea are nitrifiers both in the North Sea and in the Atlantic Ocean. In another paper published in PNAS co-authored by Gerhard Herndl and Jesus-Maria Arrieta, the phenomenal biodiversity of marine bacteria was demonstrated: one liter of seawater was shown to contain about 20,000 phylotypes. The ecological significance of this diversity will be an important research area in the coming years.

Besides these publications in the world's top journals, many other papers of high scientific quality were published in the specialized professional literature. To mention just a few, the elucidation of the role of large internal waves, breaking on the continental slope, in vertical mixing of the ocean; the negative effects of bottom trawling of shellfish in the Wadden Sea on wintering waders, especially the Knot; and, the characterization of transport and deposition of terrestrial organic matter in the North Sea. Special reports dealt with the causes of death of harbour porpoises in the Netherlands and with the long-term effects of drilling oils on benthic communities in the North Sea.

Besides the large number of refereed papers and reports, four books were also published, by Theunis Piersma ("Waarom nonnetjes samen klaarkomen en andere wonderen van het wad"), Hendrik van Aken

on “The Oceanic Thermohaline Circulation, an introduction”, Kees Camphuysen on “Whales and Dolphins of the North Sea” and Kees Booij as co-author on “Monitors of Organic Chemicals in the Environment”.

Prices were received by Oscar Bos (North Sea Award, Bruges, for this PhD thesis) and Gerhard Herndl (the Roland Wollast Award 2006 Euroceans, Barcelona). In October the European Geosciences Union EGU announced that Jaap Sinninghe Damsté will receive the Vladimir Vernadsky Medal 2007 of the European Geosciences Union (EGU). Personal Grants were obtained by Johan Weijers (Rubicon), François Vézina (Veni), Pieterella Luttikhuisen (NWO Meervoud) and Stefan Schouten (NWO Vici).

NIOZ was active in teaching by organizing the European NEBROC/ECOLMAS Introductory Course in Marine Sciences in November and an advanced NEBROC course at the institute and several courses at the universities of Groningen and Utrecht. Tjeerd van Weering, recently being appointed at the Vrije Universiteit Amsterdam as chair of paleo-oceanography, gave his inaugural speech (“Zee in Zicht”) in 2006. Jaap Sinninghe Damsté also delivered his inaugural speech (“Moleculen uit een ver verleden”) at the University of Utrecht where he holds the chair of Molecular Paleontology. Thomas Rheintaler (RUG), Cornelia Wuchter (UU), Yvonne van Breugel (UU) and Wouter Vahl (RUG) received their PhD degree from the universities of Groningen and Utrecht

6 With respect to new facilities the installation of the Multibeam Echo Sounder underneath the Pelagia deserves special mention as this tool greatly enhances the possibilities of our research vessel. Another remarkable accomplishment is the completion of the Thermistor String Model to demonstrate internal waves in the ocean. Our spin-off company AVAATECH, with support of the NIOZ technicians, sold five XRF core scanners.

Two ICES working group meetings were held at NIOZ in spring, one on Seabird Ecology and one on North Sea Benthos. We also welcomed the News and information group of the Marine Board of the European Science Foundation in December.

The Science Advisory Committee visited the department of Marine Ecology and Evolution. The committee rated the research of MEE of high quality, recommended maintaining the long-term time series and advocated their use in research, and recommended to strengthen the work on bottom-up processes in shallow water ecosystems, especially the Wadden Sea.

MANAGEMENT AND ORGANISATION

After the management change at the end of the turbulent year 2005, there were further rapid developments at the top of the institute in 2006. With Bert Geerken continuously present in management this year, the scientific leadership changed hands from Johan Meulenkamp (until July) to Herman Ridderinkhof (temporarily as interim). Carlo Heip was appointed as the new and overall responsible general director from 1 October onwards. NIOZ is grateful to Johan and Herman for the way in which they have taken care of the responsibility to lead the institute. They also paved the way to a close cooperation with the Netherlands Institute of Ecology NIOO- KNAW, the ecological research institute of the Royal Netherlands Academy of Arts and Sciences. The NIOO Centre for Estuarine and Marine Ecology (Yerseke) combined with NIOZ in a unit called FOKUZ (Fundamenteel Onderzoek van Kust en Zee).

The Board started 2006 with three members appointed in December 2005: Pier Vellinga (chair), Ward Koster and Jack Middelburg. Jack Middelburg resigned as a Board member as he is a member of staff at NIOO for which Carlo Heip is also responsible (so running both institutes on a part-time basis). At the end of the year the board was extended with Louise Vet, Guus van der Kamp and Theo Elzenga.

In our internal organization extra efforts were made to improve the supporting services, the planning & control cycle and the availability of relevant management information. In part this is based on the evaluation by a team of ten professionals of other institutes from our umbrella organization, the Netherlands Organisation for Scientific Research NWO.

The shipping activities were evaluated by Blue Star Ship Management. Their main conclusion was that Pelagia should be managed by NIOZ. Nearly all recommendations of the report will be implemented, in particular with respect to communication and responsibilities and the increase of the number of operational days of the shipping personnel.

EPILOGUE

The day before NIOZ closed down for the 2006 Christmas holidays, two special events were organized at the institute. In the evening the personnel association organized its regular end-of the-year party, attended by many scientists, students, supporting staff and shipping personnel. This social event reflected very well the good relations among the NIOZ personnel.

In the afternoon, many people watched and discussed Al Gore's "An Inconvenient Truth" where system earth was at the centre of a long debate between our experts in several fields of marine sciences and the audience at large, concluding that the climate problem is real, that NIOZ should devote effort and attention to the scientific aspects and that the problem cannot be solved without fundamental changes in human society.

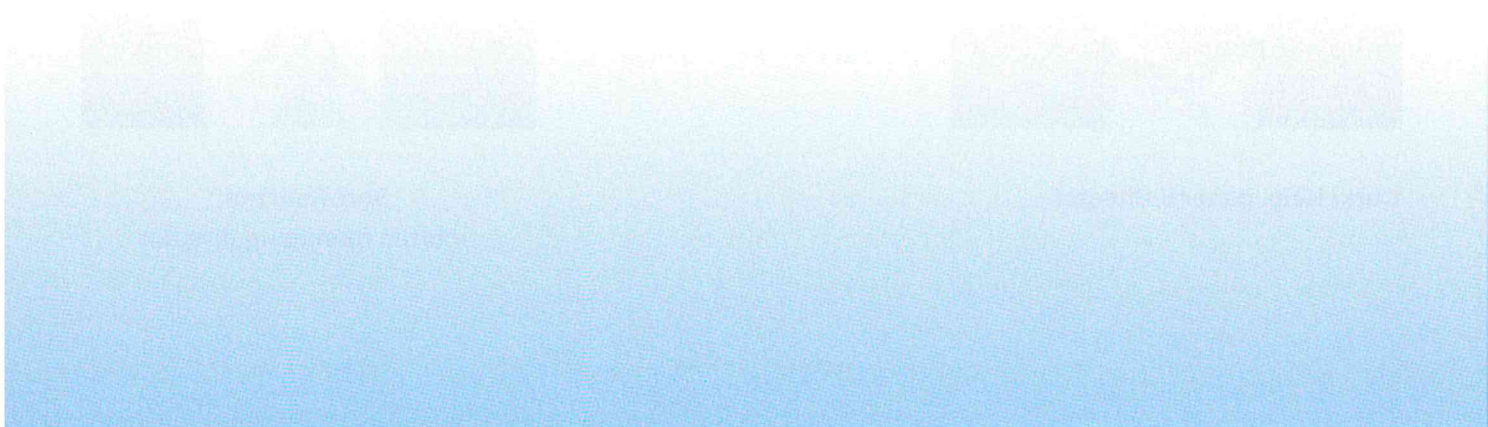
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Carlo Heip, general director



Bert Geerken,
interim managing director



COLD WATER CORALS AND CARBONATE MOUNDS

Tjeerd C.E. van Weering^{1*}, Gerard Duineveld², Fleur van Duyl³, Mark Lavaleye², Furu Mienis¹,
Conny Maier³, Henk de Haas¹, Cees van der Land¹

Cold water coral covered carbonate mounds at the Rockall Trough Margins and off the Hebrides in the North Atlantic Ocean form an important research topic for NIOZ scientists since 1998. Since then, the geological, geochemical, oceanographical and biological conditions and processes forcing the development of carbonate mounds and the benthic ecology and environmental conditions of cold water coral reefs are being studied in the framework of a number of EU, ESF and NWO programs. Our research is directed towards establishing the constraints and factors governing the development of carbonate mounds and cold water coral functioning and growth. In the geological domain there is an additional interest to use the carbonate mounds as possible modern analogues for the explanation of fossil carbonate build ups. Since the coral reefs and mounds are increasingly threatened by deep sea trawling activities, protection measures by EU and national agencies require profound and in-depth knowledge of these fragile benthic ecosystems.

Cold water coral habitats are considered hotspot ecosystems characterized by a high level of biodiversity and presumably other ecosystem functions (Fig. 1). Cold water corals mainly occur on the continental margins of the North Atlantic Ocean (Fig. 2). Quantitative information about cold water coral ecosystems is still very scarce, whereas the coral build-ups are already increasingly threatened by deep sea trawling activities. Protection measures by EU and national agencies require profound knowledge of these fragile benthic ecosystems.

Methodology

By a series of research cruises with R.V. "Pelagia" the morphology and internal structure of mounds and reefs at the Rockall Trough margin and off the Hebrides (Fig. 2) have been studied with a range



Fig. 1. Crinoids attached to a dense network of dead and live corals on top of a carbonate mound on SW Rockall Trough (Courtesy IFREMER).
Inset: Coral polyps and framework *Lopheelia pertusa*.

of seismic recording (Fig. 3) and multi-beam bathymetry sounding systems. Subsequently, water column observations, bottom sam-

ples, and seabed measurements were made, as well as video observations from the seabed and coral communities by towed cam-

¹: MCG, ²: MEE, ³: BIO, * corresponding author: tjeerd.van.weering@nioz.nl

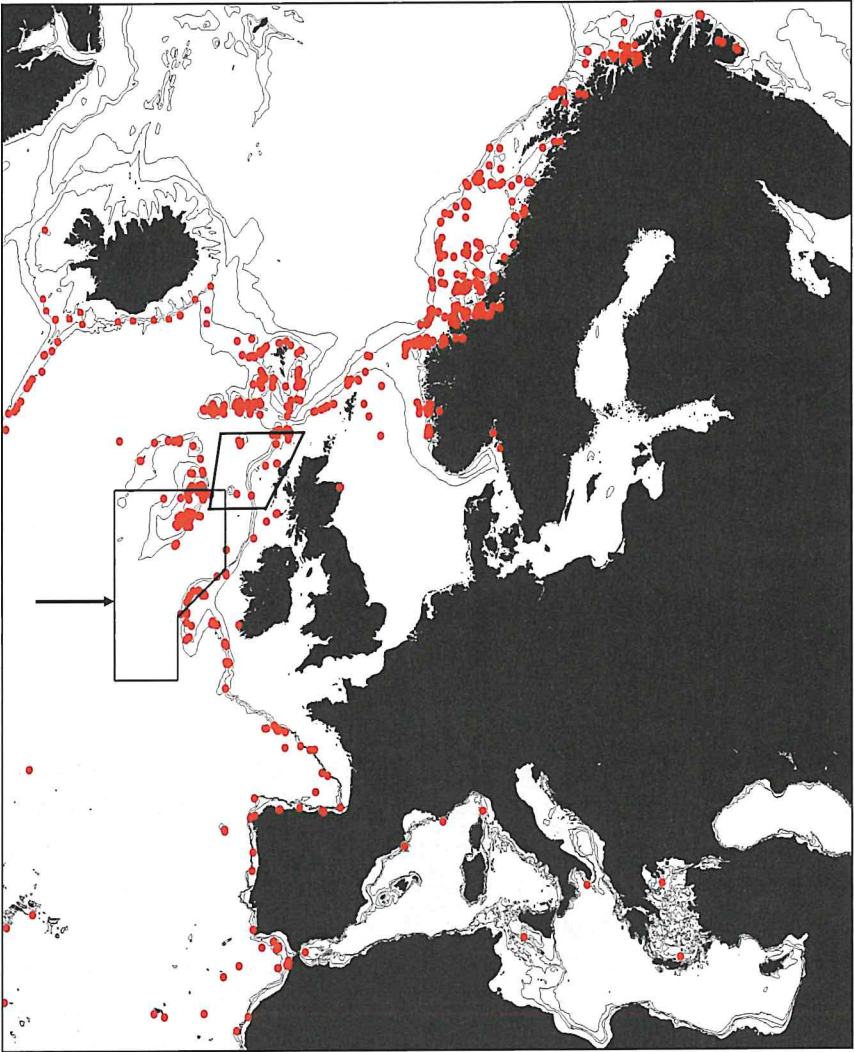


Fig. 2. Red dots indicate locations with cold water coral reefs in the northeast Atlantic Ocean. The enclosed area represents the core study areas of NIOZ at the Rockall Bank and off the Hebrides.

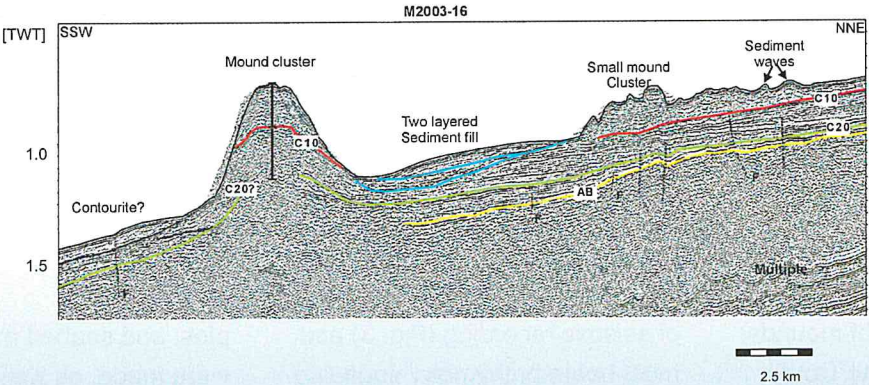


Fig. 3. Seismic structure of mounds and reefs along transect perpendicular to the SW Rockall Trough margin (after Mienis et al., 2006).

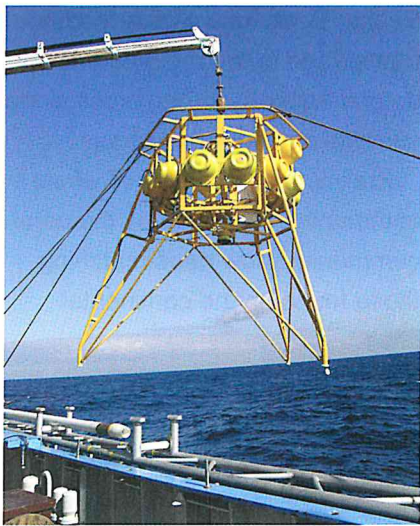


Fig. 4. Benthic seabed observatory BOBO recovered after one year deployment.

era's and by underwater video camera's mounted on sea-floor observatories.

Long and short term deployments of seabed observatories (Fig. 4) are used to measure the local hydrodynamics and the type and supply of food sources for the cold coral communities. The observatories also measure salinity, temperature, time series of current

speed and direction, chlorophyll fluorescence and the amount of particles in the water column.

In addition, experimental studies are carried out directly on board with freshly collected corals (*Lophelia pertusa* and *Madrepora oculata*) to study the feeding behaviour of the coral polyps and the dynamics of the associated micro-organisms (Fig. 5, 6).

Mound morphology and cold coral occurrence

Seismic and side scan sonar surveys across both margins of Rockall Trough (off Ireland) show the presence of single coral covered isolated mounds as well as of elongated mounded ridges of several kilometres long and up to 380 m high. The mounds occur in a specific depth zone between 600 and 1000 m. All mounds reach a specific depth level below the sea surface, with the highest mounds occurring at the lower slope of the continental margin. Video and bot-

tom samples show the presence of a thriving living coral cover on mound peaks and the upper flanks. Reefs and coral patches however, have been reported to occur at shallower depth as well.

Evidence for gas seepage or fluid flow in relation to mound build-ups and coral presence, as hypothesized in the literature, has not been found, neither in seismic profiles nor on side scan sonar images. Instead, isotopic measurements of corals and associated biota support a direct relationship with surrounding water masses.

Food supply to coral communities; role of internal waves

CTD measurements and benthic lander data indicate the presence of a diurnal tidal cycle at the southwest Rockall Trough margin and of a semi-diurnal tidal cycle at the Southeastern Rockall Trough and the Porcupine margin. Current speeds are up to 45 cm.s^{-1} at depths between 500 and 1000 m. High current speeds not only prevent the corals from getting buried by sediments, but also increase the food supply to the corals. Tidal currents at both margins force the formation of nepheloid layers (layers in the water column with an enhanced amount of particles); the distribution of cold water corals is considered directly related to the presence of enhanced turbidity in the water column, evidencing rapid transport of fresh food particles from the surface water layer to the mounds.



Fig. 5. NIOZ Ph.D Furu Mienis with a piece of coral framework.



Fig. 6. Biologist Mark Lavaleye carefully removes freshly collected material from an experimental set-up.



Fig. 7. Students conducting coral feeding experiments in the cool container onboard R.V. Pelagia.

Feeding experiments carried out in collaboration with the IUB (International University, Bremen) indicate that *L. pertusa* is capable of extending its tentacles at flow speeds as high as 30 cm s^{-1} . When corals are fed with zooplankton larvae, their tentacle extension and retraction behaviour are inversely related to flow speed, showing that corals catch more prey when flow speed increases. This supports the view that cold water corals occur at the top of the mounds where flow speed is accelerated, which enhances the transport of food particles to the coral polyps.

Biodiversity and food web structure

Results further suggest that the densities of macro-faunal animals on the coral mound is higher than in the surrounding habitat. This

also holds for the species richness, which can be twice as high on the mounds. The food web of the cold coral community appears to be relatively simple. It is dominated by filter feeding organisms. Almost no detritus feeders were found in the sediment underneath the coral branches. The conjecture of a simple food web is supported by results of $\delta^{15}\text{N}$ analysis, which show that the isotopic signatures of carnivores at the top and bivalves at the base of the food web differ only by 2 trophic levels. The amount of food available for the filter-feeders on the mounds consists of relatively fresh (i.e. fluorescence from chlorophyll) supply of phytoplankton over a relatively long period of the year with a remarkably early start of the algal spring bloom in February. The source of this material is probably a high productivity zone concentrated above

Rockall Bank from where food is transported to the mounds and into deeper water by strong cross slope currents and internal waves.

Preliminary estimates of whole community respiration by the coral community show rates matching those found on the continental shelf.

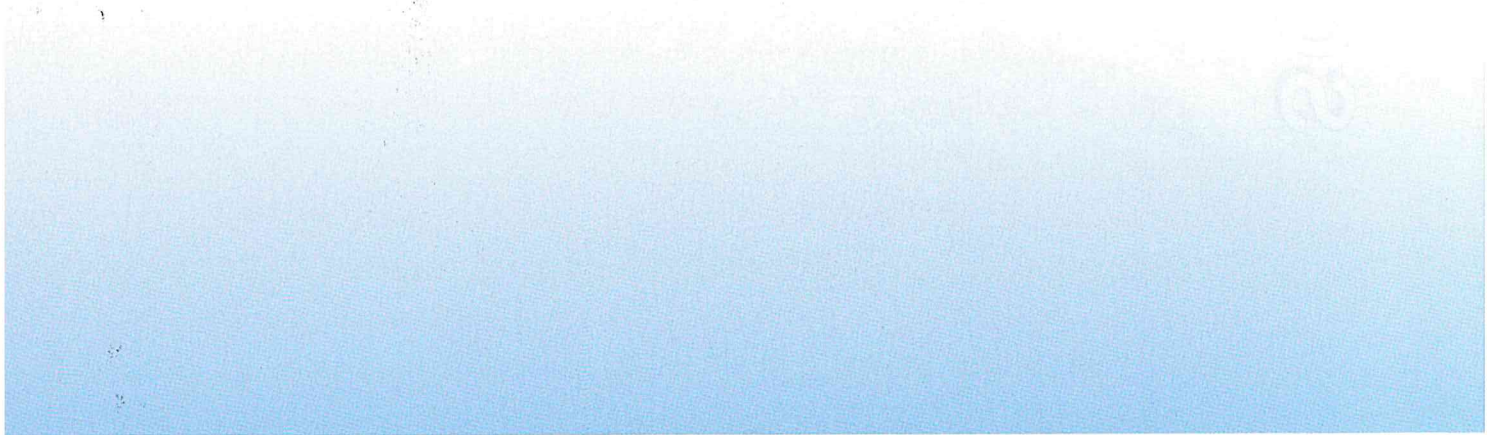
Role of microorganisms

Specific studies were done to address the question of the abundance and diversity of prokaryotic micro-organisms (bacteria, Archaea and viruses) in the deep water coral reefs and their role in coral and sponge functioning (Fig. 7). The first results indicate that the corals *Lophelia pertusa* and *Madrepora oculata* stimulate the growth of bacterio- and viroplankton in the surrounding seawater, probably through the release of mucus (organic slime) and inorganic nutrients to the seawater.

Preliminary results of an experiment to inhibit bacterial growth indicated that corals may take up microorganisms. Radioisotope labelling experiments showed that auto- and heterotrophic prokaryotes (Bacteria and Archaea) play a significant role with respect to carbon uptake and the energy supply of corals and sponges. Moreover, the abundance of microorganisms in coral and sponge tissue is also about 1000 times higher than in ambient seawater, indicating that prokaryotes may play a significant role in the ecology of cold water corals.

SCIENTIFIC DEPARTMENTS





PHYSICAL OCEANOGRAPHY

The scientific work of the department of Physical Oceanography (FYS) is organized under three main themes:

OCEAN CIRCULATION AND HYDROGRAPHY

This theme is occupied with open ocean research with a significant field component. It has a strong emphasis on climate related research and is mainly focused on large-scale ocean circulation and hydrography. Presently, research programmes are carried out in the framework of the international WCRP-programme CLIVAR.

In 2006 seagoing activities were mainly carried out as part of the NWO funded Long-term Ocean Climate Observations (LOCO) program. Sub-surface moorings were recovered or serviced and redeployed at a number of locations:

- in Lifamatola Strait (Indonesia) as part of the international INSTANT program moorings were recovered that measured (part of) the Indonesian Throughflow between 2003 and 2006
- in the Irminger Sea (North Atlantic ocean) where two profiling moorings daily measure a temperature and salinity profile over the entire watercolumn
- in the Mozambique Channel (Indian Ocean) where seven current meter moorings measure the transport through this channel for a period of five years

As part of our collaboration with biological oceanographers, processes in the deep and dark waters of the North Atlantic ocean (ARCHIMEDES) are studied. Our department participated to identify the different water masses present, because the biologist wanted to study whether ecosystems differ over the vertical water column between water masses of a different origin. This cruise was a logical follow-up of previous cruises where other branches of the North Atlantic Deep Water (NADW) were studied.

PROCESSES NEAR CONTINENTAL SLOPES, INTERNAL WAVES AND MIXING

In this theme, theoretical, numerical, laboratory and observational studies of the interaction between internal waves in a stratified ocean and topographic features are performed.

Combined CTD/LADCP yoyoing measurements were carried out over the slope of Great Meteor Seamount to determine internal-tide energy fluxes; the outcome was compared to results from numerical models. Another numerical model was used to study the transfer of energy from semi-diurnal to diurnal internal tides at low latitudes.

Analytically, the transfer to higher harmonics due to internal-wave reflection from a sloping bottom was studied. The latitudinal variation of near-inertial and tidal energy is being verified by an additional mooring array deployed in between the Canary Basin and the Cape Verdes Basin.

A new PhD project was started, in collaboration with the Centre for Mathematics and Informatics, Amsterdam, and the University of Cambridge, UK, where preliminary laboratory experiments were carried out on internal wave attractors. A laboratory model on internal tide generation was carried out in Grenoble, together with collaborators from Lyon and Grenoble.

TIDAL AND MORPHODYNAMICS OF COASTAL ZONES

Our third theme consists of studies in the shallow coastal zone using both field and laboratory observations and theoretical modelling. Detailed analyses of ongoing ferry observations on currents and suspended sediments in the Marsdiep inlet between the North Sea and Wadden Sea forms an important part of this research programme.

The ferry observations are now being used to determine the transport of fine-grained sediments between the North Sea and the Wadden Sea in great detail. The Dutch Ministry of Transport (Rijkswaterstaat) finances this study because there is great interest in determining the effect of planned changes in the Dutch coastline, like the seaward extension of the port of Rotterdam.

Janine Nauw has been appointed as a PostDoc on this project which includes also regular calibration surveys with RV Navicula.

Most of our studies are part of these themes. Some other activities like the application of marine optics in oceanography, are mainly carried out in collaboration with other departments and/or institutes (and often made possible by the availability of external funds).

Apart from the scientific activities the department supports national seagoing research programmes with hydrographic observations, satellite data and overall data-management. For these national tasks the Data Management Group acts as a separate group within our department.

Herman Ridderinkhof, head of department
(rid@nioz.nl)



EQUATORIALLY TRAPPED INTERNAL WAVES

Contributors: Uwe Harlander* and Leo R. M. Maas

A fundamental advance in the understanding of tropical motions was made in the 60s of the previous century, namely, the development of the ‘classical’ theory of equatorially trapped waves. In contrast to freely propagating waves, equatorially trapped waves cannot leave the equatorial region. While propagating zonally, their energy travels back and forth between so called *turning latitudes* north and south of the equator. Beyond these latitudes wave intensity decays rapidly; between these latitudes the waves have a standing character in meridional direction, characterized by nodal lines. However, not all equatorially trapped waves can be described by this classical theory. Trapped *internal* waves, for example, are not properly described, and yet, as we argue, might be important for understanding the enigmatic deep equatorial undercurrents and off-equatorial countercurrents. To better understand the particular and sometimes surprising properties of trapped internal waves, let us first give a brief overview of the classical theory.

Classical theory

Starting point for the classical description is a system of waves that are standing in the vertical direction, between bottom and surface, which can be studied independently from the dynamics in the horizontal plane. Moreover, the horizontal structure is such that details of the model geometry, like the shape of the lower boundary or of the turning surfaces, do not influence the solution essentially. Therefore it is believed that this classical model, though strongly simplified, gives solutions that are relevant in reality too, even though a multitude of effects ‘perturb’ the classical model.

By linearizing the model equation and by ‘freezing’ the model coefficients to constant values, the dispersion relation for equatorially trapped waves can be obtained.

This equation shows how wave frequency depends on wavelength. The dispersion relation is used to classify equatorial waves: waves with frequencies much smaller than Ω , the earth’s rotation frequency, are called Rossby (or planetary) waves; waves with frequencies much larger than Ω are called Poincaré (or inertia-gravity) waves; waves connecting the low and high frequency regimes are the dispersive Yanai (or Rossby-gravity) waves, and the non-dispersive Kelvin waves. All these trapped equatorial waves are typical for the dynamics of an ocean or an atmosphere for which the vertical structure can be separated from the horizontal structure. In contrast to the well known wind waves, particle motion due to Rossby waves is mainly horizontal, in the meridional-zonal plane. The waves’ restoring mechanism is

conservation of angular momentum. This involves a change in spin, similar to what dancers experience when executing a pirouette upon contracting or extending their arms.

A sketch of an equatorial waveguide is shown in Fig. 1a. Simply speaking, the waves behave like marbles that move frictionless down a gutter while periodically climbing and descending the gutter’s inclined sides. In the following we contrast the waves trapped in the horizontal plane to internal gravity waves that propagate not only in the meridional but also in the vertical direction which can thus be trapped in a meridional plane (see Fig. 1b). First, we consider again the simple case that allows for a decoupling of the horizontal and the vertical structure. Subsequently, we study the more

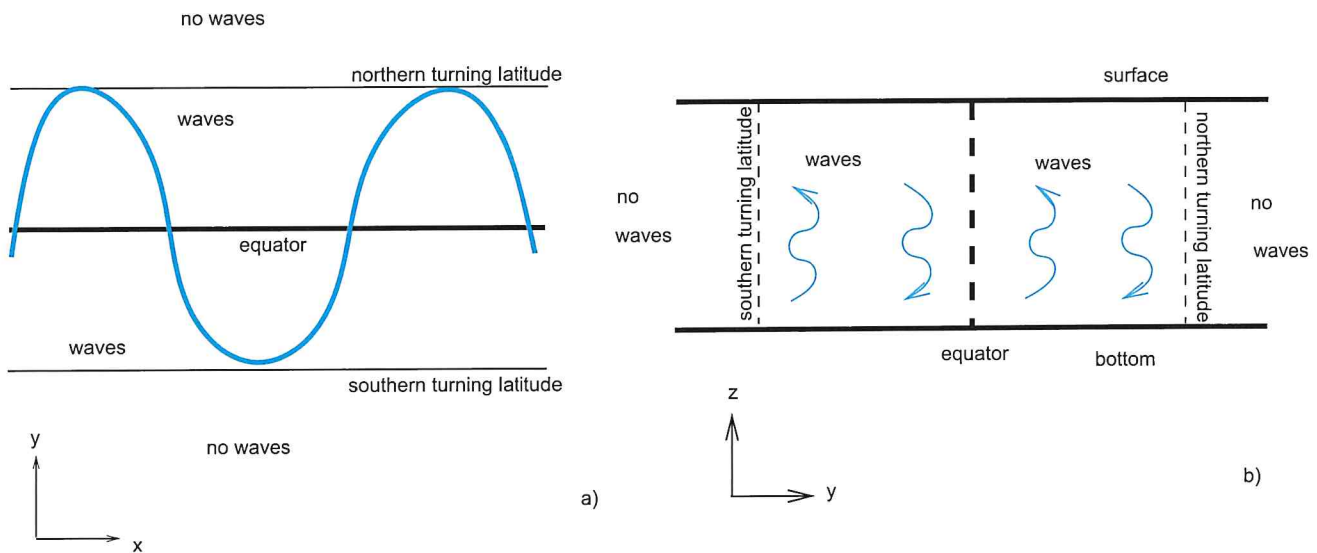


Fig.1 a) Equatorial waveguide in the horizontal x - y -plane. External gravity waves, Kelvin and Rossby waves can be trapped; b) Equatorial wave guide in the meridional y - z -plane. Internal gravity and inertial waves can be trapped.

realistic case for which a decoupling is not possible.

Inseparability

The main difference in the new approach is to employ the so-called Boussinesq equations that incorporate processes that have previously been neglected: vertical acceleration and nontraditional Coriolis terms. These give a more general description of oceanic and atmospheric motions. Trapped internal waves are then found to be governed by a type of equation that differs from that of the classical model. In contrast to the classical wave model, the new internal wave model does *not* possess the convenient property that small changes of the geometry or of the model coefficients lead to small changes of the solution. Trapped internal waves have several rather

surprising features and we will bump into one of those below.

An example of a solution for flat and non-permeable upper and lower boundaries is shown in the vertical-meridional plane in Fig. 2. Note that we zoomed in on the Northern turning latitude (right dashed line in Fig. 1b). In Fig. 2 this (solid) turning curve is located at $y=0$. Displayed are contours of the streamfunction that correspond to the streamlines of the velocity field. Currents are parallel to these lines, and their intensity is inversely proportional to the distance between them. Obviously, we find a wavy pattern to the left of the turning curve (in the hyperbolic region, as mathematicians would say), and no waves to the right of the turning curve (in the elliptic region). Note that for this simple boundary geometry, the vertical structure can be considered sepa-

rate from the horizontal structure, for which reason we find smooth solutions.

In Fig. 3a, 3b we plotted the spatial distribution of turbulent dissipation. In other words, the figure shows regions where kinetic energy is converted, through mixing, into heat. For the solution

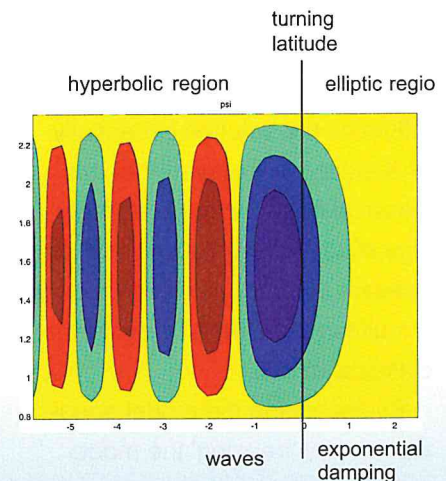


Fig. 2 Example solution of trapped internal waves close to the turning curve. The flat upper and lower boundaries allow for smooth solutions.

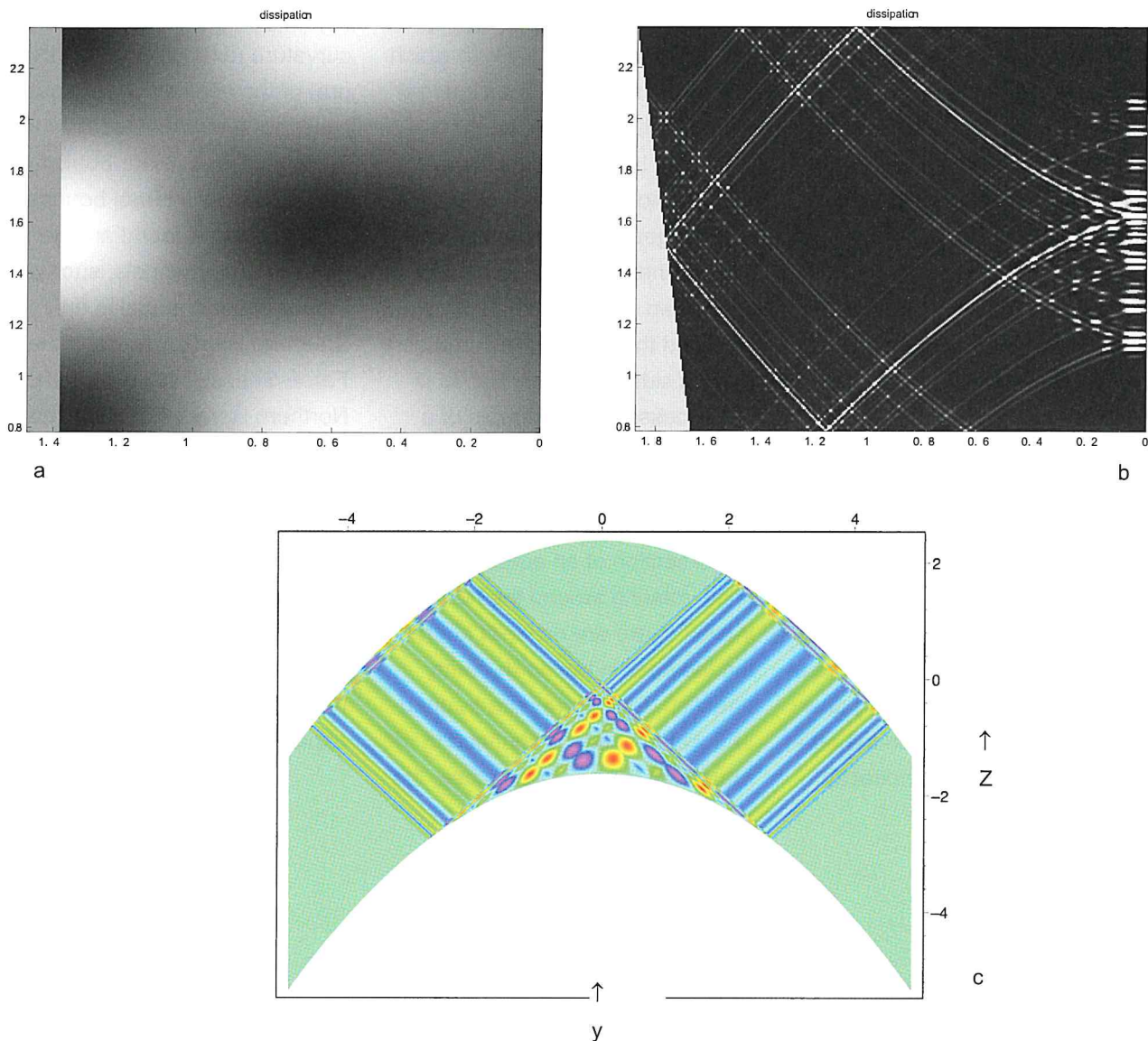


Fig. 3 a) Spatial distribution of the dissipation rate for internal waves in a rectangular box bounded to the right by a turning curve. b) Like a) but for a box with a sloping sidewall. c) Trapped inertial waves in an equatorial shell. Visible are stripes of upward (light green) and downward (blue) motion. The equator is located at $y=0$. Note that in a, b, and c Meridional coordinate y points to the right and vertical coordinate z upward.

shown in Fig. 2, a smooth pattern with small amplitude is found. (Note that in Fig. 3a we closed the region to the left of the turning curve by a vertical, non-permeable wall at $y=-1.38$). Next we would like to construct a solution for which decoupling of the horizontal and vertical structure is not possible.

The most simple thing that can be done to reach this goal is to introduce a *sloping* sidewall to the left of the turning curve. Fig. 3b shows the spatial distribution of turbulent dissipation for such a case. The solution dramatically differs from the previous one: we observe a sharp boundary-detached shear

layer with a very large dissipation rate. It is important to note that this result is typical for trapped internal waves, but *not* for the classical, equatorially-trapped waves considered first. In summary, under realistic circumstances that do not allow for a decoupling of the spatial coordinates, equatorially-trapped

internal waves are focused towards an internal boundary layer that is called a 'wave attractor'. Such an interesting localization is not possible for the classical equatorially-trapped waves since they are governed by a different type of equation.

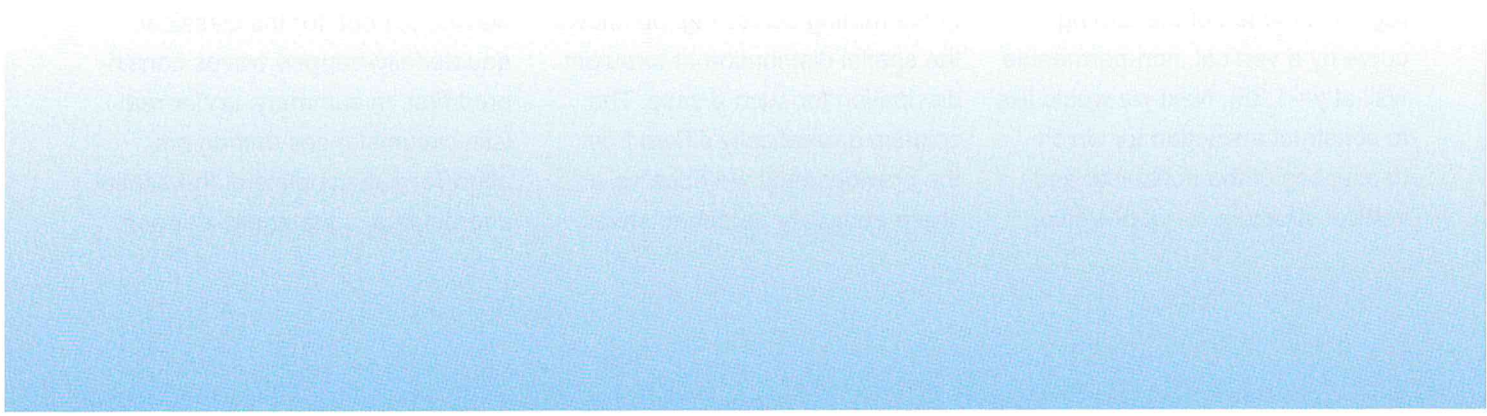
Shear layers in the ocean

Why should such internal shear layers be important in the oceans and where might they occur? We think that internal shear layers could enhance mixing in the deep ocean. Such a mixing is on the one hand important to keep the large-scale meridional overturning ocean circulation going, by bringing down heat adiabatically. But, on the other hand, mixing might also directly

drive mean flows by mixing angular momentum and density with which the fluid is stratified. Thus internal boundary layers could connect small and large spatial scales as well as short and long time scales.

The equatorial deep ocean is a region where internal boundary layers can be expected. It should be noted that for their occurrence a sloping sidewall like in Fig. 3b is not necessary. An example of a trapped *inertial* wave (just another internal wave type) is displayed in Fig. 3c. Shown is a meridional y-z cross-section of an equatorial shell, rotating around the horizontal y-axis. There are no walls bounding the shell in the north-south direction. Still, waves are trapped and wave motion is confined to the equatorial region. In this case, the

trapping is caused by the small curvature (exaggerated in this figure) of the ocean's upper and lower boundary that leads to wave focusing. Other, extra-tropical regions where internal boundary layers could be found are elongated ocean channels, such as the Mozambique channel in the Southern Hemisphere and the Faroe-Shetland channel in the Northern Hemisphere. In the equatorial case, the deep mixing that accompanies the fine-scale structures associated with the wave attractor may present candidates for driving the ubiquitous, but enigmatic deep equatorial undercurrents and off-equatorial countercurrents for which a satisfactory explanation is presently lacking.



MIXING AT THE CONTINENTAL SLOPE IN THE FAEROE-SHETLAND CHANNEL

Contributor: Hans van Haren*

Project partners: John Huthnance (POL, University of Liverpool, UK) and Mark Inall (SAMS, Oban, UK)

In shallow, flat-bottom seas like the North Sea sediment transport is mainly induced by turbulent friction due to wind and tide. When water depths exceed 100 m, these processes cannot directly affect such transport, because their bottom friction is too weak. Indirectly however, they can still dominate sediment resuspension in such seas, provided they interact with the stable density stratification above a sloping bottom, for example by generating waves in the interior. Using novel high-resolution measurements it is shown that either process may dominate resuspension in a confined basin like the Faeroe-Shetland Channel. Near-bottom steep waves carrying over 100 times more sediment than background values either have tidal or four-days (storm passage) periodicity in areas less than 100 km apart.

Solibores

During a previous experiment in the ~1000 m deep Faeroe-Shetland Channel (FSC), carried out in 1999, it was observed that approximately half-way the continental slope near-bottom temperatures could drop dramatically more than 5°C within a few minutes (Fig. 1 red curve). Such a temperature drop did occur only 3 times in a 12-days period at the particular site halfway FSC. This periodicity seemed to concur with passages of atmospheric disturbances.

Normally, the turbulent mixing associated with storms does not reach deeper into the ocean than the upper 100 m from the surface. The connection between the passage of storms and temperature variations much deeper down (500 m or more) is through the deflection of isopycnals (lines of constant density) on a sloping bottom. A sudden release of near-bottom

fronts, 'solibores', moving up the slope passes moored instruments very quickly within a few minutes, whilst whirling up sediment, typically 50 m above the bottom, due to the vigorous vertical currents exceeding 0.1 m s^{-1} associated with the front. However, the dominant four-day periodicity remained

a puzzle, since the dominant periodicity in observed (internal wave) currents was tidal.

New experiment

Therefore, a new experiment, carried out in 2005, aimed specifically to study possible tidal non-linear near-bottom wave motions. It

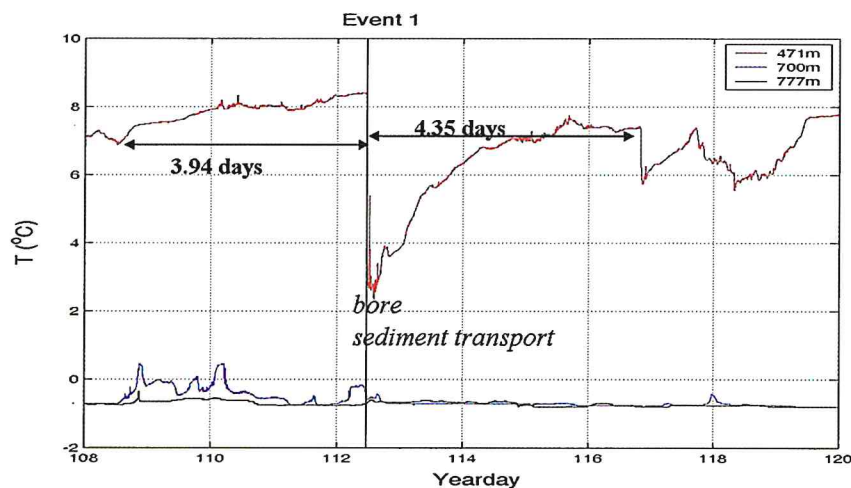


Fig. 1. Twelve days of near-bottom (8 m above the bottom) temperature time series obtained during PROCS, april 1999 (see Fig. 2). Moorings were at 471 m water depth (red), 700 m (blue) and 777 m (black).

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SLOPEMIXING 2005:
10 moorings ~3-D X-array within 5 km square

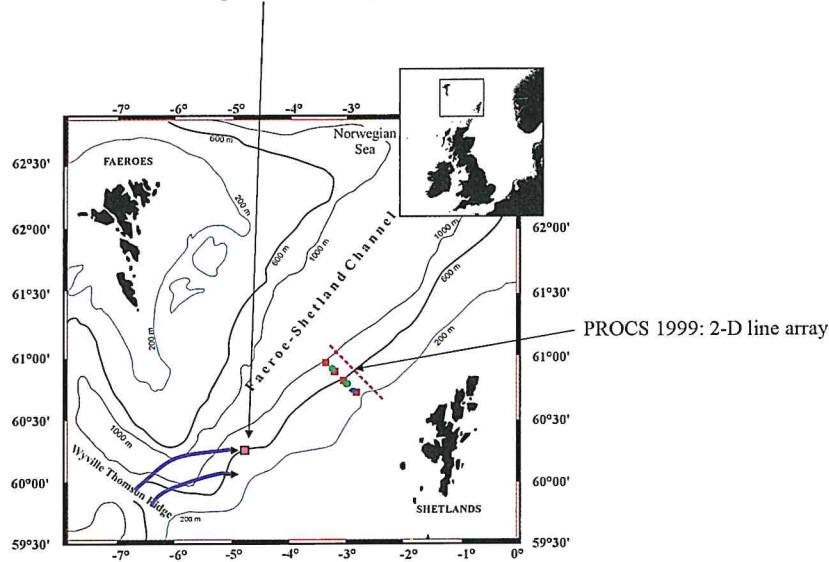


Fig. 2. Faeroe-Shetland Channel with mooring locations of projects PROCs (2-D array) and SLOPEMIXING (3-D site). The latter is closer to the Whyville-Thomson Ridge, the presumed major source of internal tidal waves, which may refract along the blue arrows.

followed a hypothesis that the dominant internal tide source in the FSC is at the Whyville-Thomson ridge at its southern entrance and that waves emanating from the ridge refract soon after generation (Fig. 2). The new experiment was set-up nearly 100 km from the previous one, and with close mooring spacing (2.5 km horizontally) at and around the 600 m isobath.

The newly observed periodicity in near-bottom temperatures (Fig. 3) is dramatically different from the previous one, whereas the range of temperature variations is about similar (compare with Fig. 1). At the 2005-site temperature variations are highly tidal periodic. Closer inspection shows that the largest

temperature variations do not occur during springtide, but during neaps around day 254 (compare upper panel of Fig. 3 with surface pressure dominated by spring-neap cycle in lower panel). Equally surprising is the fact that the three different moorings, located close together, show large differences in occurrence and timing of the passage of sudden temperature variations. Apparently, their horizontal length scale and amplitude are highly variable. Nevertheless, these short-scale phenomena do dominate sediment resuspension like in the 1999-data, as may be inferred from the large vertical current and 25 dB (factor ~300) increase in turbulent acoustic

reflection more than 60 m above the bottom, as measured in unprecedented detail using a fast-sampling ADCP (acoustic Doppler current profiler) (Fig. 4). Apparently, the periodicity of generating mechanism (tide or atmospheric disturbance, or a combination of both) is irrelevant for the sediment resuspension due to the vigorous turbulence moving up the slope.

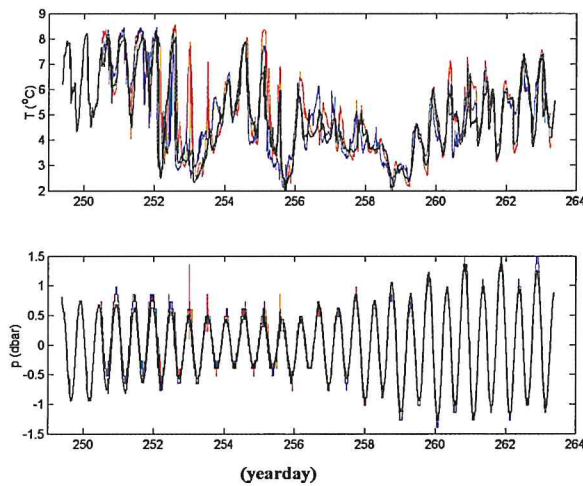


Fig. 3. Upper panel as Fig. 1 but for 14-days of data obtained during SLOPEMIXING, September 2005. Three moorings were located 2.5 km apart horizontally, all at the 600 m isobath. Lower panel shows corresponding pressure data.

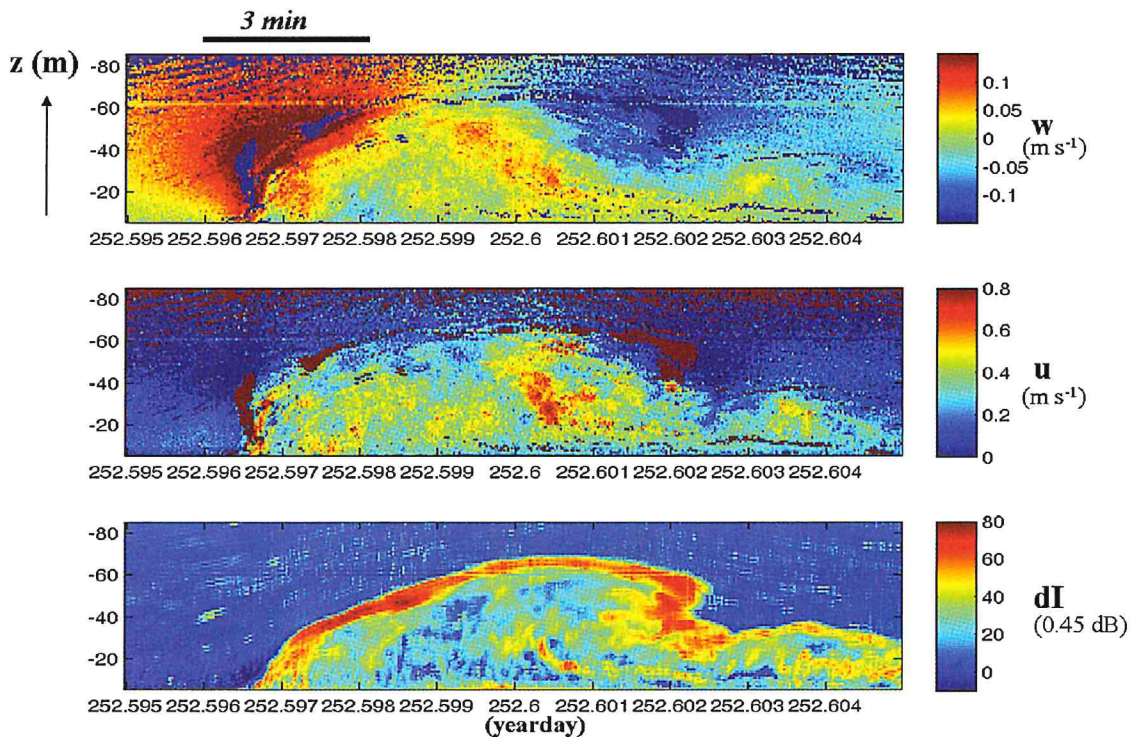


Fig. 4. Detailed [14 minutes] example of solibore passage as observed during SLOPEMIXING 2005 using 2 Hz sampling ADCP. Time (in year days) – height above the bottom (in m) panels show: Vertical currents (w ; upper panel), which are very large upward near the front of the solibore, which propagates from left-to-right up the slope. Upslope current (u ; middle panel). Acoustic amplitude relative to time mean ('relative echo intensity' dI ; lowest panel), a measure for suspended sediment and stratified turbulence, is found largest along the upper rim of the solibore and in small patches in its interior. The dark blue stripes and patches in the upper panel and the same in brown in the middle panel represent bad data.

FERRY OBSERVATIONS OF CURRENTS AND BEDFORMS

Contributors: Maarten Cornelis Buijsman, Frans Eijgenraam and Herman Ridderinkhof*

Since 1998, currents and water depths have been recorded in the Marsdiep tidal inlet with an acoustic Doppler current profiler (ADCP) mounted under the ferry 'Schulpengat'. The objective of this project is to gain insight in the effects of tides, storms, and density differences on the currents, and to determine long-term sediment transport pathways. The measurements indicate that along-channel currents and bedload transport are governed by tides, while cross-channel currents are governed by density differences and bathymetry. The observations also reveal the existence of large bedforms that migrate floodward. The strong seasonal variability in bedform height and migration speed in the northern half of the inlet may be attributed to the tides or to a temperature-related fluctuation in fall velocity.

Introduction

In cooperation with the ferry company 'Texels Eigen Stoomboot Onderneming' (TESO), we conduct ferry-mounted ADCP measurements in the Marsdiep tidal inlet since 1998 (Fig. 1). The ADCP, mounted at 4.3 m below the water level, measures current speeds, acoustic backscatter (ABS), and water depths. The ferry crosses the inlet twice per hour at a speed of about 17 km h^{-1} , up to 32 times per day, 7 days per week, about 300 days per year.

Tidal water transport and currents.

We analyzed the instantaneous water transport and (depth-averaged) currents to study the contribution of the tides. The water transport was computed by integrating all eastward current velocities u along the ferry transect and over the water depth. With 144 tidal constituents, maximally 98% (50%) of the variance in water transport and along-channel cur-

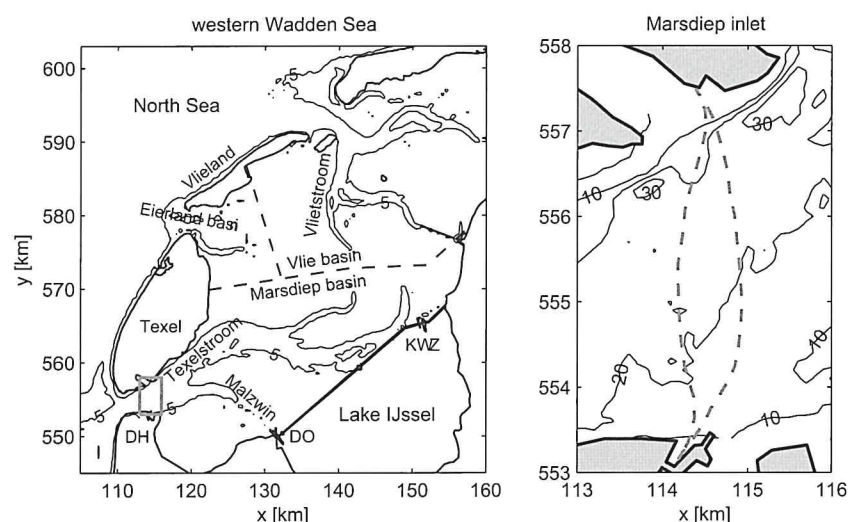


Fig. 1. Study area showing the western Wadden Sea (left panel) and the Marsdiep inlet (right panel). In the left panel, the Marsdiep inlet is marked by the grey box and watersheds by black dashed lines. In the right panel, the envelope of ferry crossings is marked by the grey dashed lines. Contourlines are contoured in meters relative to mean-sea level.

rents (cross-channel currents) is explained by the tides. The most important constituent is the semi-diurnal lunar M_2 constituent, which is modulated by the second-largest solar S_2 constituent (about 27% of M_2). Compound and overtides, such as $2MS_2$, $2MN_2$, M_4 , and M_6 , are important in the inlet. The currents are strongly rectilinear and they are sheared vertically and

horizontally, with the highest currents at the surface above the deepest part of the inlet (maximally 1.8 m s^{-1}).

Subtidal water transport

An analytical model of the subtidal water transport between the Vlie and Marsdiep tidal basins was used to study the influence of wind. The model results and observa-

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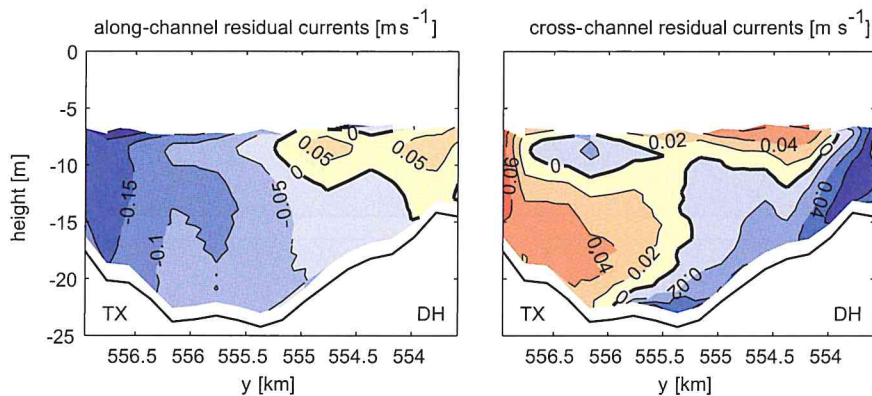


Fig. 2. Mean currents in the Marsdiep inlet for the period 2000-2001. Warm (cold) colours in the left panel indicate floodward (ebbward) flow. Warm (cold) colours in the right panel indicate northward (southward) flow. View is in the flood direction. The y-axis increases northward. TX (DH) refers to the Texel (Den Helder) side of inlet.

tions reveal a constant throughflow of about $1000 \text{ m}^3 \text{ s}^{-1}$ from the Vlie to the Marsdiep basin, which is due to the influence of tidal stresses. In agreement with data, the model shows that variability in subtidal water transport is mainly governed by wind stress. In particular, south-westerly winds force a throughflow from the Marsdiep to the Vlie basin, whereas northwesterly winds force a smaller mean water transport in the opposite direction. The contribution of remote sea-level change to the water transport has been found to be much smaller than the contribution of local wind stress.

Mean currents

The mean along-channel currents are directed into the basin in the shallower channel to the south and out of the basin in the deeper channel to the north (Fig. 2, left panel). These mean currents result from a fairly uniform inflow during flood and asymmetric outflow during ebb, with highest current veloc-

ities in the deeper channel along the Texel shoreline.

The mean cross-channel currents in the right panel of Fig. 2 are northward (southward) near the surface (bottom) in the southern half of the inlet and vice versa in the northern half. The counter-clockwise circulation in the southern half is due to the inflow of fresher water from the Malzwin channel (Fig. 1) into the inlet channel during ebb. This fresher water flows northward over the heavier

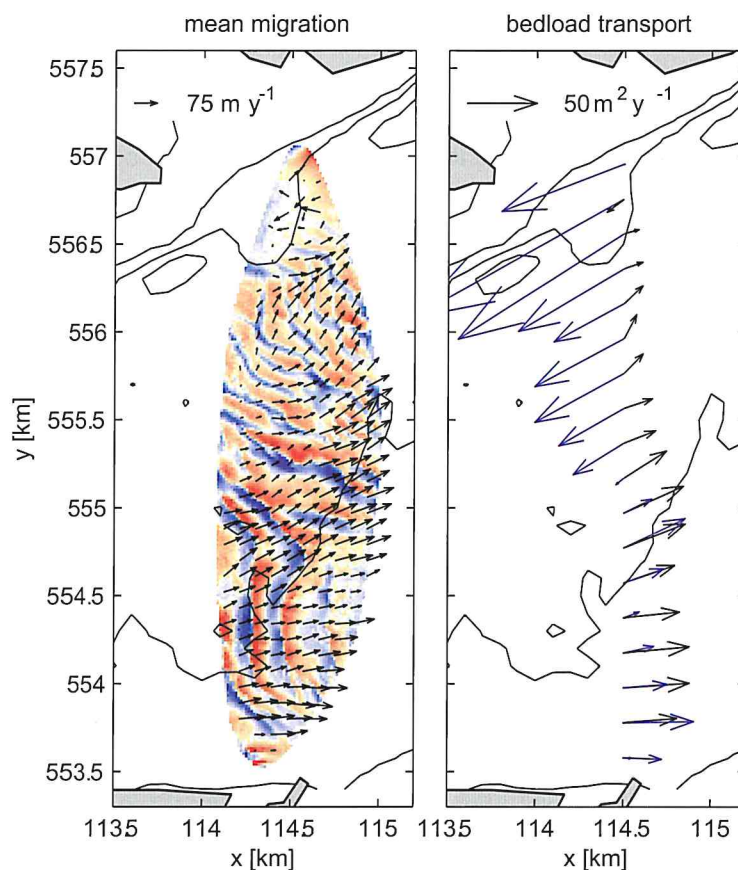


Fig. 3. Bedform migration and bedload transport. The left panel shows the mean bedform migration vectors for the period 1998-2004. Background is a digital terrain model showing the variance around the mean water depth. Warm (cold) colours indicate crests (troughs) of the bedforms. The right panel shows the mean bedload transport inferred from the bedforms (black) and currents (blue) for 1999-2002.

saltier water. In the northern half, the clockwise circulation is due to the curvature of the streamlines and density differences. During flood, a body of heavy salt water spreads out northward near the bottom, contributing to the clockwise circulation.

Bedforms

ADCP-depth measurements were compiled into digital terrain models (DTMs; Fig. 3, left panel). These DTMs reveal the existence of large asymmetric bedforms, i.e. sand waves, with lengths of order 100 m and heights of about 1 m. The sand waves migrate in the flood direction with rates up to 90 m y^{-1} (Fig. 3, left panel). The height and migration speed portray a strong seasonal variability in the northern half of the inlet (Fig. 4). The area-mean height is about 0.5 m higher in fall than in spring and the area-mean migration rate is about 40 m y^{-1} higher in winter than in summer.

The ADCP-current measurements were used to explain the sand-wave observations. 'Measured' bedload transport was inferred from sand-wave dimensions and migration speed and this was compared with 'predicted' bedload transport based on currents and bedload transport formulas (Fig. 3, right panel). In the flood-dominated southern half of the inlet, predicted bedload transport agrees in direction, magnitude, and trends with measured bedload transport. However, in the ebb-dominated northern part of the inlet

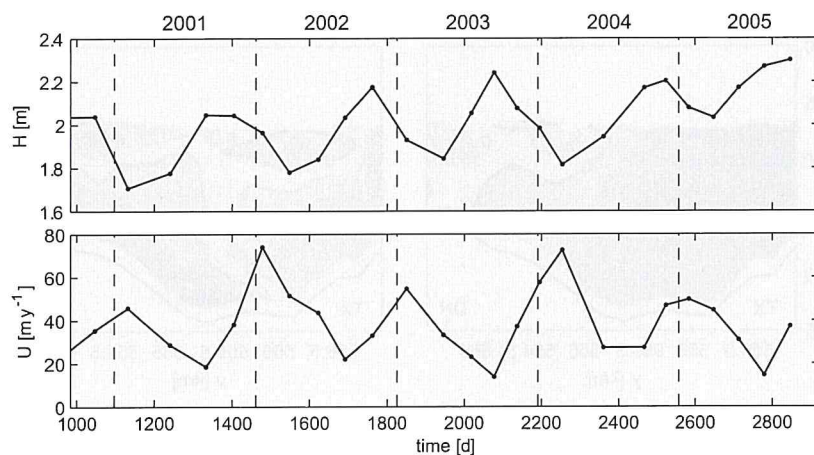


Fig. 4. Time series of area-mean sand-wave height H and migration speed U for sand waves in the northern half of the Marsdiep inlet. Vertical dashed lines indicate the beginning of a new year. Years are indicated above the top panel.

the predicted bedload transport is opposite to the sand-wave migration. It is hypothesized that in the northern half suspension transport dominates over bedload transport in driving the sand-wave migration. The dominance of suspension transport also explains why sand waves are smaller, more three-dimensional and more rounded here. The seasonal variability in height and migration may be attributed to the tides and/or tempera-

ture-related seasonal fluctuation in fall velocity. The fall velocity depends on kinematic viscosity, which is temperature dependent. In winter, stronger tides and/or a lower fall velocity enhance sediment transport, increasing sand-wave migration and decreasing sand-wave height. Storms and estuarine circulation do not appear to be important for the sand-wave variability.



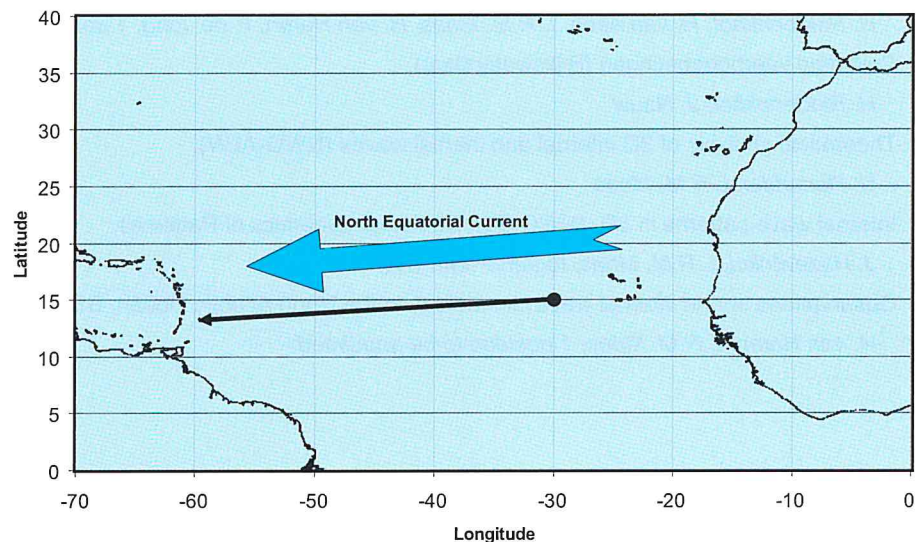
Ferry Schulpengat.

MESSAGE IN A BOTTLE...

Contributor: C. Veth*

During the R.V. Pelagia research cruise 64PE248 (bsik/LOCO-IW06) in the Canary Basin region, a bottle with a message has been launched on the 1st of June 2006 near mooring LOCO-18/3 at position 15° North, 30° West, just West of the Cape Verde islands. The bottle was found by Pat Stafford at Long Beach, on the southern most point of Barbados, West Indies on the 21st of November 2006. Apparently the bottle took the slave route from the Cape Verde islands to the West Indies, following the North Equatorial Current. The bottle has traveled more than 3000 km in about 172 days, giving an average speed of 0.22 m s^{-1} ($\sim 0.5 \text{ knts}$).

The release of the “bottle with a message” was promised during the the 2005 National Science Contest organized by the Dutch TV station VPRO and the Netherlands Organization for Scientific Research (NWO).



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photo by J.P.C. van Breevoort

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EXTERNAL PROJECTS PHYSICAL OCEANOGRAPHY

- GYROSCOP; NWO, CNRS.
H. van Haren, T. Gerkema
- Climatology of Deep Inertial Motions (CLIMA-DIM); NWO
H. van Haren, T. Gerkema
- Slope-Mixing; NERC, NWO
H. van Haren
- Long-term Ocean Climate Observations (LOCO) (NWO-groot)
H. Ridderinkhof, H. van Haren, L.R.M. Maas, H. van Aken, J.T.F. Zimmerman, T. Gerkema, C. Veth, together with Utrecht University and KNMI
- Transport and circulation around Madagascar (NWO-ALW)
H. Ridderinkhof, M. Schouten
- North Atlantic Ocean Monitoring and Modelling (BSIK – Klimaat voor Ruimte)
H. Ridderinkhof, H. van Aken, L.R.M. Maas, H. van Haren, F. de Jong, 1 post-doc to be appointed
- Calibratie veerbootmetingen (Rijkswaterstaat)
H. Ridderinkhof, J. Nauw
- Theoretical analysis of 3D internal and inertial waves (NWO-ALW).
U. Harlander, L.R.M. Maas
- Internal wave patterns in 3D (NWO-EW, Nonlinear dynamics of Patterns)
J. Hazewinkel, L.R.M. Maas, together with CWI
- Observations on the internal wave climatology in the North Atlantic Ocean; BSIK funded.
H. van Haren, L.R.M. Maas, 1 postdoc to be appointed

MARINE CHEMISTRY AND GEOLOGY



MCG aims to identify present and past climate forcing of ocean margin seabed systems, including formation and sedimentation of marine particulate matter, burial and diagenesis. Sedimentary processes and long term accumulation are primarily defined in continental margin settings and in the deep ocean, but also in shelf seas. This to better understand, reconstruct and predict the effects and forcing of ocean-climate change. Direct, short term, shipborne observations of water-column and seabed are complemented by laboratory-controlled experiments and analytical studies, whereas decadal to long-term variability is deciphered by exploiting sedimentary archives.

MCG has a strong commitment to multidisciplinary sea-going research. In 2006, seagoing activities were carried out in the Irminger Sea in relation to the VAMOC program, while also in the Mozambique Channel (Indian Ocean) studies observations were carried out in association with the LOCO program (in combination with the department of Physical Oceanography). Within the Microsystems (ESF/ALW) and Hermes (EU) programs, cruises were carried out in the Gulf of Cadiz and in Iberian Margin Canyons and in the ESONET/MOVE cruise in the Gulf of Cadiz with the R.V. Pelagia, the remotely operated bottom-tracking vehicle MOVE! underwent its second deep-ocean trial.

Closer to home, a continuous sampling program addressing the cycling of dissolved organic matter in coastal waters, was continued, including participation in short cruises of R.V. Navicula.

Research questions are formulated in three (related) subthemes:

- * Ocean and climate controls on sedimentation
- * Sedimentation, diagenesis and burial
- * Sedimentary processes and sediment accumulation, paleoceanography

Ocean and climate controls on sedimentation

Definition of ocean and climate controls on particle export from the water column as expressed in the temporal and spatial variability in settling of particulate matter to the seafloor forms the main aim of studies done under this theme. Particle export is traced to establish

the magnitude and rate of transformation, decomposition and transfer, to define the forcing processes. Primary data are obtained through water column profiling and sediment sampling, in combination with time-series sampling by moored sediment traps, equipped with current profilers and turbidity sensors.

Water column and mooring observations are locally complemented with measurements of near bed fluxes and hydrodynamic constraints at and just above the seabed by long term deployed seabed observatories.

In 2006, sediment trap moorings provided time-series measurements at the Mozambique Channel margin and in the Irminger Sea. The moorings were equipped with experimental cages to directly address the pressure related dissolution behaviour of biogenic silica. The latter was further studied and defined under laboratory conditions.

Sedimentation and diagenesis
Studies in this theme are directed to establish temporal and spatial scales of (recent) sediment transport, resuspension and burial of settling partic-

ulate matter, by combining field observations with shipboard laboratory analyses. To better understand the conditions controlling the balance of organic matter in recent and subrecent sediments and its quality, laboratory experiments are carried out in the laboratory at NIOZ, which are subsequently being validated by in-situ field observations.

This is done by combination of pore water and solid phase analyses under well defined temporal constraints and experimental conditions, and includes construction of element budgets by numerical modeling. Special attention is given to develop and produce specific electrodes/optrodes for discrete measurements.

In the HERMES (EU) project the Nazaré and Setubal/Lisbon canyon systems are being studied. Results so far show that fine grained sediment from the adjacent shelf is captured in the upper canyon and actively transported through the canyon to the abyssal plain under influence of internal waves, tidal currents and intermittent sediment gravity flows, in a suite of cycles of erosion and deposition.

Transport in the lower canyon is

predominantly by gravity flows, on a yearly or longer time scale. High accumulation rates of fine-grained terrigenous sediments, in both canyon systems, result in enhanced heavy metal accumulation. However, due to mixing with older sediments the surface concentrations are commonly lower than on the adjacent shelf and slope.

Sedimentary processes, sediment accumulation and paleoceanography studies allow to define climatic and oceanographic forcing conditions over a range of time-scales. Research in this domain focuses on climate variability in the NE Atlantic Ocean and to the further definition of climate-driven control on cold water coral carbonate mounds and formation of drift deposits along the margins of the NE Atlantic Ocean.

Modern ocean process studies are related to long-term climate-forcing by measurement of variability in sediment accumulation, as depicted by a.o. high resolution seabed imaging with the recently installed multibeam SIMRAD EM 300 sounding system, by seismic profiling, and by XRF-core scanning. This was applied in 2006 to define forma-

tion of mudvolcanoes and to constrain local conditions governing mound build-up in the Gulf of Cadiz El Arraiche mud-volcano field off Morocco (within the ESF/ALW MICROSYSTEMS project). Intermittent (methane) gas venting appears to play an important role here. In combination with the Department of MBT, attention was paid towards the expression and composition of gas hydrates in the Gulf of Cadiz and in the Black Sea through a joint project, partially supported by the NWO funded Netherlands-Russian cooperation program. Palaeoceanographic analysis of

sediment drift deposits provided centennial- to decadal-scale records of Holocene variability in surface and bottom water properties. These results constrain quantitative assessments of the rate and magnitude of North Atlantic circulation during rapid climate shifts with a particular focus on climatic optima of the Roman and Medieval warm periods, the subsequent Little Ice Age climatic deterioration, and 20th century multidecadal variability.

Apart from the scientific themes, MCG is responsible for the

national facilities (MRF) for nutrient analyses and XRF core scanning (CORTEX), and provides state-of-the-art expertise for sediment trap, coring and seismic profiling studies. Installation of the Multi beam system, acquired through a grant of NWO was successfully done (see elsewhere in this report). Within the ESONET Network of Excellence, seabed observatories are being further developed and designs and functionalities upgraded.

THE NEW MULTIBEAM ECHO SOUNDER ON BOARD THE RESEARCH VESSEL PELAGIA: 3-DIMENSIONAL MAPPING OF THE SEABED FROM THE SHELF TO THE DEEP OCEAN.

Henk de Haas*, Marck Smit and Tjeerd van Weering

Knowledge of the seabed is important in the marine sciences. Physical oceanographers study currents and internal waves that are influenced by the topography of the ocean floor, biologists study animals living at and in the seabed under conditions determined by hydrography and geologists and geochemists study ocean floor properties and processes. For all these disciplines of the marine sciences it is extremely important to not only know the water depth in the research area is, but also to have knowledge about the smaller scale variation in the seabed topography (or bathymetry) and the morphology of the sedimentary deposits. To accurately determine the bathymetry and seabed morphology in study areas of interest, Royal NIOZ has installed a Kongsberg EM300 multibeam echo sounder on board R.V. "Pelagia" in spring 2006. This allows composition of high resolution 3-dimensional images of the seabed, from the coastal seas to the deep oceans, down to at least 5 km water depth.

Introduction

With the increasing knowledge on geological, chemical, biological and physical processes in the seas and oceans, present day and future research will more and more focus on detailed studies to fine-tune our understanding of processes in the marine realm. For those scientists dealing with seabed related processes (for example benthic biologists, physical and chemical oceanographers, climatologists, geologists, geochemists), it becomes increasingly important to know the bathymetry in specific areas in detail. Variations in seabed morphology influence currents or may force internal waves, which in turn influence the transport of sediments and food particles essential for the life of animals and sediment-water exchange processes at the seabed, etc.



The difference between a single beam (left) and a multibeam (right) echo sounder. The single beam echo sounder uses 1 relatively wide sound beam, resulting in a not very accurate depth measurement along a line. The new multibeam echo sounder uses 135 very narrow beams, resulting in many accurate depth measurements along a broad strip of seabed. (Multibeam data from Galicia Bank, off shore northwest Spain.)

From 2D to 3D.

During the recording of old fashioned 2-dimensional (single beam) echo sounder lines the ship sails in a straight line with a continuous speed while the echo sounder produces a sound signal at regular intervals. The single beam echo sounder produces one sound beam, directed towards the seabed directly underneath the ship. The sound pulse is reflected at the

seabed and the echo is recorded on board. By taking into consideration the speed of sound in water, and by accurate measurement of the time difference between submitting and receiving a sound pulse, the local depth is defined. The result of continuous measurements along the ships track is a profile of the seafloor. If several lines are recorded in parallel, then this gives a rough indication of the

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local bathymetry. By contrast, the Kongsberg EM300 multibeam echo sounder produces 135 sound beams, in a fan-shaped geometry perpendicular to the ships track. In this way not a single line, but a broad strip of the seabed is scanned simultaneously. These strips are recorded in parallel and result in a 100% coverage of the seabed. These data can be used to produce detailed maps with depth contours, but also 3-dimensional images of the seafloor. Because each of the 135 beams is much narrower than the beam of a single beam echo sounder, covering of an area with the multibeam echo sounder not only goes much faster than with a traditional echo sounder, the resulting map produced with the new device is also more accurate.

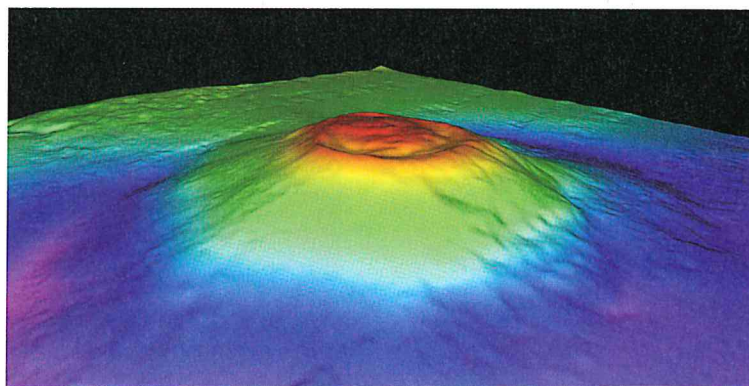
The use of multibeam images

In bathymetric complex areas the availability of accurate maps is an absolute need to select optimal locations for example for deployment of moorings, deployment of landers or bottom sampling. If for instance geologists need sediment cores with high sedimentation rates, they should avoid steep slopes, since sediments have the tendency to slide down steep slopes. If high resolution sampling is essential, for paleoclimatic or –oceanographic studies, specific sites may be chosen. Prior to the sampling, with the new multibeam echo sounder an accurate bathymetric map providing insights into most suitable station locations in

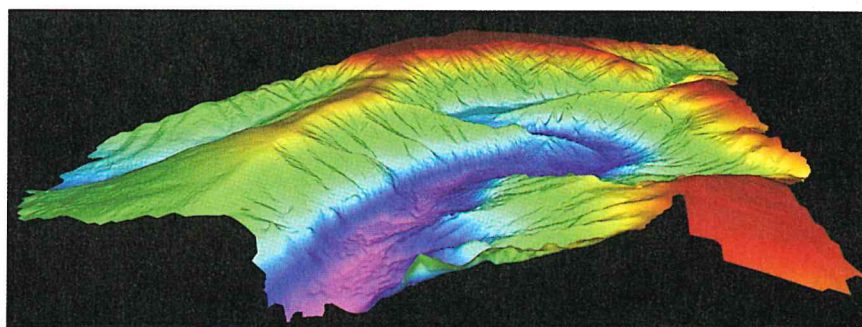
relation to the seabed structure and morphology can be composed. Likewise, multibeam echo sounders are of great use to benthic biologists.

A multibeam echo sounder not only provides detailed bathymetry, but can also supply information of the sediments composing the seabed, as the intensity of the reflected sound is different if it is reflected from a clayey bottom

compared to a sandy or rocky seabed. Three-dimensional images of the seafloor also give information on the sedimentary processes at hand. Mud volcanoes (where soft mud is expelled from the deep subsurface, similar to lava being expelled from a normal volcano), submarine canyons (underwater channels running across the continental slope and through which sediments are transported from the



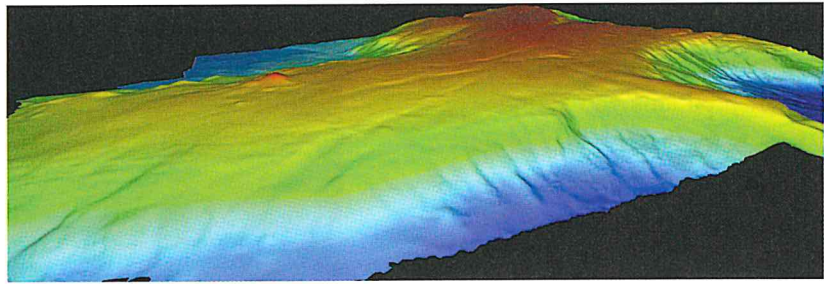
A 3-dimensional representation of the Al Idrisi mud volcano, located in the Atlantic Ocean about 20 miles off shore the north-western Moroccan coast. The water depth on this image ranges from 180 (red) to 450 m (purple). The horizontal scale varies in this view. In front the image covers about 6 km from left to right. From the front of the image to the corner at the back is about 9 km. View towards the southeast. Studies of mud volcanoes and gas seepage at the seabed are carried out through ESF/NWO and EU grants by the departments MCG, MEE and MBT. [Data collected by Henk de Haas, ESF-NWO funded project MiCROSYSTEMS.]



The upper part of the Lisbon Canyon as recorded in 3D by the new EM300 multibeam echo sounder. The viewer is located above the Portuguese shelf and looks northwards towards Lisbon. This part of the seafloor is about 11 km wide (left to right) and 13 km long. The water depth ranges from 50 m (red) to 1750 m (purple). [Data courtesy Henko de Stigter, collected within the framework of the EU project HERMES]

shallow coastal seas to the deep ocean) and deep water reefs and mounds are easy to detect on 3D bathymetric images. Thus, the images alone can provide direct insight into recent and past processes that are active in the oceans.

The purchase of the multibeam echo sounder has been made possible through a grant of the Netherlands Organisation for Scientific Research – Earth and Life Sciences (NWO-ALW).



3D Image of one of the Horse Shoe Seamounts. The Horse Shoe Seamounts is a group of mountains located in the Atlantic Ocean, about 800 km west of the Strait of Gibraltar. The mountain on this image is 2.5 km high, 24 km long (left to right on the image) and 20 km wide. The top of the mountain is at 1700 m water depth. The view is towards the northwest.

MOVE!'S IN DEPTH TESTING

D.J. Buijsman, J. van Heerwaarden, M. Laan, P. van Kralingen and E. Epping*

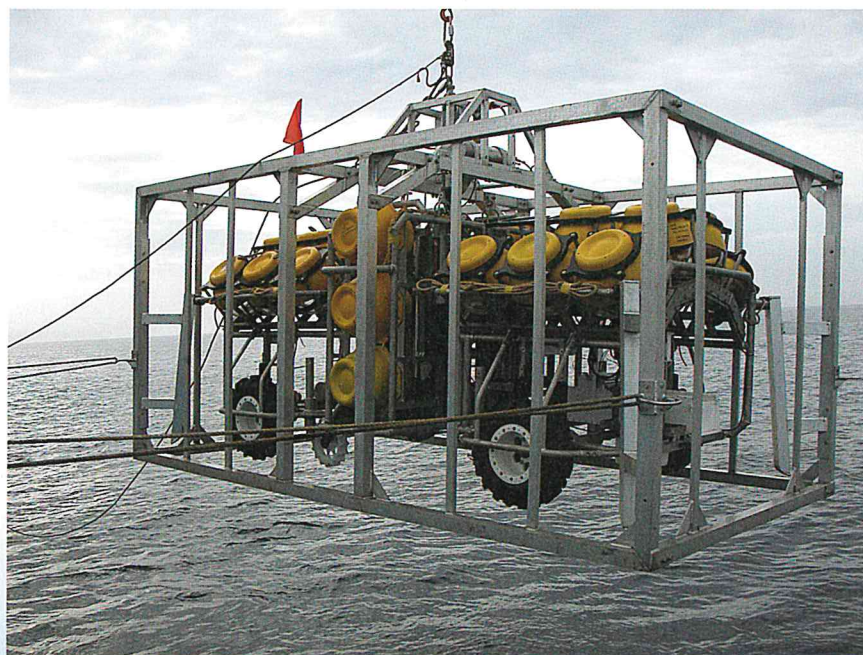
MOVE!, a new mobile platform for benthic research, has been tested at ~500 m water depth during an autumn cruise to the Gulf of Cadiz. Over the past 5 years, NIOZ has designed and constructed the core vehicle, the payload, several sensors, the video observation units, the video guarded deployment frame, and the local intelligence. Recently, the mission software for end-users has been finalised by NIOZ, allowing us for the first time to test the complete autonomous concept vehicle in 'deep' environments. The sediment in the testing area is classified as clay-silt, with an extremely soft and fluffy toplayer, and appeared quite a challenge for this mobile platform.

Growing scientific interest in spatial and temporal variability in benthic processes and the necessity for in situ observations urged us to extend current approaches and techniques with a mobile platform. A mobile platform would allow measurements and experiments distant from the area of landing-impact, a major drawback of static landers in current biogeochemical studies. The ability to visit multiple stations during a single mission would improve the spatial coverage of benthic processes within a limited area. In addition, long term deployments would enhance temporal coverage of observations, thereby overcoming the general snapshot character of short-term lander deployments. Thus, a vehicle was conceived that can function at a water depth of 6000 m, that has a moving range of over 1 kilometer, and that is able to cover 30 stations during a mission of up to 9 months in duration. Its modular design enables various end-users to hook up their payload modules if correctly interfaced, and renders

MOVE! a highly versatile mobile platform. Being tested in previous years in shallow environments only, this deep test should demonstrate its applicability to 'deep' environments.

A new scenario had been designed to deploy MOVE! alongside the ship, whereas earlier deployments were made from the rear. This new strategy allows

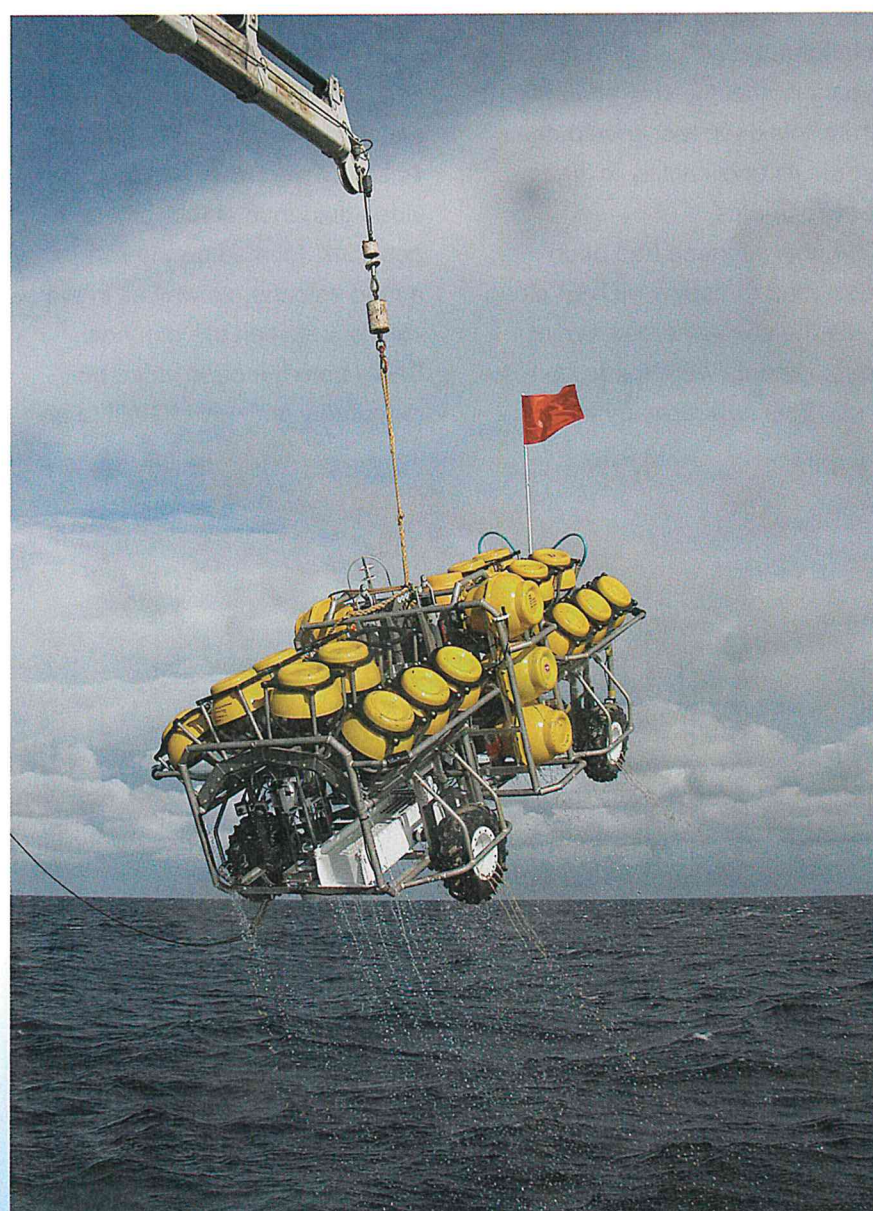
MOVE! to be deployed with a minimum of effort in a very controlled way; safe and fast, even at moderate windspeed (5-6 Bft). MOVE! was deployed from a cage under video guidance at four different positions, located on the summit of a mud volcano, as well as in the valleys between the mounds. Shots from the cage video unit repeatedly showed MOVE! to be



MOVE! is lowered to the sea floor while suspended within a deployment frame to avoid damage during touch down. The lowering and subsequent release from the frame is monitored via real-time video.

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MOVE! is back to the surface, having released 450 kg of ballast after the mission at the sea floor.



MOVE! is lifted on board to be serviced and prepared for the next mission.

positioned extremely gently on the sea floor and a flawless retrieval of the deployment cage.

The first deployment was most elucidatory, as it demonstrated a serious electrical short cut. The diagnosis of events after the mission showed that the program was reset shortly after initiation at the sea floor. Closer inspection revealed that the battery packs were completely emptied, that the titanium containers for electronics were seriously corroded, and a potential of 25 V between various subunits of MOVE!; all indicative of an electrical short cut, which could ulti-

mately be traced to 2 malfunctioning Birns connectors.

During subsequent deployments, the program was executed perfectly which allowed the testing of a benthic chamber unit, and of mobility subroutines to fine-tune the decision-criteria for the local intelligence. The benthic chamber module has a storage capacity of 150 water samples, sufficient for some 30 chamber incubations to study the exchange of solutes between the sediment and water column. After some minor ship-board modifications, this unit performed excellently and can be con-

sidered ready for use. The mobility performance of the vehicle on these extremely fluffy sediments, however, is still unsatisfactory. A video reconstruction showed that MOVE! ran for a few meters only, gradually burying itself too deep into the sediment to proceed. Preliminary suggestions to counter this problem for extremely soft sediments would simply be a reduction in drop weight (now 50 kg/wheel pressure) or an increase in wheel-sediment contact surface area. This will be a major issue for the next test cruise.



NE ATLANTIC SURFACE WATERS DURING THE LAST 2,400 YEARS: natural variability prior to man-made impacts on global climate

Thomas O. Richter*, Tjeerd C.E. van Weering, Wim Boer and Rineke Gieles

Project partners: Nicolas Caillon, Elsa Cortijo, Laurent Labeyrie (LSCE Gif sur Yvette, France)

Surface currents in the North Atlantic Ocean play a key role in modulating the regional and even global climate. Knowledge of the past behaviour of these currents is crucial to constrain their natural variability before man started to interfere with climate through emission of greenhouse gases. Here we present such reconstructions spanning the last 2,400 years, derived from a sediment core at one key N Atlantic site west of Ireland. Our results indicate that surface water temperatures and salinities were highly variable throughout this period, and suggest a general long-term cooling trend.

In the North Atlantic Ocean, the Gulf Stream and its northward extension carry huge amounts of warm and saline surface waters to high northern latitudes, maintaining the comparatively mild climate of NW Europe. Cooling of these saline waters far north increases their density, causing them to sink down and flow back southward in the deep ocean. Human greenhouse gas emissions might affect and weaken this current system and the global (combined surface and deep) thermohaline circulation, pushing climate beyond its range of natural variability. Consequences can be far-reaching, though certainly not as abrupt and dramatic as in Hollywood's "Day after tomorrow" scenario. To place possible present and future changes of the climate system in a longer-term context, it is essential to characterize its natural variability. As part of the EU-funded PACLIVA (Patterns of CLimate Variability in the North Atlantic) project, a joint effort by 12 institutes from 10 European

countries, we obtained records of surface water variability during the last 2,400 years at one key site west of Ireland (Fig. 1).

Direct instrumental temperature and salinity measurements are

available at the most for the last ~150 years. Information on longer-term climate changes has to be obtained from indirect ("proxy") evidence archived in marine sediments. We sampled one sediment

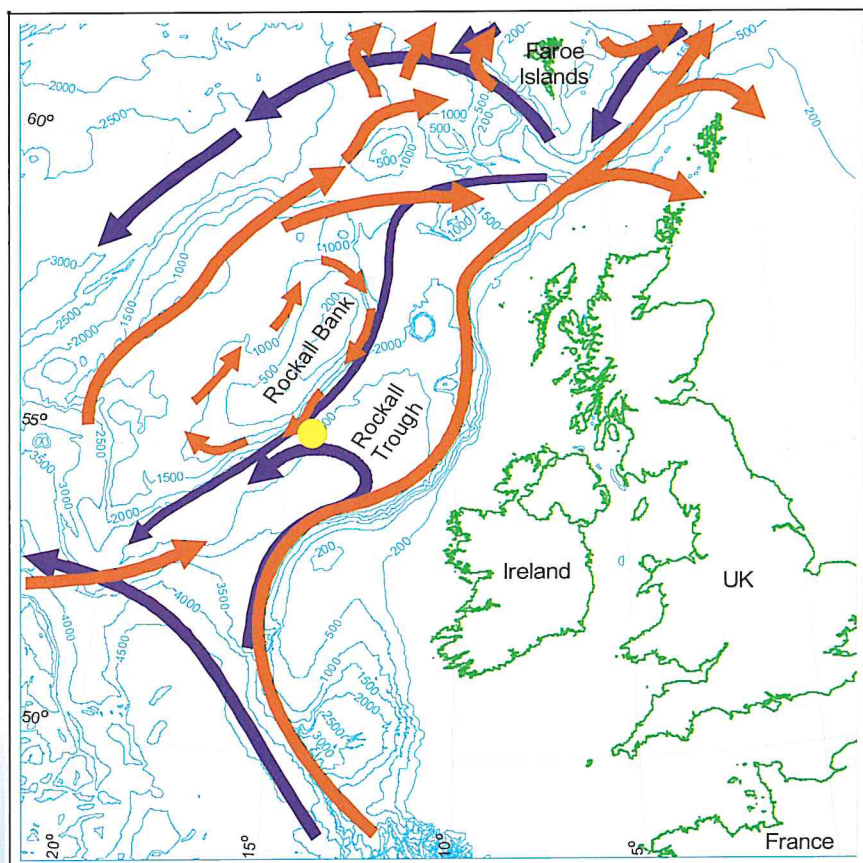


Fig. 1. Core location (yellow dot) and hydrographic setting (red arrows: surface currents, dark blue arrows: bottom currents).

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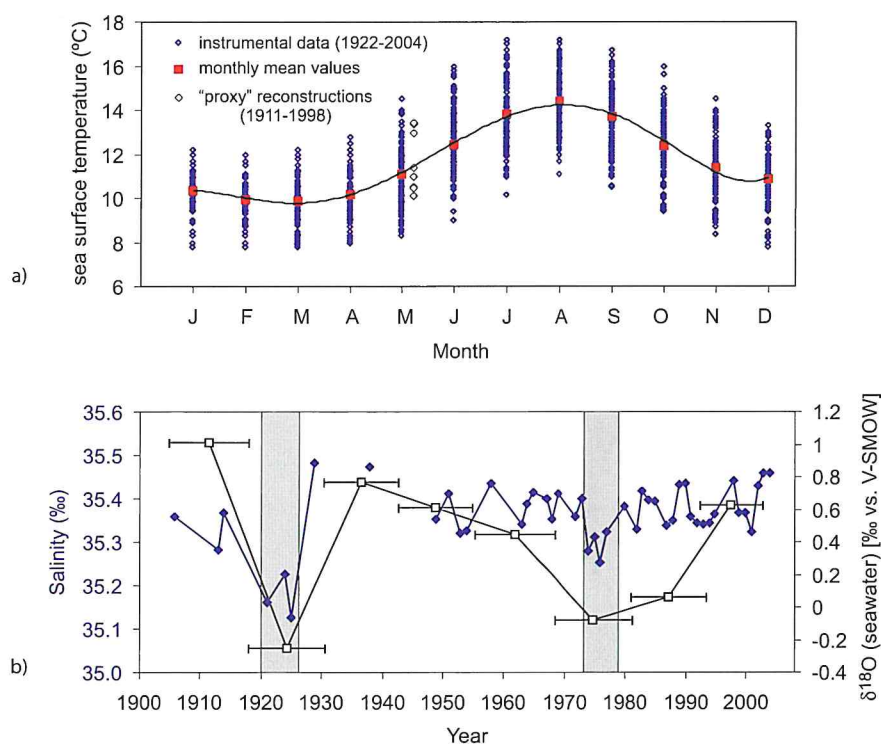


Fig. 2. Comparison of reconstructed surface water properties with 20th century direct instrumental measurements. a) Sea surface temperature. b) Salinity.

core with adjacent 'continuous' 1 cm-thick sediment slices. The age of the sediments was determined by analysing the natural radioactive isotopes ^{14}C and ^{210}Pb and the man-made isotope ^{137}Cs (derived from nuclear bomb tests and the Chernobyl nuclear accident). Proxy evidence for past surface water conditions is derived from planktonic foraminifera. These microscopic calcareous organisms live in surface waters, after dying they sink to the sea floor to form part of marine sediments. The oxygen isotopic composition ($\delta^{18}\text{O}$) of their shells reflects both water temperature and $\delta^{18}\text{O}$ of seawater, which is related to salinity. The Mg/Ca ratio of foraminiferal shells is dependent on the temperature of surrounding waters. Hence, we can simultane-

ously reconstruct surface water temperature and salinity with paired measurements of Mg/Ca and $\delta^{18}\text{O}$ in planktonic foraminifera.

The instrumental record helps to assess the validity of these indirect ("proxy") reconstructions (Fig. 2). Temperatures derived from our 20th century sediment record (top 8 cm of the sediment core) most closely coincide with late spring to early summer sea surface temperatures, indeed corresponding to the main growth season of the analysed foraminiferal species. The instrumental salinity record is discontinuous prior to 1950, especially during World War II. However, the available data reveal that our salinity reconstruction traces the main features of the instrumental record, particularly episodes of low salinity

during the 1920's and 1970's as highlighted by shaded rectangles in Fig. 2b). Obviously, the sediment record does not resolve year-to-year variability because each sediment slice was deposited during ~10-15 years (horizontal error bars in the figure) and thus represents average conditions over this time interval.

Reconstructions for the last 2,400 years (Fig. 3) reveal pronounced surface water variability over the entire record and a general long-term cooling trend. Some of the warmest temperatures and highest salinities occur from 150-400AD and 750-1150AD, coinciding with climate anomalies ("Roman and Medieval Warm Periods") described from several other records of past climate. However, temperature and salinity maxima are not sustained over several centuries, but alternate with cooler and fresher conditions in between. Surprisingly, the 20th century displays some of the lowest temperatures and salinities of the entire record. Pervasive temperature and salinity fluctuations may partly reflect internal 'unforced' variability of surface ocean currents. External forcing through variations in solar activity (inferred from fluctuations in production rate of the cosmogenic nuclide ^{14}C , Fig. 3a) may also play a role; based on the correlation between both records, it could explain up to 50% of the total variability in our sea surface temperature record.

In summary, we obtained evidence for pronounced variability in

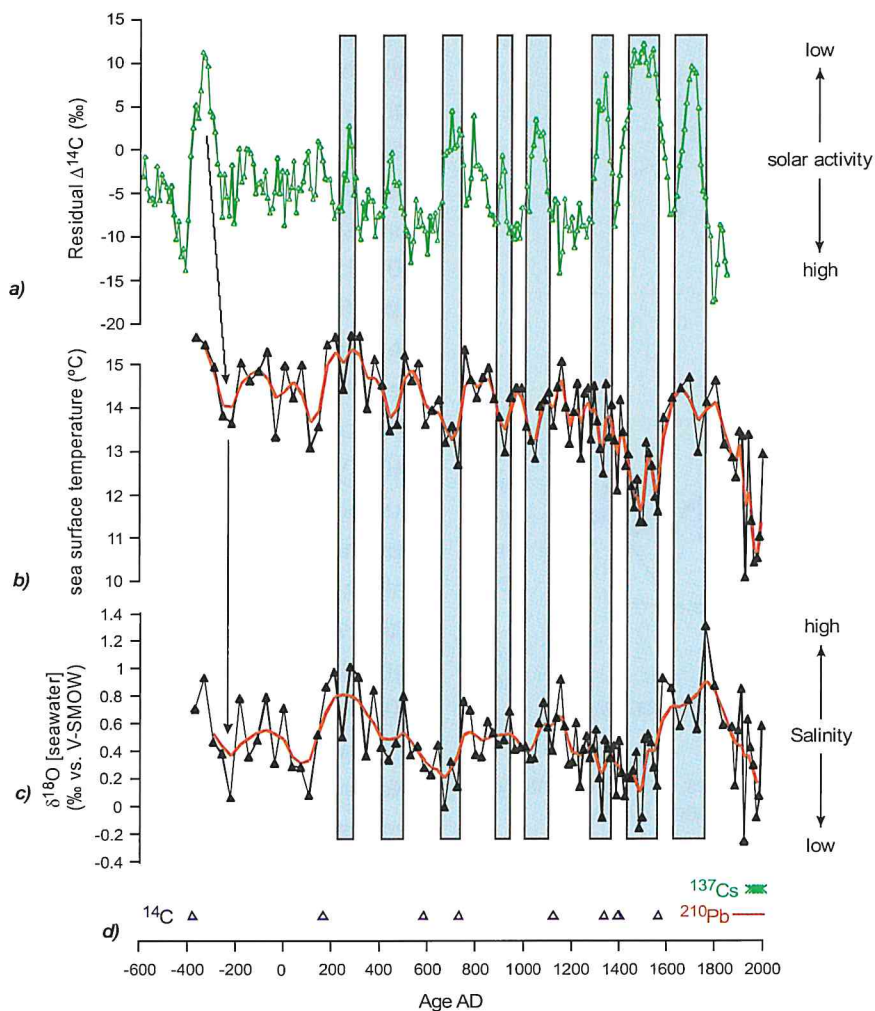


Fig. 3. Surface water reconstructions for the last 2,400 years. a) Atmospheric ^{14}C concentrations [literature data] tracing variable solar activity. b) Reconstructed sea surface temperature. c) Oxygen isotopic composition ($\delta^{18}\text{O}$) of seawater, an indicator for salinity. d) Age control derived from analyses of natural and man-made isotopes.

surface water conditions and, by inference, in the intensity of northward surface currents, prior to the onset of human greenhouse gas emissions constituting a unique and dangerous global climate experiment. Cooling during the 20th century could be interpreted as already reflecting weakened surface currents due to anthropogenic greenhouse gas emissions. However, we caution that it may instead represent the (temporary) culmination of a long-term natural

cooling trend. Moreover, our record is obviously site-specific; thus additional records from other locations will be required to assess if unprecedented circulation changes already occur on a basin-wide scale.

EXTERNAL PROJECTS MARINE CHEMISTRY AND GEOLOGY

- Forcing of carbonate mounds and deep water coral reefs along the NW European continental margin (Moundforce, ESF/NWO-ALW).
H. de Haas, T.C.E. van Weering
- Past Climate Variability (PACLIVA, EU)
T. Richter, T.C.E. van Weering
- Hotspot Ecosystem Research on the Margins of European Seas (HERMES, 6th FWP EU)
H.C. de Stigter, T.C.E. van Weering, G. Duineveld
- Lead in submarine canyons of the Portuguese margin (NWO-ALW)
H.C. de Stigter, T. Richter, T.C.E. van Weering
- A National Swath bathymetry system (NWO-Middelgroot)
H. de Haas, M. Smit, B. Koster, T.C.E. van Weering
- Forcing and development of carbonate mound formation along the NW European margin (NEBROC2, NWO)
C. van der Land, T.C.E. van Weering, J.S. Sinninghe Damsté
- ESONET European Seabed Observatories Network (network of excellence) (EU). Status
T.C.E. van Weering
- Instrumentation for multiple element ratio analysis: High Resolution-Inductively Coupled Plasma - Mass Spectrometer (HR-ICP-MS) (NWO-Middelgroot).
G.J.A. Brummer, W. van Raaphorst, W. Helder
- Carbonate Chemistry, Carbon Cycle and Climate Change: a multidisciplinary view (6C, 5th FWP of EU).
J. Ossebaer, S. Schouten, G.J.A. Brummer, in cooperation with AWI (Germany)
- Divalent cations: development and validation of proxies, from empirism towards a mechanistic understanding (NWO-DFG Bilateral Cooperation Programme).
G.J.A. Brummer, R.P.M. Bak. In cooperation with: AWI, Utrecht University, Münster University (Germany)
- East Kalimantan Programme for Coastal Zone Research Netherlands-Indonesia (WOTRO/KNOW/ICOMAR).
G. van den Bergh, G.J.A. Brummer, T.C.E. van Weering, R. Bak, in cooperation with Utrecht University.
- Long-chain diols as palaeoproductivity proxies (NWO-ALW).
S. Rampen, K. Timmermans, G.J.A. Brummer, S.G. Wakeham, S. Schouten, J.S. Sinninghe Damsté
- Variability of Atlantic Meridional Overturning Circulation (VAMOC; NWO-NERC-RCN trilateral programme RAPID2).
L.P. Jonkers, G.J.A. Brummer, H. van Aken, T.C.E. van Weering, in cooperation with VUA, CAM (UK), NOC (UK), Bergen University (Norway)
- Temperature and salinity proxies of ocean thermohaline circulation and climate change: development and verification (NEBROC2, NWO).
U. Fallet, G.J.A. Brummer, S. Schouten, in cooperation with AWI (Germany)
- Role of cyanobacteria in present and past biogeochemical cycling (DARWIN).
T. Bauersachs, S. Schouten, G.J.A. Brummer, J.S. Sinninghe Damsté
- Paleosalt (NWO/ESF-EuroClimate).
M.T.J. v.d. Meer, S. Schouten, J.S. Sinninghe Damsté, G.J.A. Brummer, E.C. Hopmans
- SINDOCOM [Southern Indian Ocean/Tropical Pacific teleconnections assessed by a joint coral-in situ ocean monitoring database] (NWO-ALW/Climate Change Program).
PhD student, G.J.A. Brummer, in cooperation with VUA
- MOVE! Construction of a remotely controlled vehicle for benthic research (NWO-Middelgroot/BMBF).
H.G. Epping, J.W. de Leeuw, G. Duineveld

- Early diagenetic reactions between iron and silica and their role in the global marine silica cycle (NWO-ALW).
F.A. Koning, H.G. Epping, in cooperation with Utrecht University
- Dynamics of dissolved organic matter in a coastal environment (NIOZ/NIOO-CEME).
M. Keuning, H.G. Epping, in cooperation with NIOO-CEME Yerseke



MARINE BIOGEOCHEMISTRY AND TOXICOLOGY

The department MBT addresses a field of research at the interface of the basic disciplines of chemistry, geology and biology. The basic questions are:

- Which organic compounds are present in the different compartments (biota, water, sediments) of the marine environment and what is their origin?
- What is their biochemical role in marine organisms, or, in case of anthropogenic components, what are their toxic effects?
- Which reactions (e.g. biotransformation and diagenesis) affect these components during transport in the marine environment? How are these reactions affected by environmental conditions and on which time scales? What can these components tell us on the biogeochemical cycling of carbon, nitrogen and sulfur in the ocean?
- What can be learned from organic matter deposited in marine sediments with respect to marine evolution, the functioning of past marine ecosystems, climate variability and organic carbon burial?

The research of MBT is divided into two departmental themes; Marine Biogeochemistry and Marine Toxicology.

In 2006, fieldwork was performed in a variety of places varying from the Atlantic Ocean to trace anammox activity, to cold seeps at the seafloor of the Mediterranean to investigate microbial communities oxidizing methane anaerobically, to a Swedish fjord to study the interaction of specific benthic foraminifera with bacteria. Quite a number of new graduate students started their project within the Darwin Centre for Biogeology where MBT collaborates with (micro)biologists at the Dutch universities and the sister institute of the NIOZ, the Netherlands Institute for Ecology (NIOO). At the same time, two graduate students got their PhD degree: Cornelia Wuchter for her work on the ecology of marine crenarchaeota and Yvonne van Breugel who studied negative carbon isotope excursions in the geological past, partly by a detailed study of remineralization processes in a Norwegian fjord. Probably our most outstanding scientific achievement in 2006 was the high number of papers in high impact journals; our department contributed to five Nature, two Science and one PNAS papers. This was partly due to the very successful application of our sea surface temperature proxy TEX₈₆ in disentangling the Arctic climate during greenhouse periods in the geological past in a collaborative effort with the scientific party of the Arctic Coring Expedition (ACEX) of the IODP. Another high-light was our work demonstrating the strong involvement of archaea in nitrification by detailed studies in the North Sea and Atlantic Ocean

in collaboration with our colleagues from the Biological Oceanography Department. Our department head, Jaap Sinninghe Damsté, was awarded the Vernadsky Medal from the European Geosciences Union for his innovative use of biomarkers to elucidate interactions between the Biosphere and Geosphere across major ecosystems and timescales. In 2006 he also gave his introductory speech ('oratie' in Dutch) as professor of molecular palaeontology at Utrecht University, Department of Geosciences. Our PhD student Johan Weijers obtained a prestigious Rubicon award from NWO. Rubicon offers researchers who have completed their doctorates in the past year the chance to gain experience at a top research institution outside the Netherlands. In May the department organized the NEBROC course "Advanced Organic Biogeochemistry" which was attended by 35 persons from eight different countries.

A more detailed account of the results of some of the projects that ended in 2006 is given on the following pages.

AN ATLANTIC JACUZZI IN THE CRETACEOUS

Astrid Forster, Stefan Schouten and Jaap S. Sinninghe Damsté*

Future atmospheric levels of carbon dioxide are anticipated to rise substantially during this century. Since carbon dioxide is an important greenhouse gas, this is expected to result in a warmer climate but it is not easy to predict how warm. In the geological past, such as in the mid Cretaceous (80-120 My ago) there have been times characterized by atmospheric carbon dioxide levels 4-10 times higher than pre-industrial levels. Using a palaeothermometer called TEX₈₆ based on fossil membrane lipids of archaea, we estimated tropical sea surface temperatures (SSTs) in the mid-Cretaceous. The results show that tropical SSTs varied between 30 and 40°C, suggesting substantially warmer oceans in the near future.

In the last years we have developed a method to reconstruct SST by the analysis of fossil membrane lipids of pelagic crenarchaeota, tiny prokaryotic organisms which occur ubiquitously in the ocean. These archaea adjust their membrane composition according to temperature and a small amount of these lipids escapes mineralization and is stored in marine sediments. In this way, marine sediments function as archives of past climate change and can provide information on extreme climates in the past.

Calibration of the thermometer for high temperatures

One problem in the application of this palaeothermometer is that it is calibrated for present ocean systems, where annual mean SSTs are always <30°C (TEX₈₆<0.7). Consequently, TEX₈₆ values >0.7 have to be extrapolated from the present-day core-top calibration curve. To overcome this problem, waters from the tropical Indian Ocean containing Crenarchaeota

were incubated in mesocosms at temperatures ranging from 25 to 40°C (Fig. 1) to study the changes in membrane lipid composition. Our results reveal that Crenarchaeota were able to thrive at temperatures up to 40°C and show a similar linear correlation of TEX₈₆ with incubation temperature as demonstrated previously for incubation experiments at lower

temperatures (Fig. 2). However, due to changes in the membrane lipid composition that are not observed for fossil lipids in sediments deposited in exceptionally warm oceans of the geological past, our mesocosm calibration should still be used with caution to convert TEX₈₆ values from these sediments into SST.

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Fig. 1. Set-up of the mesocosm experiments to calibrate the TEX₈₆ at 30-40°C using waters from around the Seychelles. Experiments were carried out in the dark.

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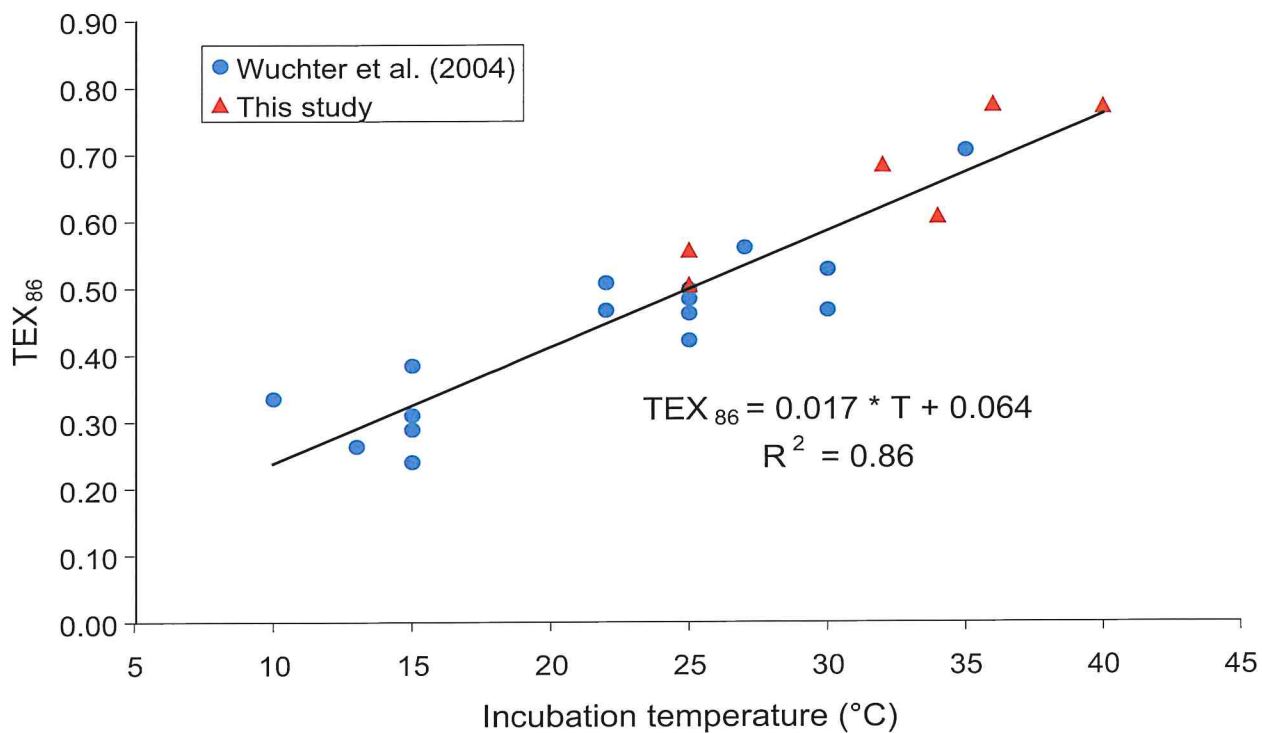


Fig. 2. Correlation of the TEX₈₆ with sea water temperature in the mesocosm experiments. The blue points were obtained previously by Cornelia Wuchter using water from the North Sea. The data points in red were generated during this project.



Fig. 3. Part of the scientific party of Leg 207 to the Demerara Rise on the bridge of the ODP drilling ship the R/V Glomar Challenge. On the left Astrid Forster who was one of the organic geochemists participating on this expedition.

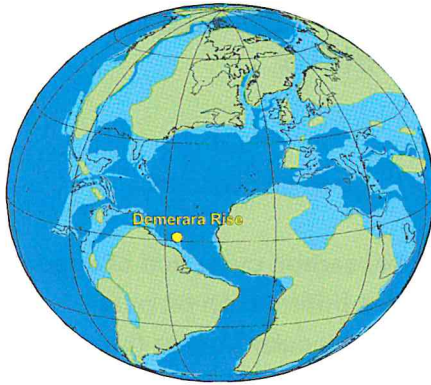


Fig. 4. Paleogeographic map of the Mid Cretaceous with the location in the tropical proto-North Atlantic Ocean of the drilling sites at the Demerara Rise (ODP Leg 207). Green=land, light blue= shallow sea, dark blue=deep sea.

Determining SSTs of the tropical ocean in a Greenhouse world

During the mid-Cretaceous (Early Albian to Campanian), Earth witnessed an extraordinarily warm climate and high sea-level. If mid-Cretaceous global warmth were linked to atmospheric carbon dioxide concentrations exceeding considerably the present level, contemporaneous SSTs should have been warmer than today globally, even in the tropics. We tested this by generating long-term TEX_{86} -based SST records on cores obtained during Ocean Drilling Program (ODP) Leg 207 (Fig. 3) to the Demerara Rise (western equatorial Atlantic, Fig. 4). We find that Albian-Santonian SSTs in the equatorial Atlantic Ocean ($\geq 32^\circ\text{C}$) were substantially warmer than today ($\sim 27\text{--}29^\circ\text{C}$) with an optimum during the Turonian (Fig. 5). If we apply the TEX_{86} calibration from the mesocosm experiments (Fig. 2), reconstructed SSTs are even above 40°C (red scale Fig. 5).

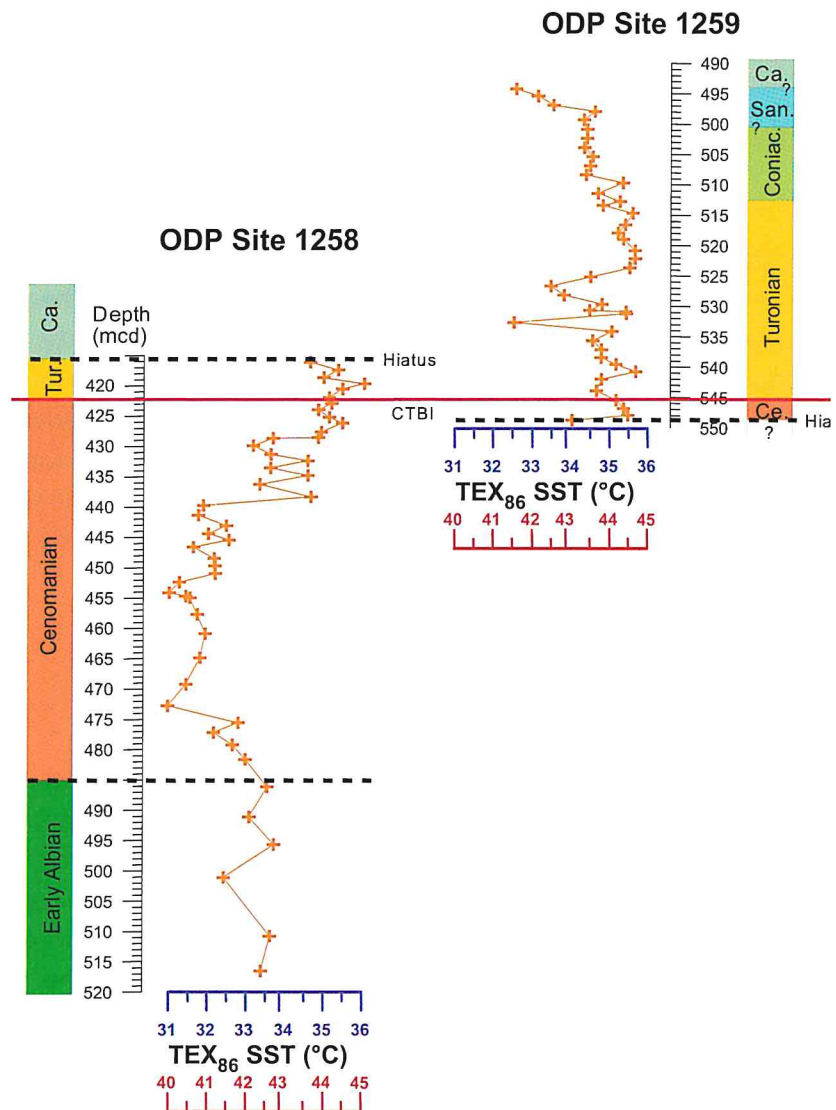


Fig. 5. TEX_{86} palaeo-SST records of Sites 1258 and 1259 revealing the long term trend from the Albian to the Santonian. The temperature scale in blue refers to the conservative estimate based on the present-day marine core top calibration (from Schouten et al., *Geology* 31 (2003) 1069-1072). The temperature scale in red is based on the TEX_{86} -temperature calibration of the mesocosm experiments (see Fig. 2). mcd = meters composite depth; Ca. = Campanian; Coniac. = Coniacian; San. = Santonian

These results are consistent with the hypotheses that the mid-Cretaceous high levels of atmospheric carbon dioxide were an important factor for the extreme warmth during this period. They also suggest that with increasing levels of carbon dioxide not only the poles but also the tropics will

experience a substantial warming in the near future.

SOIL-DERIVED BACTERIAL REMAINS AS TRACER OF TERRESTRIAL ORGANIC MATTER IN MARINE SEDIMENTS

Johan W.H. Weijers*, Stefan Schouten, Ellen Hopmans and Jaap S. Sinninghe Damsté

The flux of organic matter from land to sea is an important link in the global carbon cycle and of importance to global climate change. Reconstructing this flux in the past provides information on past changes in the carbon cycle and past changes in river activity. Most of the molecular tracers (biomarkers) used for these purposes are derived from higher plants and thus vulnerable to vegetation changes. We developed a new approach by looking for biomarkers derived from organisms thriving in soils which are thus more specific tracers of soil organic matter in marine sediments. We show that this new method is able to trace soil organic matter in marine sediments in front of the Congo River outflow and in reconstructing the past activity of one of the largest European rivers that ever existed at the end of the last Ice Age.

Most tracers used up till now to distinguish between terrestrial and marine organic matter in marine sediments are either non-specific bulk parameters, e.g. the carbon isotopic composition of organic matter, or plant derived biomarkers which are, in contrast, highly specific for vegetation but vulnerable for changes in the vegetation composition and tend to neglect soil organic matter. An alternative and additional approach is to use biomarkers derived from microorganisms living in soils. In this context we developed a method based on branched glycerol dialkyl glycerol tetraether (GDGT) membrane lipids, i.e. molecules making up the cell membrane of micro organisms, from bacteria living in soils and peat bogs (Fig. 1). These molecules are, upon soil erosion, transported by rivers to the marine environment and settle down to the

ocean floor. Marine crenarchaeota, ubiquitous pelagic archaea thriving in the oceans, synthesise a similar type of membrane molecule called crenarchaeol (Fig. 1), which eventually also gets buried in the marine sedimentary archive. The

ratio between these two types of molecules, called the Branched vs. Isoprenoid Tetraether (BIT)-index (Fig. 1), gives information on the relative fluvial input of soil organic matter. Analysis of a diverse suit of soils showed that branched

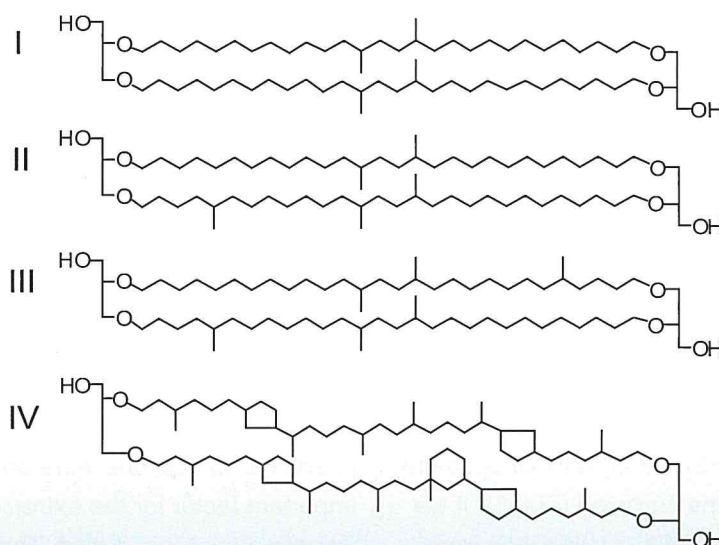


Fig. 1. Chemical structures of the branched glycerol dialkyl glycerol tetraethers (GDGTs) (I to III) and crenarchaeol (IV). The BIT-index is defined as $[I+II+III] / [I+II+III+IV]$. Thus, BIT indices approaching 0 indicate a pure marine source and BIT indices approaching 1 indicate a pure terrestrial source.

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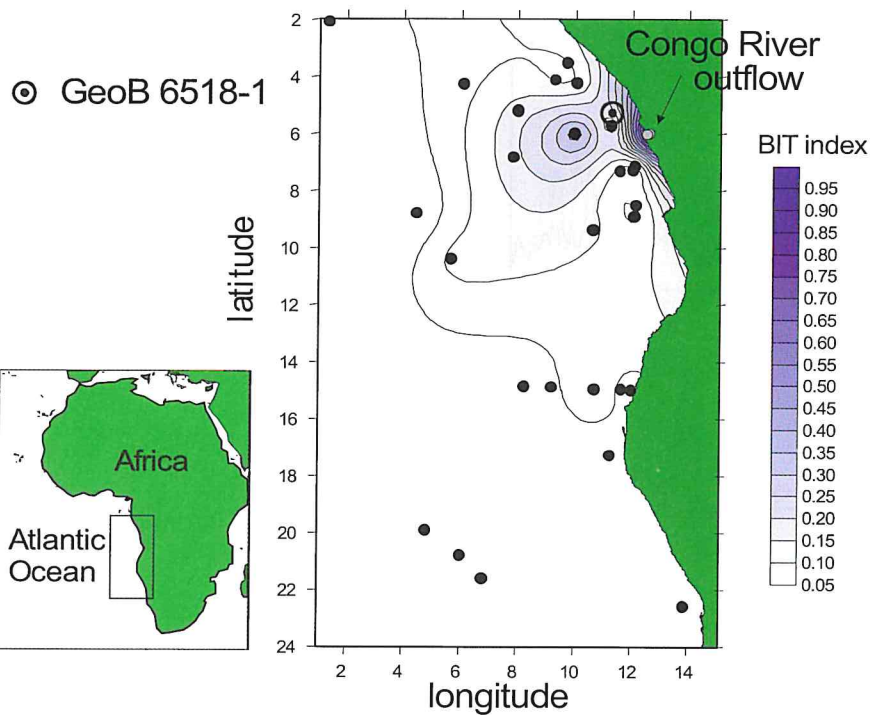


Fig. 2. Contour plot of the BIT index based on analyses of surface sediments from the eastern equatorial Atlantic Ocean (black dots). The high BIT indices near the Congo River outflow are indicative of relative high input of terrestrial organic matter. These decrease with increasing distance from the river mouth.

GDGTs are present in every soil analysed so far and that the BIT index in soils is high, between 0.9 and 1.0. Calculating the BIT-index in surface sediments in the western equatorial Atlantic Ocean in front of the Congo River shows a river plume pattern with decreasing BIT indices with increasing distance from the river mouth (Fig. 2). This indicates that the branched tetraether membrane lipids indeed originate from land and that the BIT-index can be used to trace soil organic matter in marine sediments.

Application of the BIT-index in a marine sediment core (GeoB 6518-11; Fig. 2) from the Congo fan in conjunction with the stable carbon isotopic composition and the carbon over nitrogen ratio of

organic matter allowed us, by using a three end-member mixing model, to quantify the terrestrial organic matter input in the Congo deep sea fan over the last 20,000 years. It appeared that on average 45% of the organic matter at this site is of terrestrial origin. Additionally, tentative carbon burial budget calculations show that the amount of terrestrial carbon buried in this Congo deep sea fan varied over this time interval from 2 to $10 \times 10^{11} \text{ gC yr}^{-1}$, and is strongly related to variations in Congo River discharge. In general, based on these calculations, approximately 3 to 5% of the fluvial terrestrial organic matter discharge by the Congo River seems to have been buried eventually in marine sediments, while the remainder is

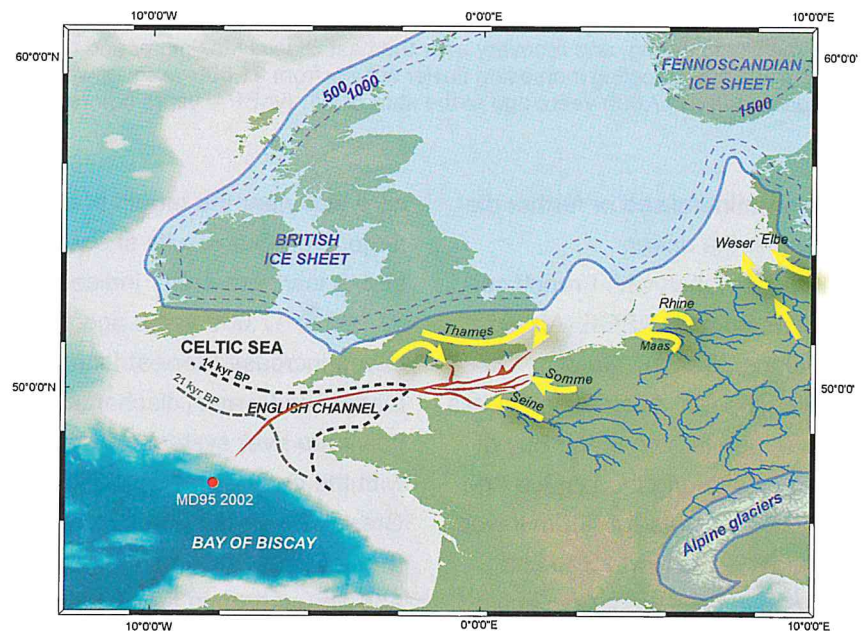


Fig. 3. Map showing the environmental conditions during the Last Glacial Maximum in north-western Europe. The British and Scandinavian ice sheets coalesced above the northern North Sea basin and forced river waters and ice sheet melt waters to flow across the dry North Sea basin and Channel basin. This river, known as the Channel River, was one of the largest rivers known in Europe and discharged into the Bay of Biscay (orange lines). The dashed grey and black lines indicate the position of past shore lines and the red dot indicates the core location.

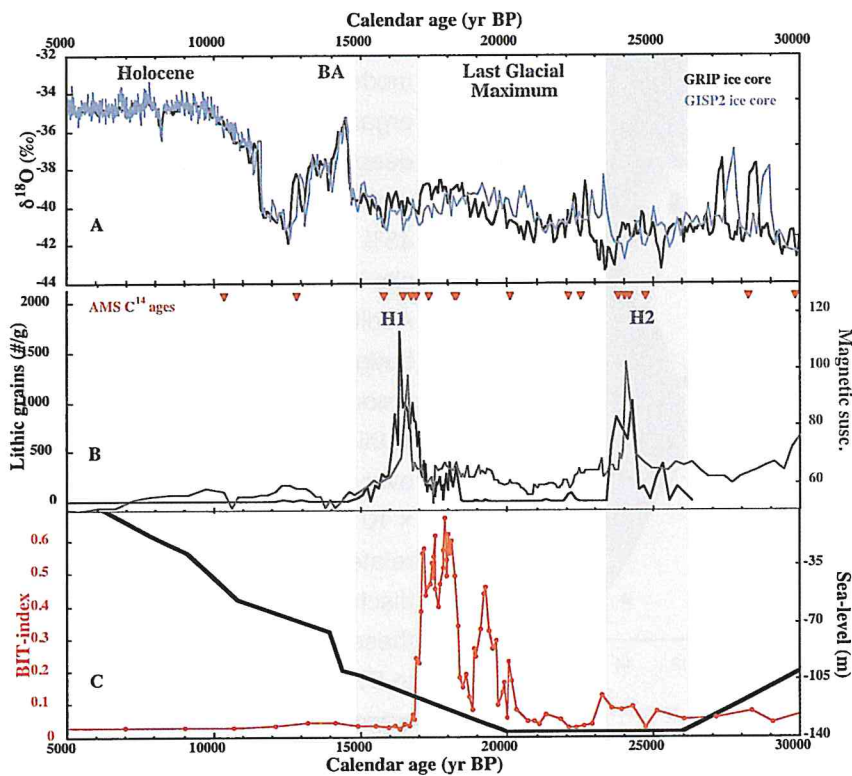


Fig. 4. (A) Greenland ice core records showing an initial warming at ca. 21,000 years ago; (B) Grain counts (black line) indicate the occurrence and timing of Heinrich event 1 (H1); (C) Sea level reconstruction (black line) showing the sea level low stand during, and recovery after the Last Glacial Maximum, and the BIT index (red line) indicating increasing fluvial activity from 21,000 years onward and an abrupt end at 17,000 years ago at the start of H1. (yr BP = years before present)

either remineralised or further dispersed in the ocean.

In cooperation with French colleagues from CEREGE (Aix-en-Provence, France), we also applied the BIT-index to sediments from a marine core in the Bay of Biscay. As during the last Ice Age the sea level was ca. 130m lower than today, the North Sea and Channel basins were dry causing the large European rivers (Rhine, Meuse, Thames, Seine etc.) to merge into one of the largest rivers ever on the European continent, known as the Channel River (Fig. 3). At that time, the location of this

core was near the mouth of this large river. Our results show a strong increase in BIT indices from 21,000 to 17,000 years ago, indicating increased terrestrial organic matter (and water) discharge by this large river system, coincident with the early warming in the Greenland air-temperature record (Fig. 4). Most striking is the sharp and abrupt drop in the BIT index at 17,000 years ago right at the start of Heinrich event 1 (Fig. 4), which is an event whereby large amounts of ice bergs calved off the large ice sheets around the North Atlantic Ocean and drifted over the ocean.

These ice bergs partly floated into the Bay of Biscay and their fresh melt water created a 'lit' of cold water on top of the saltier ocean water of the Bay of Biscay. This hindered the evaporation of water and thus cloud formation and caused a return to dryer (and probably colder) conditions on the European continent resulting in lower river runoff. The BIT-index did not return to higher values again in this record as due to the sea level rise this core site became located more distal from the river mouth.

CHANGES IN THE STRUCTURE OF BROMINATED FLAME RETARDANT MOLECULES INFLUENCE THEIR BIOACCUMULATION IN THE FOOD-WEB

Yvonne van Breugel, Anhelique Mets and Jan Boon*

Brominated flame retardants are widely applied to diminish the chance of fires. This is a great bonus for the safety of a wide variety of goods, such as electronic equipment, foams and upholstery in furniture, carpets and building insulation materials. The other side of the medal of this increased safety are increased levels of these compounds in the environment. The bioaccumulation of these compounds in the food-web is closely related to their resistance to environmental processes causing changes in their molecular structures. It was found that the molecular structures of some compounds can be changed more easily by the cytochrome P450 liver enzymes of fish and marine mammals than others, but large differences between species occurred.

Brominated flame-retardants (BFRs; Fig.1) enhance the fire resistance of many materials. Drawbacks of this great safety feature are environmental problems, since some representatives have become known as persistent organic pollutants (POPs). These 'POPs' accumulate in lipid-rich tissues of animals and have a high resistance to environmental degradation processes. A good understanding of the fate of BFRs in the environment is important to assess the long-term toxic effects on animals. An important step in the structure-effect cascade is whether the structure of the compounds can be changed by the action of enzymes in organisms. This process is called biotransformation or metabolism. Enzymes of the cytochrome P450 family play a key-role in this process. These enzymes are present in many tissues of animals, but for the biotransformation of man-made pollutants the liver is the key-organ.

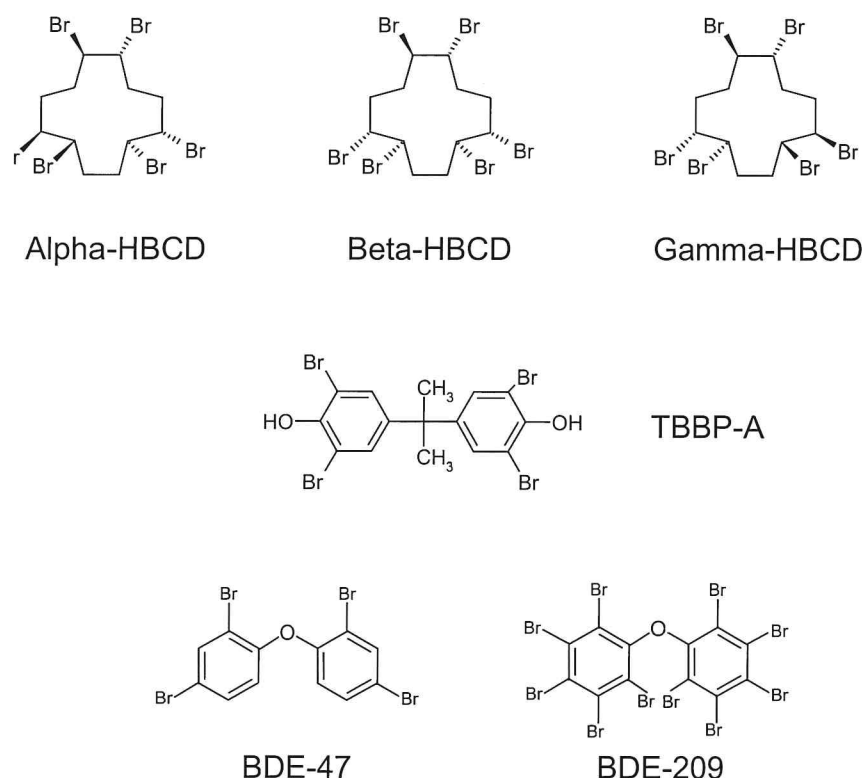


Fig. 1. Structures of brominated flame-retardants.

To study this in whole fish is very elaborate and time-consuming, and a study with marine mammals is impossible for ethical as well as logistical reasons. However, the process can also be studied with isolated fractions from livers which

were taken out of the animals. In the case of fish, the livers originated from animals that were caught in the Wadden Sea with the NIOZ research vessel Navicula. The livers were excised on board and they were subsequently frozen

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in liquid nitrogen. The samples of marine mammals were taken from animals that were sampled shortly after the animals died. The samples of pilot whale were a gift of Dr. Maria Dam of the Food- Veterinary- and Environmental Agency of the Faroe Islands

The liver tissue is homogenised and centrifuged twice to get tiny subcellular organelles called the smooth endoplasmatic reticulum, in which the biotransformation enzymes are embedded like small protein islands in an ocean of phospholipids. The final fractions are called microsomes.

For the experiments, small amounts of microsomes equivalent to 10mg of protein mL^{-1} were put in Erlenmeyer flasks, to which the different brominated test compounds were also added in a small volume of an organic solvent that mixes well with water. The biochemical reaction occurs only when the reaction is fuelled by an energiser in the form of the electron donor NADPH. Three classes of bromi-

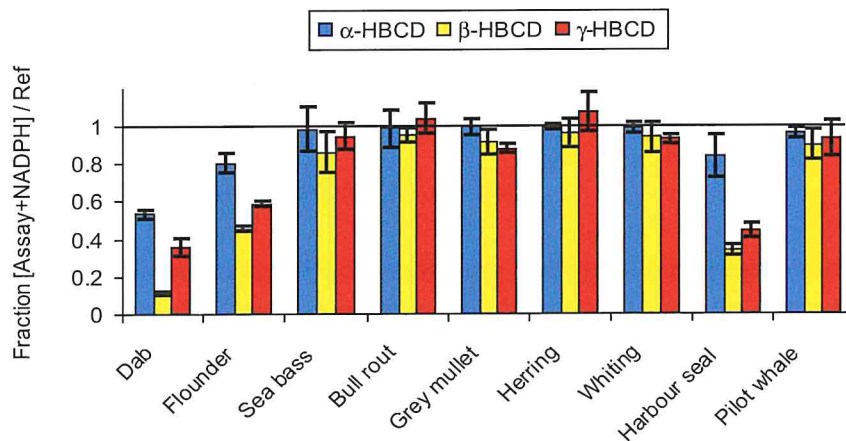
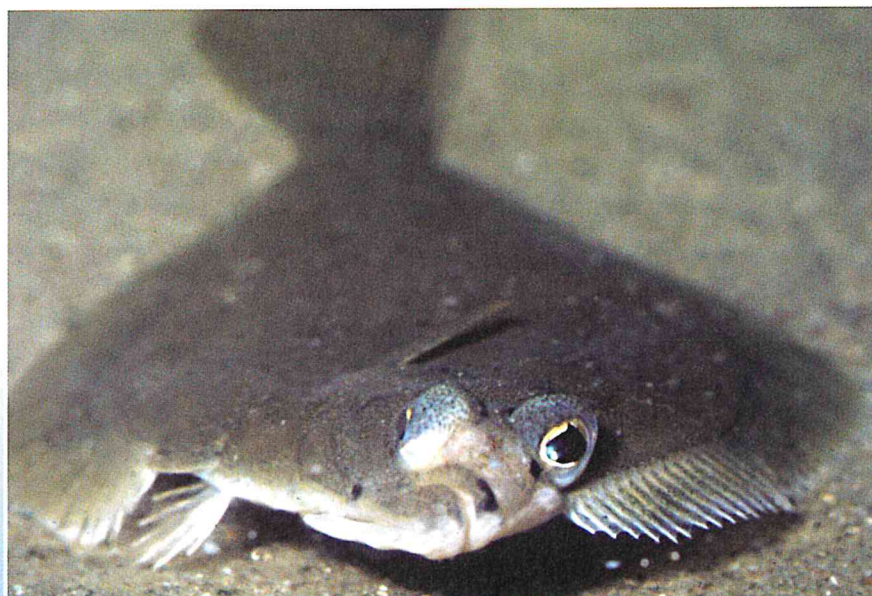


Fig. 2. Fraction recovered hexabromocyclododecane, corrected with the internal standard BDE153, and calculated against the reference assays after 90min biotransformation assays with hepatic microsomes of fish and marine mammals at 25°C and 35.5°C, respectively. The values in the presence of NADPH, were calculated as fraction against reference assays, to which no NADPH was added. A value of 1 means no changes in the presence of NADPH. Results are the mean and standard deviation (error bars) of four assays. The biotransformation studies were performed with the individual HBCD stereoisomers.

nated flame retardants were investigated: different types of hexabromocyclododecanes (HBCDs), tetrabromobisphenol-A (TBBP-A) and a mixture of polybrominated diphenyl ethers (PBDEs).

Of seven fish species belonging to six families, including bottom-dwelling and pelagic fish, only the microsomes of the flatfish species

dab and flounder (*L. limanda* and *P. flesus*, respectively) were capable of metabolizing all three types of HBCD molecules. The experiments showed for the first time that α -HBCD can also be metabolised by cytochrome P450. A 60% reduction by biotransformation of β and γ -HBCD occurred also in the assays with harbour seal microsomes, but no significant reduction was detected for α -HBCD (Fig. 2). In tissue residues from animals originating from different European seas, the α -HBCD isomer gets strongly enriched compared to especially γ -HBCD. The β -HBCD isomer is small in industrial mixtures and in the environment and thus plays a minor role. The formation of hydroxylated metabolites was tentatively confirmed by gas chromatography- mass spectrometry.



TBBP-A was significantly metabolized by microsomes of sea bass (*Dicentrarchus labrax*) and harbour seal (*Phoca vitulina*; Fig. 3). This compound is also more polar than HBCDs and PBDEs and it can be coupled to compounds naturally present in the animal body, which increases the polarity and speed of excretion further. In contrast to the HBCDs and PBDEs, TBBP-A is chemically bound to the matrix of the products in which it is applied, and therefore the escape to the environment is probably much lower.

The PBDEs were not reduced by any of the fish or marine mammal microsomes within the 90 minutes assay time frame. For comparison, similar assays have also been carried out with microsomes of rats of which the cytochrome P450 system was boosted prior to the in vitro experiments by exposing them to the model inducer compound phenobarbital. These microsomes were very active and showed metabolism of several PBDEs. However, metabolism of the fully brominated deca-BDE compound could not be established with rat microsomes either. Thus, this compound was at least stable in our assay and this route does not seem to contribute to the observed debromination of this compound in humans, soils and the atmosphere. The less brominated PBDEs were metabolised according to similar structural requirement rules as we found about twenty years ago for the structurally related polychlorinated

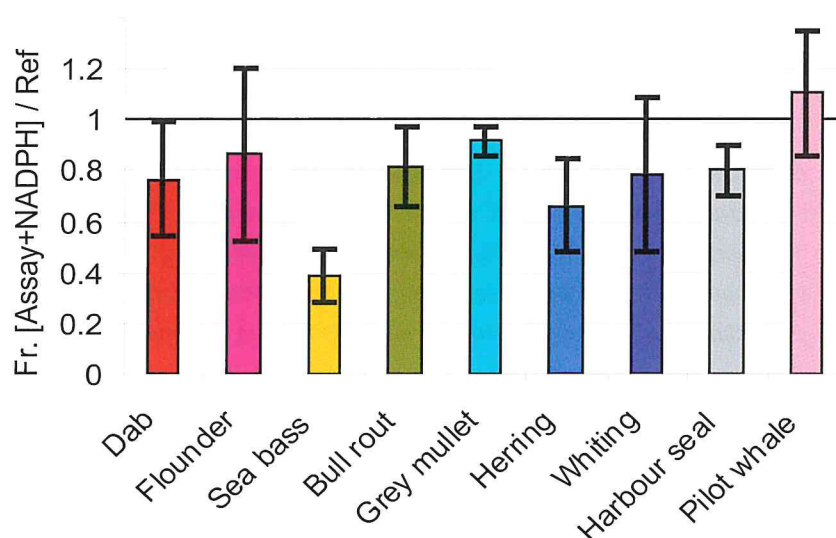


Fig. 3. Fraction tetrabromobisphenol-A, corrected with the internal standard ^{13}C -TBBP-A, recovered after 90min biotransformation assays with hepatic microsomes of fish and marine mammals at 25°C and 35.5°C, respectively. The values in the presence of NADPH, were calculated as fraction against reference assays, to which no NADPH was added. A value of 1 means no changes in the presence of NADPH. Results are the mean of four assays $\pm$ standard deviation.

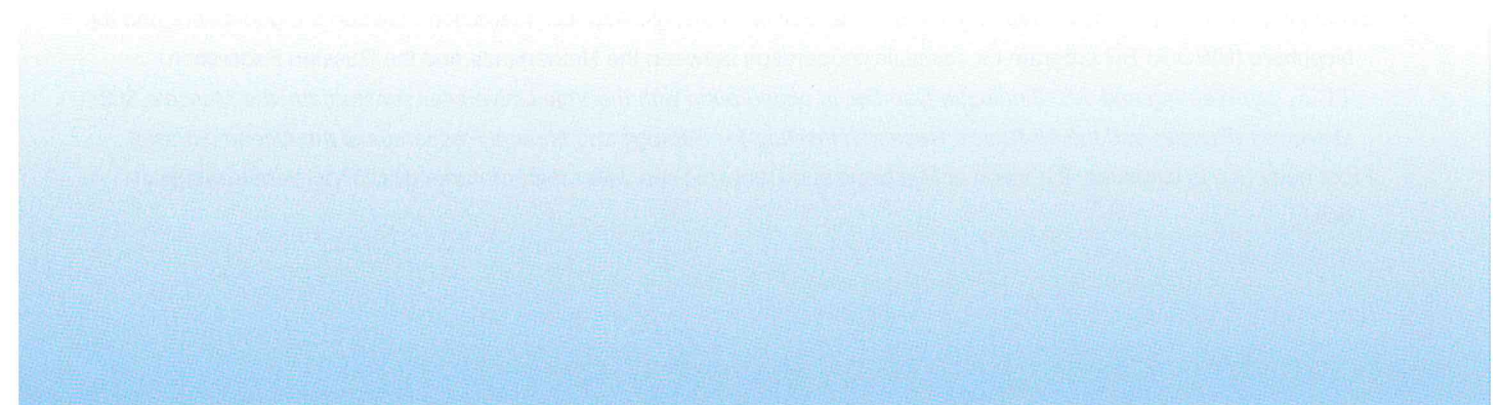
biphenyls (PCBs) in harbour seals. However, the rates for PBDEs are apparently too low in wildlife to register them in our in vitro test system. Nevertheless, this system allows a first screening of the biotransformation potential of many species towards a specific compound without using large numbers of animals in experiments. The FIRE project has shown that there is often a close relation between biotransformation and biochemical effect.

The project **Flame retardants Integrated Risk assessment for Endocrine effects (FIRE)** was supported by the 5th Framework programme of the European Commission under contract No: QLK4-CT-2002-00596.

EXTERNAL PROJECTS MARINE BIOGEOCHEMISTRY AND TOXICOLOGY

- Environmental controls on present and past microbial diversity as revealed by extant and fossil DNA from Antarctic Ace Lake and Ellis Fjord (NAAP/NWO-ALW).
B. Abbas, M. Coolen and J.S. Sinninghe Damsté, in cooperation with the CSIRO (Tasmania).
- Role of cyanobacteria in present and past biogeochemical cycling (DARWIN).
T. Bauersachs and J.S. Sinninghe Damsté, in cooperation with the NIOO-CEME.
- Land-Ocean Interaction and oceanic response in the Mid-Cretaceous western tropical Atlantic (DFG).
B. Beckman, J.S. Sinninghe Damsté and S. Schouten, in cooperation with the University of Cologne (Germany) and the Newcastle University (UK).
- Fossil DNA as recorder of global change and ancient biodiversity in Quaternary marine settings (NWO-ALW, SPINOZA).
A. Boere, M. Coolen and J.S. Sinninghe Damsté.
- Bioavailability of surfactants in marine sediments (ERASM).
K. Booij, in cooperation with Aquasense and IRAS (Utrecht University).
- Contaminant fate assessment in the Berau delta (NWO-WOTRO).
K. Booij, in cooperation with the Research Centre for Oceanography-LIPI (Indonesia).
- The biophysical properties of newly-discovered membrane lipids: Insights into the functioning of cell membranes of marine microorganisms (NWO-Molecule to Cell program).
H. Boumann and S. Schouten, in cooperation with the Radboud University Nijmegen, the University of California at Davis (USA) and CalTech (USA).
- International Census on Marine Microbes (Sloan Foundation).
H. Boumann and J.W. de Leeuw.
- The nitrogen cycle: foraminifera, bacteria and molecular paleontology of the marine deeper redox zone (NWO-ALW).
J. Brandsma and J.S. Sinninghe Damsté, in cooperation with the Radboud University Nijmegen and the Utrecht University.
- Environmental controls on ancient microbial diversity and metabolic processes as revealed by stratigraphic analysis of fossil and extant functional genes (NWO-Vernieuwingsimpuls, Veni grant).
M. Coolen.
- Palaeothermometry of the mid-Cretaceous greenhouse world using a new sea surface temperature proxy based on crenarchaeal membrane lipids (NWO-ALW).
A. Forster and J.S. Sinninghe Damsté.
- Archaeal carbon fixation and burial and terrestrial organic matter input in the coastal system as revealed by tetraether membrane lipids (NWO-ALW, LOICZ and SPINOZA).
L. Herfort and J.S. Sinninghe Damsté.
- A new sea surface temperature proxy based on planktonic archaeal membrane lipids, the TEX₈₆ (NWO-ALW, SPINOZA).
C. Huguet, S. Schouten and J.S. Sinninghe Damsté.
- The impact of Anammox on the present-day and past oceanic nitrogen cycle (NWO-ALW).
A. Jaeschke and J.S. Sinninghe Damsté, in cooperation with the Radboud University Nijmegen and the Skidaway Institute of Oceanography (USA).
- Fate of land-derived organic compounds in the coastal ocean (Marie Curie Intra-European Fellowships (EIF)).
J-H. Kim and J.S. Sinninghe Damsté.
- Bacterial anaerobic methane oxidation in high temperature environments (DARWIN).
A. Klimiuk and J.S. Sinninghe Damsté, in cooperation with the NIOO-CEME and the Wageningen University.

- Development, calibration and application of independent salinity proxies (Paleosalt) (NWO EuroCLIMATE).
M.T.J. van der Meer and S. Schouten.
- Global anoxic events (Ministry of Economic Affairs, Shell).
A. Mueller and J.S. Sinninghe Damsté, in cooperation with the Utrecht University, IMAU (KNMI) and Shell.
- 6C: Climate change, carbon cycle and carbonate chemistry (EU).
J. Ossebaer and S. Schouten.
- Ecology and lipid chemistry of marine Crenarchaeota in present and past marine environments (DARWIN).
A. Pitcher and J.S. Sinninghe Damsté, in cooperation with the NIOO-CEME and the Radboud University Nijmegen.
- Long-chain diols as palaeoproductivity proxies (NWO-ALW).
S. Rampen and J.S. Sinninghe Damsté, in cooperation with the Skidaway Institute of Oceanography (USA).
- Anaerobic ammonium oxidation (anammox): A new shunt in the oceanic nitrogen cycle? (NWO-ALW).
J.E. Rattray, E.C. Hopmans and J.S. Sinninghe Damsté, in cooperation with the Radboud University Nijmegen and the Max Planck Institute for Marine Microbiology (Germany).
- Tropical environmental change and its teleconnections during the last deglaciation: a lipid biomarker study dated with ^{14}C wiggle-matching (NWO-ALW).
M. Rietkerk and G.J.M. Versteegh.
- Rapid global change during the Cenomanian/Turonian oceanic anoxic event in the tropical ocean: Examination of a natural climatic experiment in Earth history (UU).
J.S. Sinninghe Damsté, in cooperation with the Utrecht University.
- Validation and paleotemperature proxies in marine and lacustrine systems (Darwin UU).
J.S. Sinninghe Damsté, in cooperation with the Utrecht University.
- MEDIFLUX: An integrated study of seepage through the seabed of the Nile deep sea fan (ESF/NWO-ALW).
A. Stadnitskaia and J.S. Sinninghe Damsté, in cooperation with the Utrecht University and the Vrije Universiteit Amsterdam.
- Recycling of respired CO_2 in stratified marine systems: Consequences for the interpretation of the stable carbon isotope record (NWO-ALW).
Y. van Breugel and J.S. Sinninghe Damsté.
- Land-ocean interaction and oceanic response in the Mid-Cretaceous western tropical Atlantic (DFG).
I. Stusser, S. Schouten and J.S. Sinninghe Damsté, in cooperation with the University of Cologne (Germany) and the Newcastle University (UK).
- Biomarker and isotope studies of organic matter cycling in the Black Sea: A focus on bacteria and archaea (NSF).
S. Schouten and J.S. Sinninghe Damsté, in cooperation with the Skidaway Institute of Oceanography (USA).
- Development, evaluation and application of organic geochemical tracers for terrestrial carbon input into the marine environment (NWO-ALW).
J.W.H. Weijers, E.C. Hopmans and J.S. Sinninghe Damsté.
- High-resolution reconstruction of Late-Glacial and Holocene climate variability in equatorial East Africa, based on laminated lake sediments from Mt. Kilimanjaro (CHALLACEA, ESF).
J.S. Sinninghe Damsté.
- Evolution and ecology of cold seep structures in the Gulf of Cadiz, NE Atlantic: interaction between the geosphere and the biosphere (NWO/RFBP program for scientific cooperation between the Netherlands and the Russian Federation).
T.C.E. van Weering and J.S. Sinninghe Damsté, in cooperation with the Vrije Universiteit Amsterdam, the Moscow State University (Russia) and the All-Russia Research Institute for Geology and Mineral Resources of the Ocean (Russia).
- From hothouse to icehouse: Evolution of Mesozoic and Cenozoic sea water temperatures (NWO Vici vernieuwingsimpuls).
S. Schouten



BIOLOGICAL OCEANOGRAPHY

The research goal of the department BIO is to obtain insight into the behavior and life strategies of all the components of the lower food web ranging from viruses to mesozooplankton. Thus, BIO aims at elucidating intra- and interspecific interactions and, to identify key species for specific ecological conditions and ecosystem functioning. Research in BIO ranges therefore from autecological studies of key species to food web studies including a modelling component.

In 2006, members of the BIO participated in three cruises in the Atlantic Ocean. In the frame of the NWO-ALW funded project BIOSYS (Biology and Ecosystem Functioning of Cold Water Corals) a two weeks cruise led to the deep-water coral reefs at the Hebrides (NE Atlantic) and some BIO-scientists joined the HERMES cruise to the Rockall Bank area. During the cruises, experiments with living corals (*Lophelia pertusa*) were carried out to study their feeding and growth rates and to determine the bacterial and archaeal dynamics in the gastral cavity of the corals. Preliminary results indicate that microorganisms play an important role in deep-water coral metabolism and overall functioning (see also report on "Cold, deep water corals and carbonate mounds" by T.C.E van Weering et al. in this Annual Report).

From 13 November until 13 December the second NWO-ALW funded ARCHIMEDES research cruise to the subtropical NE Atlantic was conducted with the R/V Pelagia in collaboration with members of the department of Physical Oceanography (FYS). The biogeochemistry and microbial community composition and activity of the main deep-water masses were followed. We paid specific attention to the interface of deep-water masses on the activity of prokaryotic communities and to the deep-water microbial activity measured under in situ pressure and under surface pressure conditions using the new NIOZ high pressure sampling and incubation device constructed by our Marine technology department (MTM).

The most outstanding scientific achievements in 2006 were the publication of two papers in the Proc. Natl. Acad. Sci., USA, one paper in collaboration with MBT on the occurrence of nitrifying Crenarchaeota in the North Sea and the mesopelagic realm of the North Atlantic. In the other paper we showed, in collaboration with the Marine Biology

Laboratory at Woods Hole, USA, that deep-water bacterioplankton are more diverse than assumed hitherto. Using the revolutionary pyro-sequencing technique enabled the discovery of an enormous diversity of low abundance bacterial phylotypes, we coined 'low biosphere'. This finding sheds new light on the evolution of bacterial species and opens new avenues for research on the evolutionary and ecological role of this rare biosphere.

Four ALW funded projects started in 2006 in the frame of the Dutch contribution to the International Polar Year, one funded by NWO-NAAP. Two Ph.D. students (Rob Middag, Edouard Thuroczy) started their work within the Netherlands Contribution to the International Study of the Biogeochemical Cycles of Trace Elements and Isotopes in the Arctic and Southern Oceans (IPY/Geotraces). Babette Bontes was appointed to work on Southern Ocean diatoms in a

high CO₂ world and Maarten Klunder to study dissolved iron in the North Sea. Eva Sintes and Claire Evans started their Post Doc fellowships funded by IPY-NWO to work on the ecology of Archaea and viruses, respectively, in the Arctic Ocean.

Thomas Reinthaler defended his Ph.D thesis at the University of Groningen. A summary of the thesis of Thomas Reinthaler was presented in the Annual Report 2005 of the NIOZ in the Scientific Reports.



VIRAL MORTALITY OF PHYTOPLANKTON

Anne-Claire Baudoux and Corina P. D. Brussaard*

Viruses are the most abundant ‘forms of life’ in the ocean. These pathogens potentially infect all marine organisms, but bacteria and phytoplankton are numerically their major hosts. Marine viruses strongly affect the nutrient cycling and they can contribute substantially to the demise of algal blooms. Our study shows that viruses infecting phytoplankton can harbour high diversity and play a relevant role for the regulation of phytoplankton in contrasted marine environments.

Microbial communities (phytoplankton, bacteria, archaea, heterotrophic protozoa and viruses) comprise the majority of the biomass in the oceans and drive the nutrient and energy cycling. Photosynthetic unicellular algae (phytoplankton) form the basis of the marine food web. Traditionally, grazing by zooplankton and sinking have been considered to be important sources of phytoplankton mortality. The past decades, however, evidence has accumulated showing the existence of other sources of phytoplankton cell death, amongst which virally mediated lysis. Most of the existing classes of phytoplankton have been reported as hosts for virus-like particles. Viruses can have a strong effect on the abundance of the phytoplankton population they infect, and particularly for bloom-forming algal species. Because viruses are typically host-specific pathogens and regularly exhibit a high degree of strain* specificity, viral infection impacts specific phytoplankton populations and thus enhances interspecies, and even intraspecies, diversity.

In the southern North Sea, the phytoplankter *Phaeocystis globosa* is well known for its high biomass spring blooms. *P. globosa* has a polymorphic life cycle with flagellated unicellular and non-motile cells that are embedded in colonies (Fig. 1). The collapse of *P. globosa* blooms can be sudden and generate large amounts of foam that can be washed onshore (Fig. 2). During the bloom demise, cell lysis was found to be a major source of mortality. A recent mesocosm experiment carried out at the Royal NIOZ revealed that viruses were the responsible factor for cell lysis of *P. globosa* single cells during the bloom. The characterization of these viruses and the estimation

of their influence in the field still had to be explored.

The ecological role of algal viruses in the field has long remained elusive because of the lack of appropriate methods. Very recently, a dilution approach that directly estimates viral lysis and microzooplankton grazing rates was developed. An adapted version of this assay was applied during two consecutive *P. globosa* spring blooms in the coastal southern North Sea. Viral lysis accounted for 5 to 66% of the loss of *P. globosa* single cells. Towards the end of the bloom, viral lysis rates could be even higher than microzooplankton grazing rates (Fig. 3). Thus viruses contributed

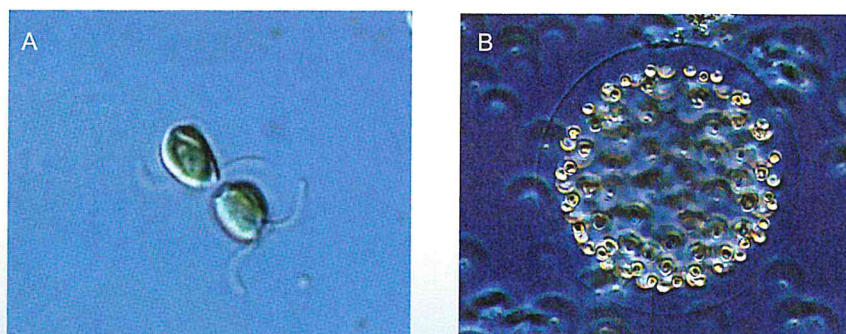


Fig 1. *Phaeocystis globosa* (A) single cells (5-8 μm in diameter), and (B) colonies up to 1 mm in diameter containing up to 20,000 cells. Photos taken by Anna Noordeloos.

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Fig. 2. Foam washing ashore at the end of a *Phaeocystis globosa* spring bloom. Courtesy of Marcel Veldhuis.

groups, e.g. cyanobacteria, grazing was the main loss factor.

These results imply that viruses infecting phytoplankton are diverse and cause a significant amount of marine phytoplankton mortality, collectively with grazers, in contrasted marine environments. This finding is important since phytoplankton losses caused by viral lysis and grazing influence the flow of nutrient and energy in different ways. The release of cell con-

actively to the demise of the *P. globosa* bloom. The isolation and the characterization of twelve *P. globosa* viruses furthermore revealed that they harbour a high level of diversity, based on phenotypic criteria such as their particle size, their genome size and the way these viruses interact with their host (Fig. 4).

In more oligotrophic systems (e.g. the open ocean), the phytoplankton community is composed of several groups of phytoplankton of very small size (typically $<3 \mu\text{m}$). In these environments, the impact of viruses differed across the groups forming the phytoplankton community. While viral lysis was the main source of mortality for some eukaryotic algae, for other

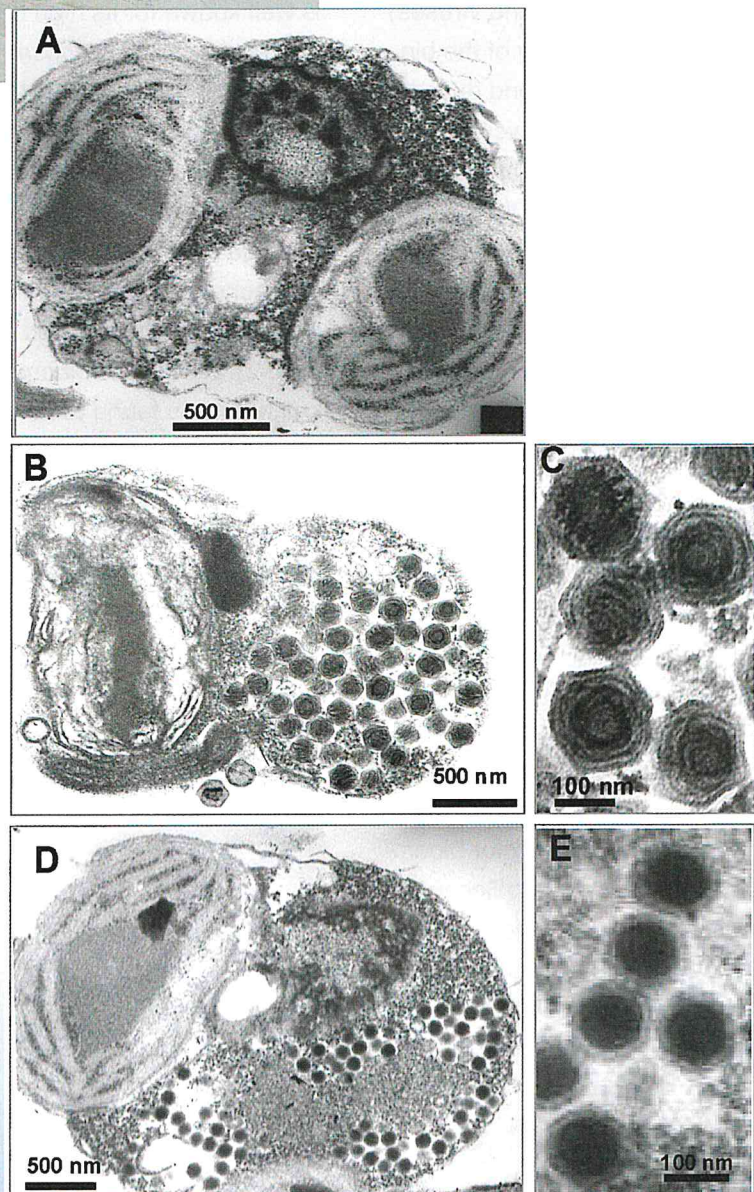


Fig. 3. Transmission electron micrographs of *Phaeocystis globosa* noninfected (A) and infected by two different virus (B, C and D, E).

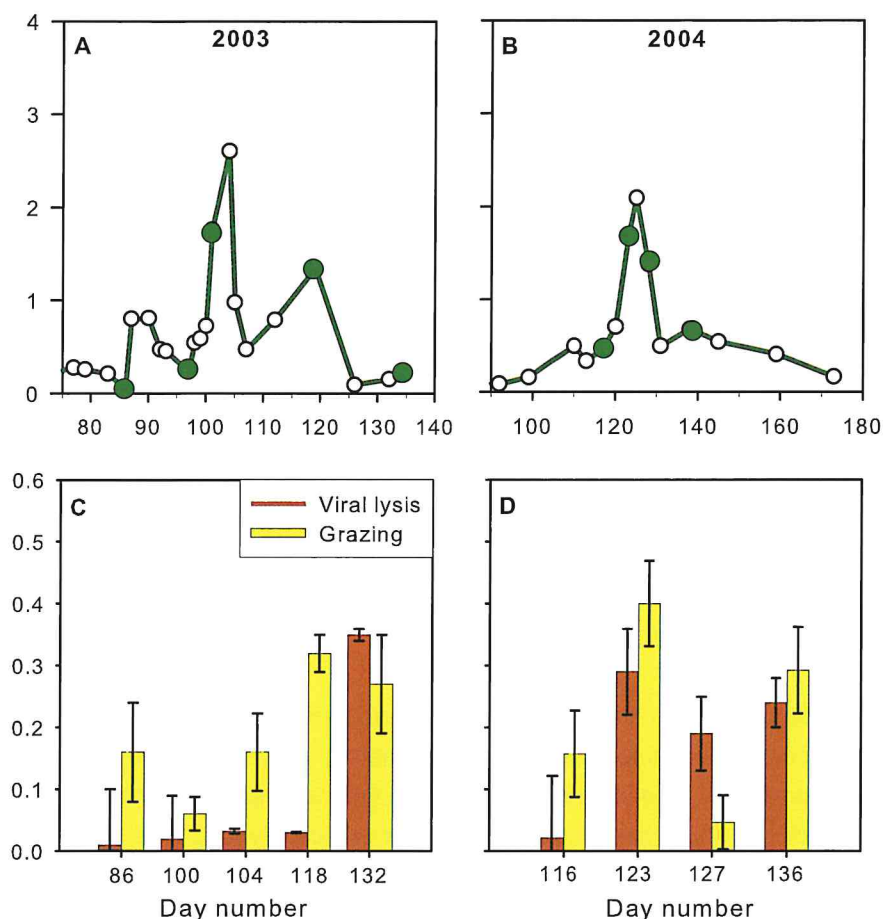


Fig. 4. Abundance of *Phaeocystis globosa* single cells during the spring blooms in 2003 (A) and 2004 (B), with estimates of viral lysis and microzooplankton grazing by the dilution assay on selected dates (green dots) of 2003 (C) and 2004 (D).

stituents upon lysis has a direct impact on the flux of organic carbon and the recycling of nutrients whereas grazing channels phytoplankton biomass to the higher trophic levels. Future research should aim on gaining more insight into the genetic diversity and clonal variation of the algal virus and its host, the regulatory factors underlying successful viral infection, and last but not least should study the impact climate change has on virus-host interactions.

This research was funded by the Netherlands Organization for Scientific Research (NWO-ALW).

FREE CHITOBIASE, A MARKER ENZYME FOR THE GROWTH OF CRUSTACEANS

Martien A. Baars* and Swier S. Oosterhuis

Copepods are the most abundant animals in the plankton. These crustaceans undergo a series of moults during their development from egg to the adult stage. We developed a new method to measure growth of copepods in the open sea by using the enzyme chitobiase. The enzyme breaks down the old chitin exoskeleton and is released in the ambient water during the moult. Experiments showed that the free chitobiase in water samples can be used quantitatively to calculate copepod production in the sea. Field surveys in the North Sea indicated that copepod growth varied from less than 10% of body weight per day in autumn and winter, up to more than 30% in spring and summer. The chitobiase method could also be a relevant tool to estimate the production by other crustaceans like shrimps and crabs living on the bottom of the Wadden Sea.

The measurement of production is a key variable in ecological research, especially if the focus is on the transfer of carbon and energy through the pelagic food web from algae via animal plankton to fish. The ^{14}C -bicarbonate incorporation method for estimating primary production and tritium labelled amino acids for estimating bacterial production are used in aquatic studies. To estimate zoo-

plankton production, there is no such method available using the incorporation of a specific substrate during short-time incubations.

Copepods, small crustaceans, representing the most dominant group of the marine zooplankton, have generation times of several weeks to months. Theoretically, the growth of copepods can be deduced from the changes in

abundance and size in time series sampling. However, in the open sea the tracking of populations over sufficiently long time spans is hampered by logistic constraints and by advection, patchiness and vertical migration. Consequently, estimates of secondary production in open marine waters are mainly based on plankton net catches combined with growth rates measured in laboratory experiments.

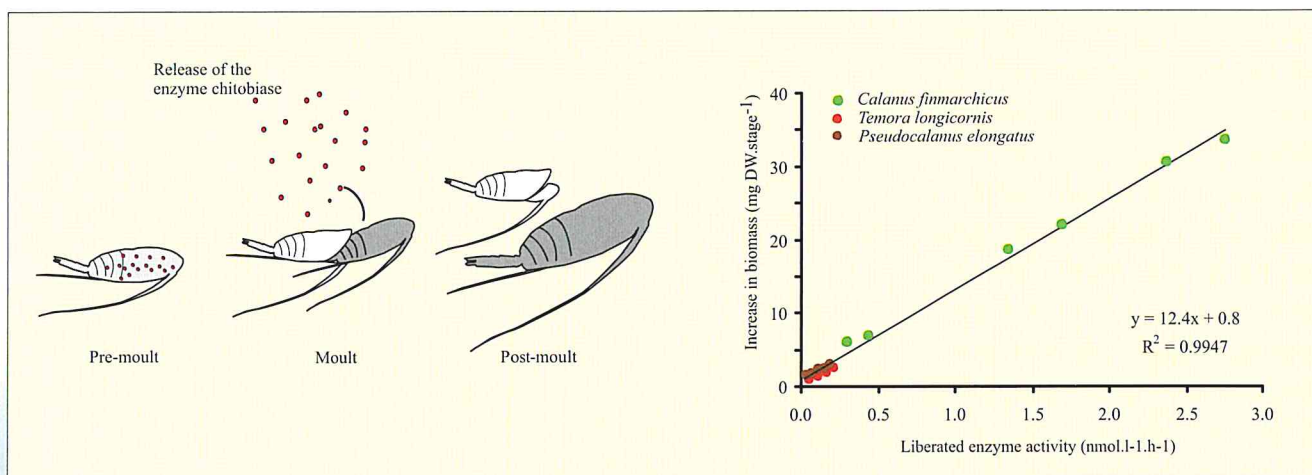


Fig. 1. Left panel: The release of the enzyme chitobiase (red dots) in the ambient water during the moult of a copepodite. Right panel: Relation between the increase in body weight and the released chitobiase activity for moults of different stages of three copepod species. *Temora longicornis* (red), *Pseudocalanus elongatus* (brown) and *Calanus finmarchicus* (green).

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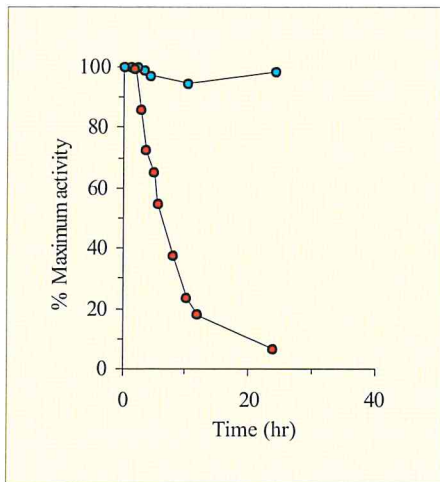


Fig. 2. Free chitobiase remains present in autoclaved, sterile seawater (blue dots) whereas the consumption by bacterioplankton causes an exponential decay of chitobiase in raw seawater (red dots).

Thus, there is still need for an easy field method to measure copepod growth more directly.

At the NIOZ, a new approach to estimate crustacean production was developed. The principle is not based on the uptake of a substrate but on the release of a specific substance indicative of growth. In the pre-moult phase of crustaceans, the old chitin exoskeleton is degraded by the chitinolytic enzymes chitinase and chitobiase. The NAG-monomers (*N*-acetyl- β -D-glucosaminide) resulting from the cleavage of chitin by this combined enzyme action, are re-used as building blocks for the new chitin skeleton underneath the old exoskeleton. During the moult, the remnant of the old skeleton is shed and the chitinolytic enzymes are released into the ambient water (Fig. 1). In laboratory experiments, the release of chitobiase by juve-

niles during the moult was measured. The amount of enzyme was linearly related to the growth of the juveniles between moults. The relation was similar for three different copepod species, and the regression equation on the combined data (inset in Fig. 1) is used to estimate the total daily growth in mixed copepod populations in the sea. The free enzyme is not accumulating in the water but steadily consumed by bacteria (Fig. 2). Thus, to estimate the total amount of chitobiase released per day, the rate of chitobiase decay over 24 hours has to be measured in addi-

tion to the amount of dissolved chitobiase present in the water.

The spatial distribution of copepod production was mapped with the new technique during surveys in the North Sea. A plume of turbid English Coastal Water with high concentrations of suspended matter and low salinity (see the contours in Fig. 3) crosses the Southern Bight in-between the more saline Central North Sea Water and Channel Water. In September 2000, daily primary production was low inside compared to outside of the plume (0.5

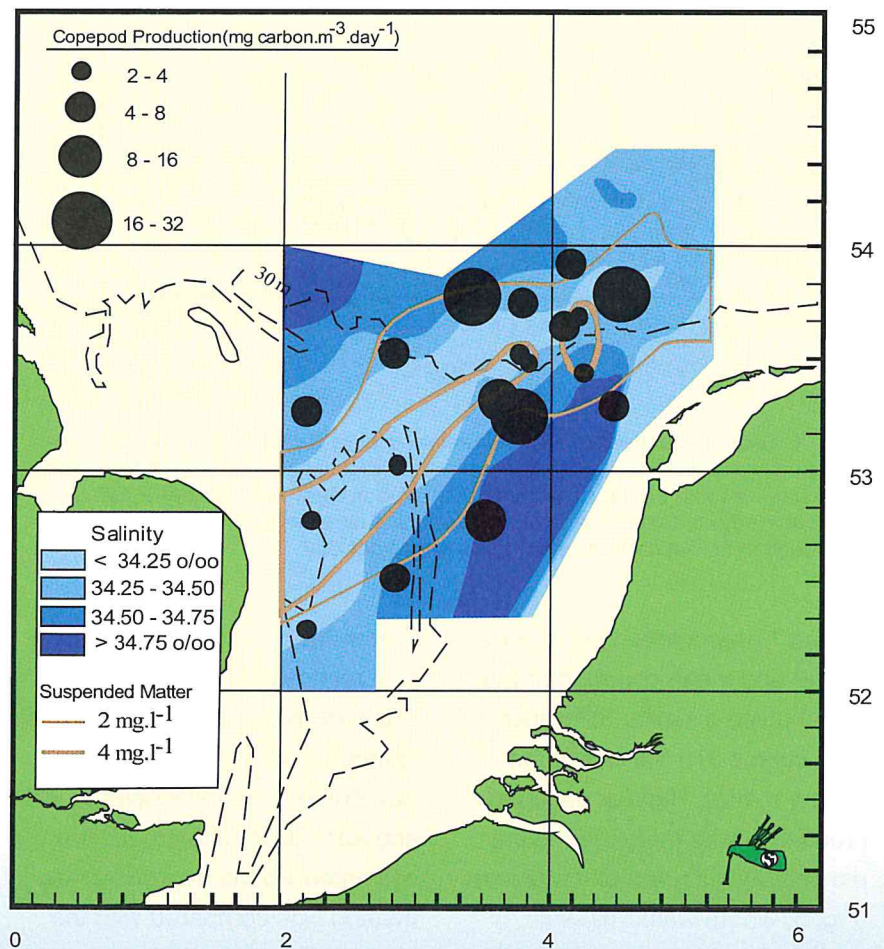


Fig. 3. Copepod production (black dots) estimated by free chitobiase in the southern North Sea plotted on contour maps of surface salinity (blue scales) and concentration of suspended matter (mg/litre, brown lines). Plume & Bloom cruise September 2000.

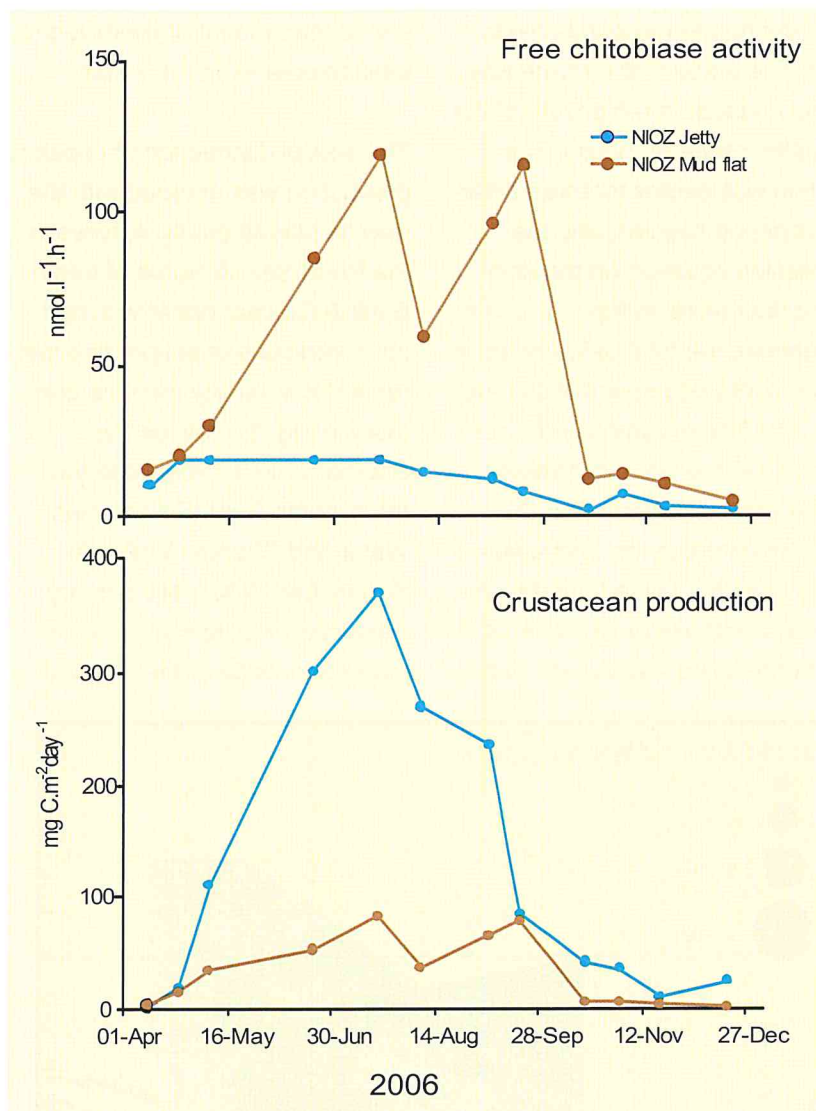


Fig. 4. Seasonal pattern of free chitobiase activity (upper panel) and the calculated crustacean production (lower panel) in the water column at the NIOZ jetty and at the mud flat near the NIOZ harbour, April – December 2006. Enzyme activity (expressed in units substrate cleaved) per litre per hour; production (in mg carbon) per square metre per day.

versus 1 gram carbon per square metre) and mean copepod production showed a similar difference (150 versus 370 mg carbon per square metre). Highest copepod production was measured at the rim and downstream of the plume (Fig. 3) where water masses mixed. One particular station, at the southern, muddy slope of the Oyster Ground – the so-called

Frisian Front – was visited during several cruises through the year. Copepod production was one order of magnitude higher in June and September than in December 2003 and April 2004. The production estimated via the free chitobiase method was compared with the biomass of copepods in the net catches. Production/biomass ratios ranged between 0.30-0.35 during

late spring/summer to 0.05- 0.10 in winter/early spring.

Free chitobiase was frequently markedly higher in near-bottom water samples than in water collected in the upper layer of the North Sea. This phenomenon indicates that copepods or other crustaceans concentrate near the bottom. The benthic boundary layer may form a special, productive habitat for crustaceans due to the constant sedimentation and resuspension of phytoplankton and detritus by the tidal movement. High productivity of the crustacean community of the bottom was measured regularly at a small mudflat near the NIOZ. The free chitobiase signal in the water collected above the mudflat near the end of ebb was significantly stronger than the chitobiase signal in the first flood-water collected at the nearby jetty (Fig. 4 upper panel). The extra chitobiase originates from both the harpacticoid copepods, the crustacean component of the meiofauna in the bottom and from shrimps and crabs living on the bottom. An attempt was made to calculate the square metre crustacean production of the plankton in the mean water column near the jetty and of the mudflat (Fig. 4 lower panel). This pilot study suggests that the chitobiase approach may be a useful tool in field programs to estimate the productivity of all the different crustaceans in the Wadden Sea.

REDUCING THE RISK OF INVASIVE ORGANISMS BY CLEANING THE BALLAST WATER OF SHIPS

Marcel J.W. Veldhuis*, Jan P. Boon and Cato C. ten Hallers-Tjabbes

Ships need ballast water for their stability and manoeuvrability. This water is not pure, but it contains a sample of the local ecosystem at the place of intake. Within a few days to weeks, vast quantities of water are shipped from one continent to the other. At the port of destination, ballast water is often pumped overboard, including the organisms it still contains. The receiving ecosystem is not always well adapted to the reception of newly introduced species. Such new species sometimes develop into a plague, pushing native species to the edge of their existence. The International Maritime Organisation of the UN has declared that from 2009 onwards ballast water has to be free of organisms to minimize the risk of introduction of invasive species. NIOZ is involved in the development of the proper test protocols for the evaluation of ballast water treatment installations and for compliance control measurements by the port authorities.

Ships transport 5-10 billion tons of ballast water annually all over the globe, loaded with a enormous variety of organisms. These organisms belong to the natural ecosystem in the port of origin but are often not present in the ports of destination at the end of a ship's journey. In hundreds of cases around the world, this has resulted in severe damage to the receiving ecosystem because the non native organisms developed into a pest. This can have a high impact on the ecosystem, resulting in a decrease of stocks of commercially valuable fish, shellfish species and occasionally outbreaks of diseases like cholera. To minimize these risks for the future, the International Maritime Organization (IMO) of the United Nations (UN) has adopted a Ballast Water Convention in 2004. This Convention states that starting in 2009 for ships with a ballast water capacity below 5000 m³ to

Hamann Modular Ballast water treatment system 500 m³/h

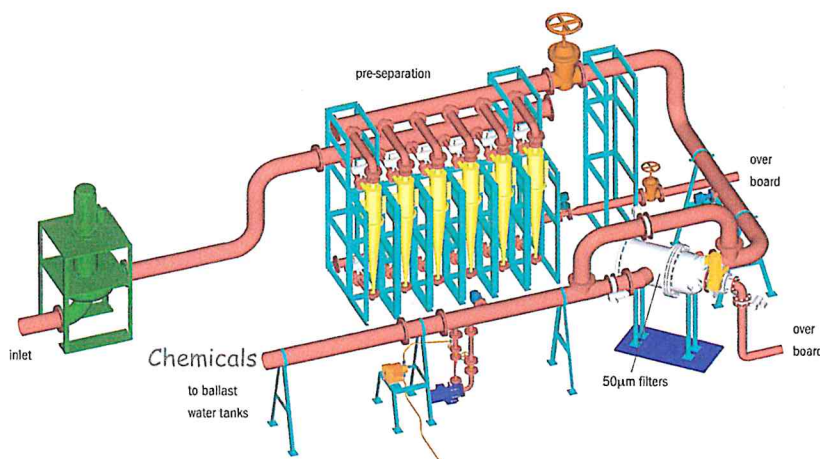


Fig. 1. Schematic configuration of the Ballast Water Treatment system SEDNA (Hamann AG, Hollenstedt, Germany).

finally all ships (> 50,000 in number) in 2016 should install a certified Ballast Water Treatment (BWT) equipment on board. NIOZ has the ambition to become the European test centre for the certification of BWT equipment. To achieve this, we have developed

new and adapted our existing automated analyzing methods for phytoplankton, zooplankton and bacteria for this special purpose. This was done in a collaborative experimental study with the German firms Hamann AG and Degussa AG. The SEDNA BWT installation

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Fig. 2. The Ballast Water Treatment system temporarily installed at the NIOZ harbour.

of Hamann AG was used as a test instrument (Fig. 1) and the NIOZ harbour as the land-based test site (Fig. 2).

The IMO Ballast Water Convention includes very challenging standards for the test methods. For proper testing, brackish test water should contain minimum densities of two size-classes of plankton: at least 10^5 organisms per m^3 for organisms larger than 50 μm and at least 1000 organisms per ml for organisms between 10 and 50 μm . With exception of the winter season, these densities of organisms are present in the natural community of the Wadden Sea.

The cleaning efficiency of the BWT system should be very high since the maximum allowed numbers of organisms in the treated ballast water at discharge are extremely low: For the organisms larger than 50 micrometer, the maximum is 10

viable organisms per m^3 and for the smaller organisms between 10 and 50 micrometer, a maximum of 10 viable organisms per ml is allowed. Also for the presence of humans pathogenic bacteria (*E. coli*, *Enterococcus* and *Vibrio cholerae*) in treated ballast water, extremely low maximum numbers are defined.

Based on pilot studies, it became evident that there is no single step solution to treat ballast water to remove both sediment and biota. Moreover, the treatments should be effective to a huge variety of organisms, as well as to the resting stages of various species which under normal conditions are capable of surviving prolonged unfavourable conditions. Also, the ballast water should not only be organism free but also non-toxic for the receiving ecosystem when it is discharged. The SEDNA unit of

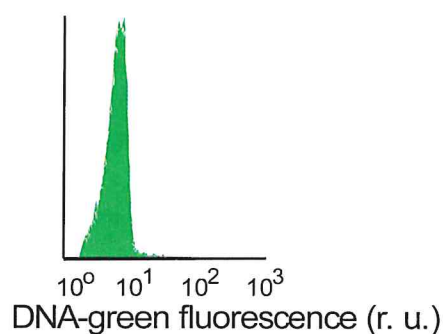
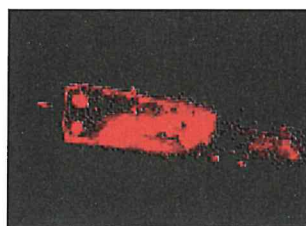
Hamann consists of a primary cleaning method using six hydrocyclones in combination with filtration over a self-cleaning 50 micrometer filter. This primary phase reduces the number of organisms and suspended sediment particles in the water. The final treatment step involves the use of the active chemical mixture PERACLEAN Ocean, manufactured by Degussa AG (Hanau, Germany). The two active ingredients are hydrogen peroxyde and peroxyacetic acid. Both compounds are initially very toxic when added to the ballast water, but they disintegrate within a few days. This should result in harmless concentrations of these compounds when the ballast water is discharged.

At the beginning of the tests at the NIOZ harbour in 2004, no well-described test methods were available. Thus we had to develop these methods according to the requirements laid-out in the IMO ballast water convention and the methods developed for our fundamental research on plankton. In practice sampling devices and sample volumes had to be adapted taking into account the extremely low thresholds of maximum allowed densities of organisms after treatment. For the large organisms, a new type of sampling net was designed to concentrate the organisms from several m^3 of ballast water after it had been in the tanks. For the small organisms the required sample sizes fitted well with the volumes used for

semi-automated plankton counting by flow cytometry. In addition, the Convention refers to the presence of viable (living) organisms rather than total organisms. To differentiate between live and dead plankton, a newly developed staining method using the dye SYTOX Green was successfully applied. This method is based on the integrity of the cell membrane which is intact in life cells but is distorted when cells are exposed to stress, e.g. caused by physical damage or chemical treatment (Fig. 3).

A

Live cells



B

Dead cells
(SYTOX green stained)

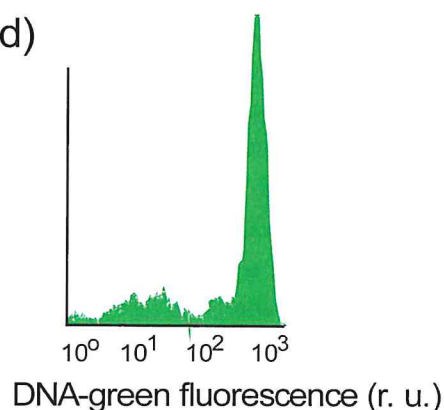
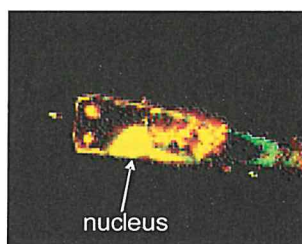


Fig. 3. The nucleic acid stain SYTOX Green does not enter live cells (A) but dying or dead cells are green-yellow stained (B). The fluorescence (in relative units) of the SYTOX-stained DNA in readings by flow cytometry is more than two orders higher in the non-viable cells.

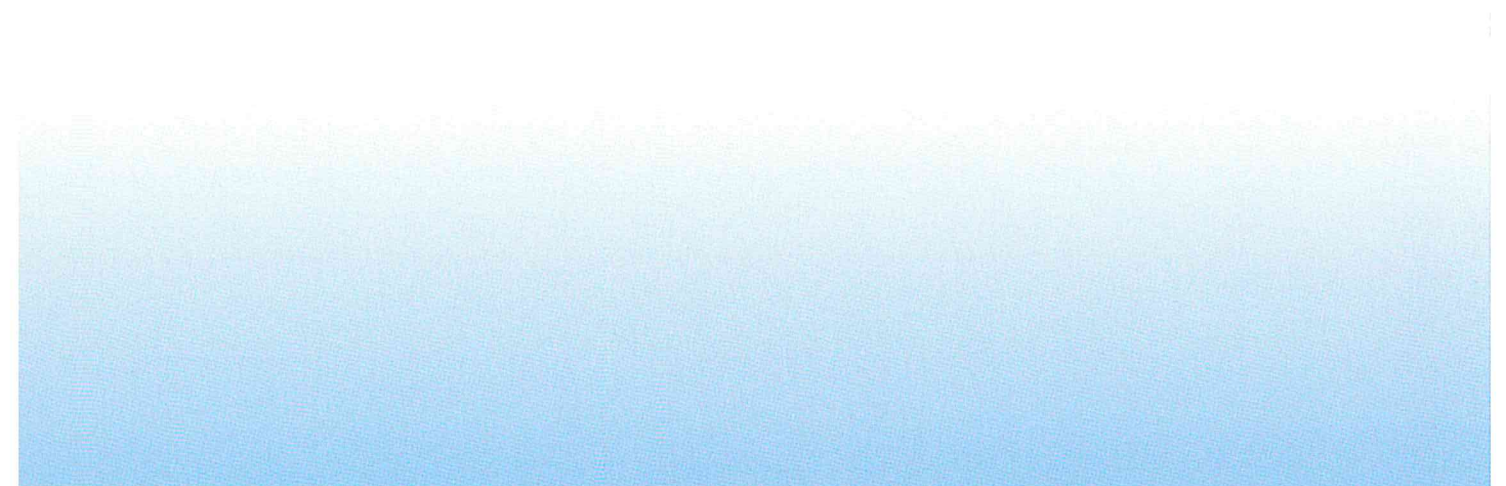
The physical components of the SEDNA system (hydrocyclone and filters) turned out to be effective in reducing the numerical abundance of the larger organisms but a secondary treatment with chemicals was still necessary to reduce the number of living organisms in the smaller size class to below the tolerated maximum of 10 organisms ml⁻¹. The bacteriostatic compound of the chemical (H₂O₂) delayed the regrowth of total bacteria with ca. 10 days.

Currently the draft protocols, test results, and instrumentation for testing developed at NIOZ are communicated with various national and international agencies. Upon agreement by IMO and in collaboration with specialized classification societies for ships, it is our goal to develop these protocols further to official guidelines used for certification together with our international partners in Europe, the United States and Asia.

EXTERNAL PROJECTS BIOLOGICAL OCEANOGRAPHY

- Pelagic Archaea in the changing coastal Arctic (PACCA, ALW-IPY).
E. Sintes, G.J. Herndl
- Bacterioplankton cell death: competition between flagellate grazing and viral lysis and the role of bacterioplankton cell wall-derived dissolved organic matter in the ocean (BADE, ALW-NWO).
V. Parada, G.J. Herndl
- Activity, rates, carbon use and high-pressure microbial ecology of the deep sea (ARCHIMEDES, ALW-NWO).
T. Reinthaler, G.J. Herndl
- Application of capillary electrophoresis for isolating bacteria and assessing Ectoenzyme diversity and kinetics (ACE, Marie Curie Host Fellowship of EU).
G.J. Herndl
- Capillary electrophoretic separation of dissolved carbohydrates of the aquatic realm (CAESAR, Marie Curie Fellowship, 5th FWP EU).
E. Sintes, G.J. Herndl
- Prokaryotic activity in the North Atlantic deep waters assessed by MICRO-CARD-FISH in relation to bulk activity (PROACTINOR, Marie Curie Fellowship, 6th FWP EU)
M.M. Varela, G.J. Herndl
- Prokaryotic activity and phylogeny of oceanic systems (PAPHOS, Marie Curie Fellowship, 6th FWP EU).
H. Agogué, G.J. Herndl
- Microbial diversity and ecosystem functioning: concepts, open questions and recommendations for integration of microbes into general ecological frameworks. (Responsive Mode Project, MARBEF, 6th FWP EU).
G.J. Herndl, in cooperation with IOW Warnemünde (Germany)
- International Census of Marine Microbes (ICoMM).
M. Brink, G.J. Herndl, in cooperation with MBL Woods Hole (USA)
- Microbial population structure of the world's oceans. (Keck Foundation, USA).
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- Virus control of the picophytoplankter *Micromonas pusilla* population dynamics in European waters (MICROVIR, ALW-NWO).
J. Martinez Martinez, C.P.D. Brussaard
- Fast Advanced Cellular and Ecosystems Information Technologies (FACEiT, 6th FWP EU).
L. Peperzak, C.P.D. Brussaard
- The significance of viruses for polar marine ecosystem functioning (VIRPOL, IPY-NL).
C. Evans, C.P.D. Brussaard
- Ecosystem Modelling; Mediterranean Forecasting System Toward Environmental Prediction (MFSTEP; FWP Energy, Environment and Sustainable Development, EU).
P. Ruardij
- Rapid development of an ecosystem/ecological modelling capacity on the North Sea (DEFRA, London).
P. Ruardij, in cooperation with CEFAS, Lowestoft (UK)
- Sustainable production, physiology, oceanography, natural products, genetics and economics of sponges (Sponges, 6th FWP EU).
F.C. van Duyl

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C. Maier, F.C. van Duyl
- Dissolved organic matter cycling on coral reefs: Are coral cavities sinks of DOM? (NWO-WOTRO, W84-547).
J.M. de Goeij, F.C. van Duyl
- The role of native and/or invasive ecosystem engineers in explaining biodiversity. (Responsive Mode Project, MARBEF, 6th FWP EU).
F.C. van Duyl
- Efficacy of the SEDNA® ballast water treatment system in reducing the risk of invasive organisms.
M.J.W. Veldhuis, J.P. Boon, in cooperation with Hamann, Hamburg (Germany)
- CARBOOCEAN (Integrated Project of the 6th FWP of EU).
H.J. Zemmeling, H.J.W. de Baar
- Prominent uptake of anthropogenic CO₂ by the Southern Ocean via Antarctic Intermediate Water (NWO-ALW 813.03.003).
H.J. Zemmeling, H.J.W. de Baar
- IPY GEOTRACES (NWO-ALW, IPY).
P. Laan, L.J.A. Gerringa, H.J.W. de Baar
- Dissolved Aluminium and Manganese as Source Tracers for Iron in Polar Oceans (NWO-ALW, IPY).
R. Middag, H.J.W. de Baar
- Physical and Chemical Speciation of Dissolved Fe in the Polar Oceans (NWO-ALW, IPY).
C.-E. Thuroczy, L.J.A. Gerringa
- CO₂ & ncp (BSIK).
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- Southern Ocean primary productivity in a high-CO₂ world (NAAP, NWO-ALW, NAAP).
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- Improved quantification of Southern Ocean diatoms as indicators for Carbon Fixation (KERGUELEN, SRON).
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H.J.W. de Baar, L.J.A. Gerringa
- The UK SOLAS Deep Ocean gas Exchange Experiment (UK SOLAS NE/C001702/1).
H.J. Zemmeling, in cooperation with the University of East Anglia, Norwich (UK)
- Time Series Measurements of Dimethyl Sulfide Dynamics at BATS.
H.J. Zemmeling, in cooperation with Woods Hole Oceanographic Institution (USA)



The department aims at a mechanistic understanding of the structure and dynamic behaviour of marine macrobenthos populations and communities. Taking up one of the great challenges in modern ecology, we try to understand the properties of populations and communities on the basis of characteristics of individual organisms. We focus on the role of bottom-up (food input and competition for food and other resources) as well as top-down (predation) processes in structuring benthic communities.

The work within the department of MEE covers three major themes:

1. The structuring role of top-predators in marine ecosystems
2. Competition, life-history strategies and dynamic energy budgets
3. Recruitment and dispersal in relation to spatial and genetic structure of benthic invertebrate populations

In 2006 the work on an avian predator, the red knot *Calidris canutus* and its bivalve prey in the Wadden Sea was continued and the research program on the Banc d'Arguin, Mauritania could be further extended due to PhD and post-doc grants. The red knot colour ring programme which started there six years ago, begins to reveal reliable estimates of annual survival rates in relation to habitat choice. Studies on interference among foraging turnstones *Arenaria interpres* and among foraging shorecrabs *Carcinus maenas* were continued in laboratory experiments.

At the level of the individual benthic invertebrate, interest was directed towards performance (e.g. growth, age and size at maturity, fecundity, survival, or more generally energy budgets) in response to food availability and other environmental conditions, and a start was made with studying the consequences of choosing a specific energetic strategy for competitive interactions and fitness.

At the population level, it has been observed that the period around the settlement of the recruits is extremely important in marine benthic population regulation. Henceforth over the last few years we focused intensively on recruitment processes (e.g. intra- and interspecific adult-juvenile competition by means of settlement inhibition by adults, or the competition for food affecting the age and size at metamorphosis). In 2006 recruitment studies were performed again in intertidal systems (Wadden Sea), shallow coastal seas (North Sea) and in coral reef communities in deep water (continental shelf edge) and in the tropics (Caribbean).

This year Wouter Vahl defended his PhD thesis about interference competition among foraging waders and Joana Cardoso finished the preparation of her thesis. The work of both is summarized below.



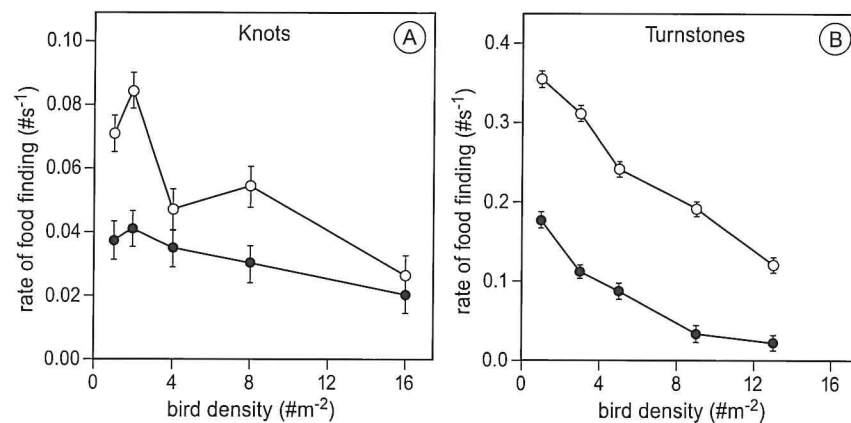
FIGHTING FOR FOOD

Wouter K. Vahl*, Jaap van der Meer and Theunis Piersma

Intertidal areas such as the Dutch Wadden Sea have an important function as wintering grounds for migratory waders (shorebirds). But how many waders can winter in a certain intertidal area? This question interests biologists for both applied (nature management) as well as fundamental (population dynamics) reasons. It seems clear that the maximum number of waders will depend on the amount of food in the area. Perhaps less obvious, the (aggressive) behaviour of the waders themselves is also of importance.

Wintering waders are thought to compete with each other. Competition may be indirect, through the depletion of resources, but also direct, through behavioural interactions such as fights or mutual avoidance. Because time and energy spent on behavioural interactions cannot be used to search for food, competition may lower the condition and survival of wintering waders. The extent to which wintering waders suffer from competition, however, strongly depends on the way in which they compete.

To study whether and how wintering waders compete for food, we performed a series of experiments in the indoor aviaries of NIOZ (the 'Experimental Shorebird Facility'). Use of the aviaries enabled us to study the behaviour of known individuals at experimentally determined combinations of food and forager density, whereas variables that often confound field observations (such as weather, predation risk, level of satiation etc.) are in control. As study species we used



The rate of food finding of knots (A) and turnstones (B) at initial prey densities 50 (black) and 200 (white). Both species found less food items when foraging at higher forager densities.

red knots (*Calidris canutus*) and ruddy turnstones (*Arenaria interpres*), two medium-sized waders that differ strongly in their foraging behaviour. Knots are, for instance, more specialised in their food preferences than turnstones. The two species differ in their social behaviour too: there is a much clearer dominance hierarchy in turnstones than in knots.

In a first experiment we found that both knots and turnstones find less food when foraging at higher densities. This negative effect did, however, not result from the steal-

ing of food items (kleptoparasitism), the mechanism that is generally assumed to underlie competition. Follow-up experiments suggested that foraging waders may instead suffer from competition through resource monopolisation. We found that when food was distributed in clumps (as it is naturally), dominant foragers are able to monopolize the food, thereby achieving a much higher intake rate than their subordinate competitors. An experiment on the beaches of New Jersey, USA, in which we studied the foraging

behaviour of free-living turnstones, indicated that resource monopolisation can indeed be a mechanism that underlies competition in the field.

Our results reveal the importance of knowledge of competition mechanisms. When foraging waders compete with each other through the monopolisation of clumps of food, it no longer suffices to know the overall density of food to predict the maximum number of waders that can winter in an intertidal area; the (small-scale) distribution of food should also be known. Moreover, we found that social dominance strongly and consistently affected the intake rate of foraging individuals. This implies that individual differences need to be accounted for in studies of the maximum number of waders that can be sustained in intertidal areas.



Close-up of a ruddy turnstone (*Arenaria interpres*) searching for food on an experimental foraging arena. Food in this experiment was covered by a layer of seaweed to resemble the natural foraging situation of turnstones.



Design of one of the experiments performed in the 'Experimental Shorebird Facility' of NIOZ. In this experiment two patches were offered to foraging turnstones; only one of them contained food (the left one). The behaviour of the foraging waders was recorded with video cameras. Note that the floor of the aviary is covered with water; this ensured that the experimental birds always used one of the experimental patches.



Free-living ruddy turnstones (*Arenaria interpres*; 7 individuals) and sanderlings (*Calidris alba*; 2 individuals) searching for food on the beaches of Delaware Bay (USA). While most individuals are searching for food, two of the turnstones are engaged in an aggressive interaction. Interactions like these are thought to reduce the rate of food intake.

FOOD CONDITIONS AND GROWTH OF BIVALVE SPECIES IN THE WESTERN WADDEN SEA

Joana F.M.F. Cardoso*

Bivalves are a main component of the bottom fauna in many estuarine areas. They often occur in high abundance and form an important food source for shore birds, fishes and crustaceans. Environmental conditions such as water temperature, salinity and food availability influence growth in bivalves, and determine their distribution and abundance. The role of food as a forcing function determining population dynamics of bivalve populations is still unknown. In this project growth of five bivalve species was analysed with a dynamic energy budget model. Model results were compared with observed growth in the field and food conditions for the various species were reconstructed. The results suggest that growth of bivalves in the western Wadden Sea is not maximal due to suboptimal food conditions.

In the shallow Wadden Sea bivalve species are an important component of the bottom fauna, both in intertidal and subtidal areas. In these areas, bivalves experience strong seasonal and annual variations in environmental conditions such as temperature and food availability. Food availability is considered the most important factor influencing growth of bivalves. In this study, differences in growth between bivalve species (interspecific) and within different habitats of a species (intraspecific) in the western Wadden Sea were analysed. The aim was to reconstruct the food level in the field for the different species by analysing growth at the current water temperatures. In this way insight could be obtained also into the existence of food competition among bivalve species in the western Wadden Sea.

The study included five of the most common species: the Baltic

tellin *Macoma balthica*, the edible cockle *Cerastoderma edule*, the blue mussel *Mytilus edulis*, the soft-shell clam *Mya arenaria* and the Pacific oyster *Crassostrea gigas*. These species were sampled in intertidal and subtidal areas in the Wadden Sea and along the North Sea coast. A well known dynamic energy budget (DEB) model was applied to analyse the allocation of energy to growth in relation to habitat conditions (temperature and food). Two types of DEB simulations were done: [1] annual growth in shell length of the various species was predicted under current temperature conditions and a range of food levels, between 0 (starvation) and 1 (ad libitum), and [2] seasonal variation in food level was reconstructed for each species and habitat by simulating growth along the year and comparing it with the observed growth in the field, under current temperature conditions.

Comparison between model simulations and growth measured in the field showed that for most species and habitats growth in the field was lower than maximal since, for most individuals, simulated growth curves only matched observed growth curves when food level was lower than 1 (Fig. 1).

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Digging for soft-shell clams *Mya arenaria* in an intertidal area.

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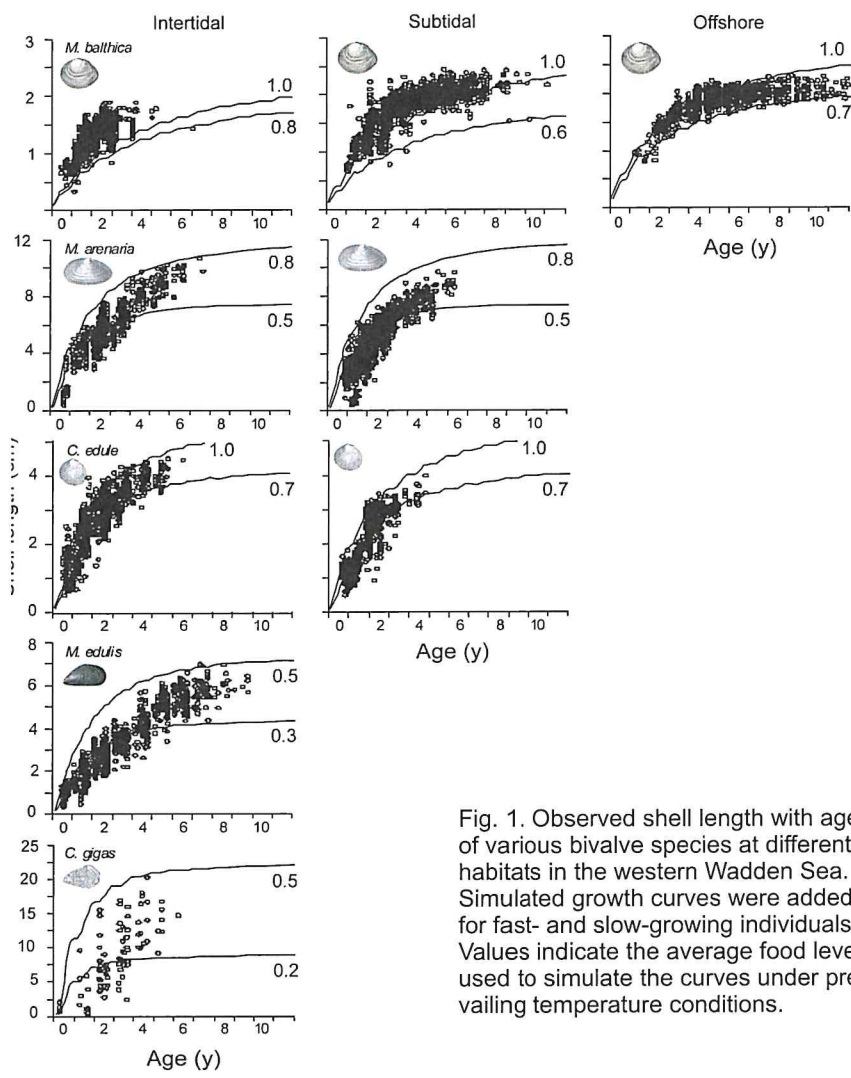


Fig. 1. Observed shell length with age of various bivalve species at different habitats in the western Wadden Sea. Simulated growth curves were added for fast- and slow-growing individuals. Values indicate the average food level used to simulate the curves under prevailing temperature conditions.

Intraspecific differences in growth rates of bivalves growing up in different habitats appeared to be not very large. However, variability among individuals within sites was rather strong. This could be due to bias in age determination or/and to variability in food conditions caused by the high density of some species. In *M. balthica*, observed growth at the intertidal and subtidal was faster than maximum simulated growth at optimal food conditions. Individual or within site variability in DEB model parameter values could be responsible for this. The most successful species were *M. balthica* and *C. edule* with an annual simulated food level between 0.7 and 1.0; followed by *M. arenaria* (0.5-0.8), *M. edulis* (0.3-0.5) and *C. gigas* (0.2-0.5). For analysis of the seasonal variation in food conditions, the seasonal pattern in food level was reconstructed separately for each age class. The reconstructed mean food level for two species is presented in Fig. 2.

Fastest growth was found between spring and summer, corresponding to the bivalves' main growing season. As a result, the highest reconstructed food level was found in this period. In the Wadden Sea, the growing season starts at the beginning of the phytoplankton spring bloom. During this period of abundant food in the water column, bivalves can feed maximally. After the spring bloom, phytoplankton growth declines and the amount of food for bivalves in the water decreases. As a result,



Sampling with the box-corer by boat in a subtidal area.

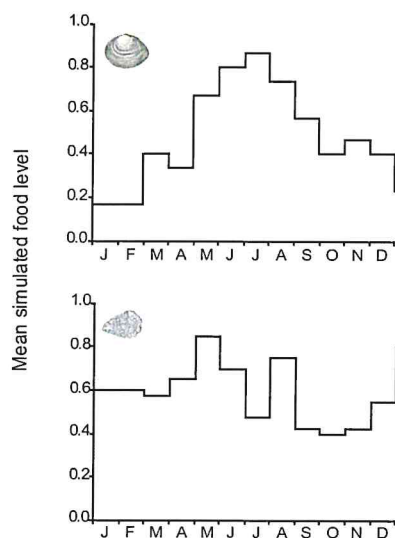


Fig. 2. Simulated seasonal food level for two bivalve species

the simulated food level for the various species decreases during summer and/or autumn, suggesting that strong food competition between species must have occurred during these periods. Overall, growth of the different species is not maximal at the current water temperatures, probably due to suboptimal food conditions. Whether these are the consequence of food limitation only or also of reduced filtration efficiency

due to the high sediment load in the water is still uncertain.

This research was supported by the project 'Praxis XXI' from the Portuguese Science Foundation and by the project Van Gogh from the Netherlands Organization for Scientific Research (NWO).



The Mok bay at Texel (intertidal area where oysters *Crassostrea gigas* were sampled).

MONITORING THE BOTTOM FAUNA IN THE DUTCH SECTOR OF THE NORTH SEA FOR 15 YEARS.

Rogier Daan* and Maarten Mulder

This programme has registered the development of the bottom fauna of the Dutch Continental Shelf (DCS) of the North Sea for a period of 15 years (1991-2006). Its goal has been to generate a time series, which can form a basis to detect trends in time and in space in four different regions of the DCS. On local scale, rather strong fluctuations were sometimes observed in the abundance of individual species. On a DCS wide scale however, the fauna showed hardly any trends.

In 1989 the national program BIOMON was started for biological monitoring of the waters in the Dutch sector of the North Sea, the Wadden Sea and the Delta area. The program was initiated by the National Institute for Coastal and Marine Management (RIKZ) of the Ministry of Transport, Public Works and Water management. It comprises monitoring of all trophic levels in the food web, from plankton to top predators like birds and mammals. BIOMON is carried out by several institutes; NIOZ has contributed to the program from 1991 onwards with monitoring of the animals larger than 1 mm in body-size living in or on the bottom of the North Sea; the benthic fauna.

In the framework of BIOMON, 100 stations have been chosen in the North Sea, which were sampled every year with a boxcorer. The stations are located within the four regions Dogger Bank, Oyster Grounds, the southern offshore area and the Dutch coastal area. Within each region, the locations of the stations were chosen at ran-

dom, with the number of stations being proportional to the surface area of each region.

During 15 years of monitoring, over 400 species have been identified, mainly belonging to 4 taxonomic groups: polychaete worms, crustaceans, molluscs and echinoderms.

At the community level, there appeared to be no clear trends in the changes over the entire period. The species diversity was consistently highest at the Dogger Bank and in the Oyster Ground, on average twice as high as in the southern offshore and coastal areas. The overall faunal densities were generally the highest in the Oyster Ground. The highest biomass values were found in the coastal area, due to the presence of very densely populated banks of truncated surf clams (*Spisula subtruncata*) or American razor clams (*Ensis americanus*). The latter species has invaded the North Sea from the East-coast of the United states and Canada. At coastal stations where these bivalve species were absent, the biomass values

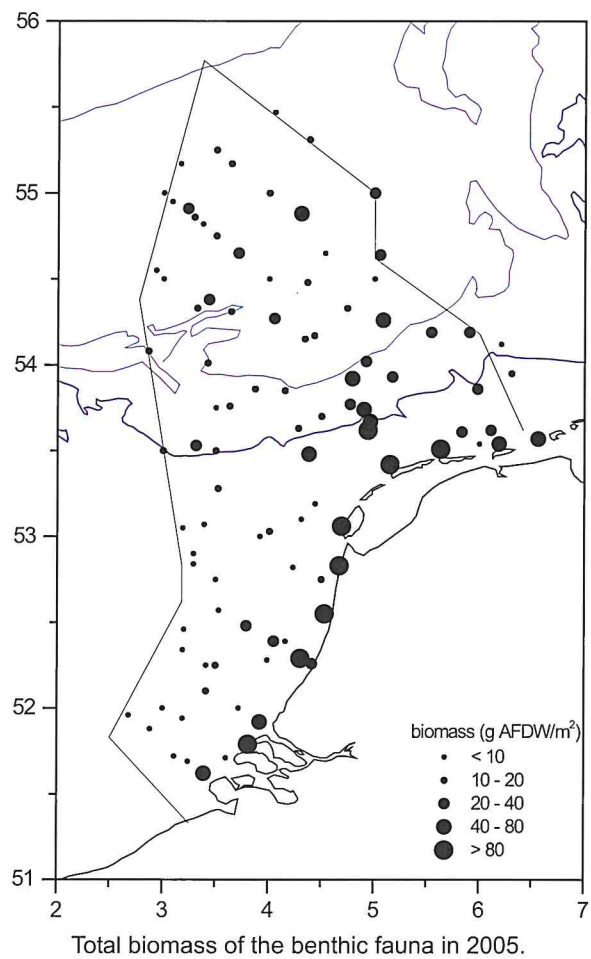
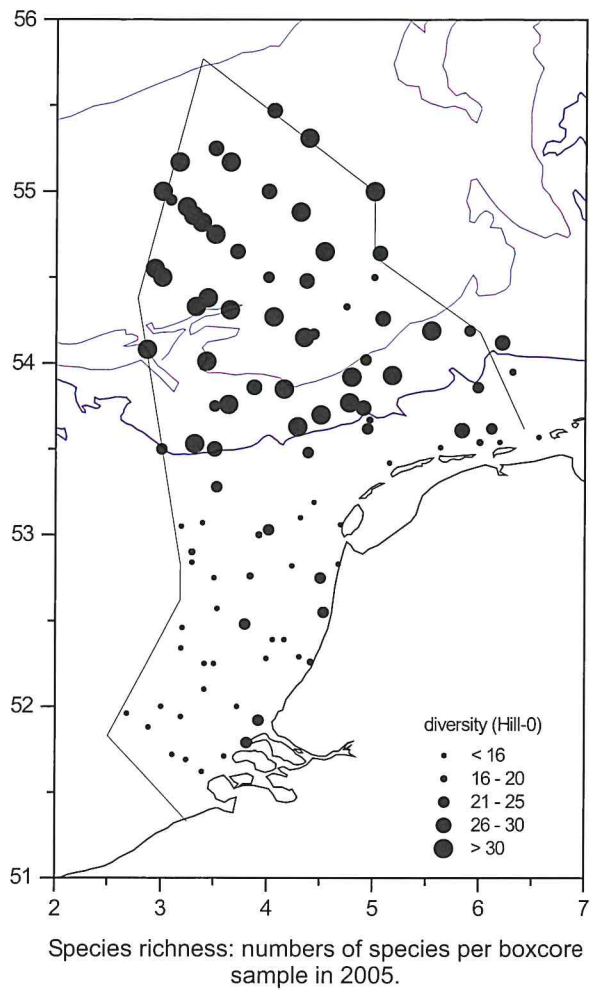
were usually the lowest of the whole DCS.

At the species level, there were some clear trends. At the Dogger Bank the small polychaete worm *Aricidea minuta* was common in the nineties, but the species completely disappeared after 1999. A few years later this sand dwelling species showed a decrease in the southern offshore area too. In the Oyster Ground there was a period



Sediment core collected in the Oyster Ground.

* Corresponding author: daan@nioz.nl



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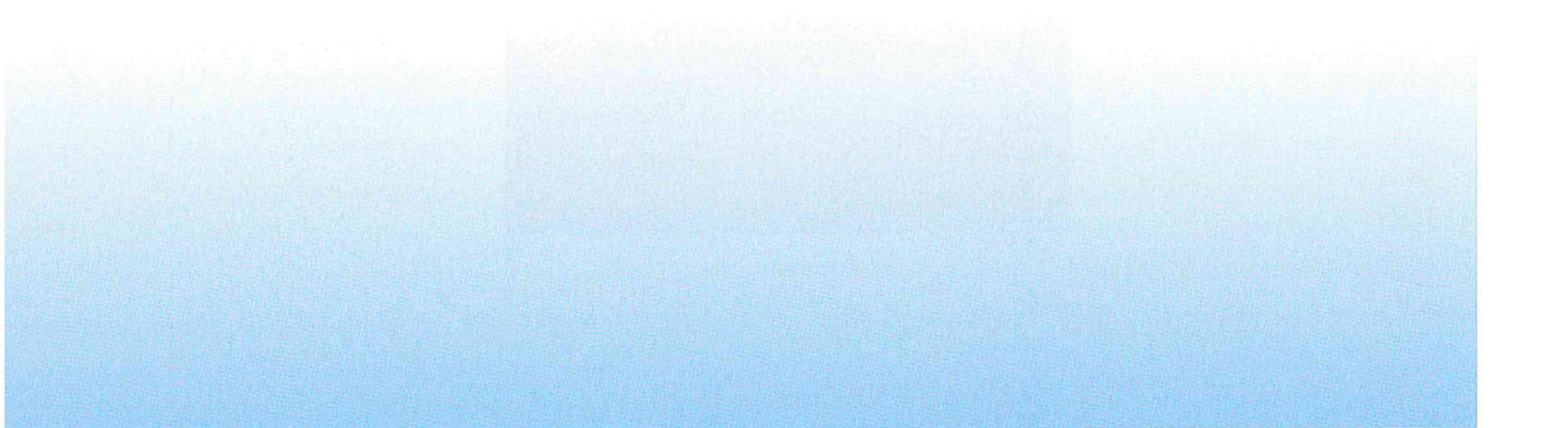
Boxcorer.

of low abundance of the brittle star *Amphiura filiformis* and the mud shrimp *Callinassa subterranea* in the second half of the nineties, but the densities of both species recovered rapidly after 2000. In the coastal area there seemed to be a decrease in the densities of the truncated surf clam (*Spisula subtruncata*). Possibly there has been no successful spatfall in recent years, but it can not be excluded

that banks with extremely high densities of this species were not covered by our sampling stations.

In the Oyster Ground, a substantial decrease was observed in fine particles in the bottom, in particular the silt content (particles smaller than 63 micrometer) of the upper 10 cm of the sediment, from 2001 onwards. At the 42 stations in this area the average silt content decreased from 13 to 8% within a

period of 4 years. Before the decrease there were 12 stations with silt contents well above 20%, but after 2001 such high concentrations were no longer observed. The decrease was particularly dramatic in the highly productive Frisian Front area. However, there is no indication that the decrease of silt concentrations has affected the abundance of any of the common species occurring here.



EXTERNAL PROJECTS MARINE ECOLOGY AND EVOLUTION

- Biological monitoring programme North Sea and Outer Delta (BIOMON, RWS-RIKZ)
R. Daan, M. Mulder
- Long-term effects of former discharges of oil contaminated drill cuttings in the North Sea (NOGEPA)
R. Daan, M. Mulder
- Macrozoobenthos monitoring in Wadden Sea and Ems-Dollard (BIOMON, RWS-RIKZ)
R. Dekker, C.M. Waasdorp
- PRODUS sublitorale natuurwaarden Waddenzee (Min. LNV / IMARES)
R. Dekker, J. van der Meer
- Beached bird survey monitoring programme, 2005/2006 (RWS - North Sea Directorate)
C.J. Camphuysen
- Beached bird survey monitoring programme, 2006/2007 (RWS-RIKZ)
C.J. Camphuysen
- Critical Interactions between species and their implications for a precautionary fisheries management in a variable environment - a modelling approach (BECAUSE, Leibniz Institut für Meereswissenschaften an der Universität Kiel)
C.J. Camphuysen
- Conservation of marine areas in Portuguese waters (SPEA/BirdLife, Lisboa)
C.J. Camphuysen
- Chronic oil pollution in Europe (IFAW, Brussels)
C.J. Camphuysen
- Whale detection and behavioral studies (TNO)
C.J. Camphuysen
- Protected marine areas in the North Sea (IMARES)
C.J. Camphuysen
- Harbour porpoise dissections (IMARES)
C.J. Camphuysen
- Nearshore windfarm seabird observations (IMARES)
C.J. Camphuysen
- Impact of oil spills on seabirds (Sea Alarm Brussels, University of A Coruña, Spain)
C.J. Camphuysen
- Global Flyway Network: the shorebird ecological demographics and conservation initiative (BirdLife Netherlands).
T. Piersma
- Marine propagation along the coasts of Europe (MarPACE, EU)
C.J.M. Philippart, J. van Bleijswijk
- Evaluation of the Ca isotope system in carbonate polymorphs as a new proxy for seawater temperature and secular variations of Ca concentration and fractionation throughout Earth history. (CASIOPEIA, NWO / Eurocores / ESF)
R. Witbaard
- Climate and filter feeding bivalves in the North Sea.(BSIK, Klimaat voor ruimte, A6)
R. Witbaard
- How do corals with single type zooxanthellae cope with large depth range and bleaching (FCT, Portugal)
P. Frade, R.P.M. Bak
- Health status of coral reefs along the east coast of Kalimantan, Indonesia (NWO-WOTRO)

M. Nugues, R.P.M. Bak

- Size dependent predation risk for young bivalves (NEBROC)

H. Andresen

- Ecology of deep sea coral reefs (HERMES, EU)

M.S.S. Lavaleye

- GIS-charts of bottom fauna for an offshore wind farm (BSIK, We@Sea)

M.S.S. Lavaleye

- Transport of bivalve larvae in the Dutch coastal zone (NZW)

P. van 't Hof, G.C.A. Duineveld

- Survival repercussions of individual timing differences in the Afro-Siberian Red Knot *Calidris canutus canutus* during migration from Banc d'Arguin (Mauritania) to Taymyr (Russia) (MAVA foundation)

J. Leyrer, T. Piersma

- Fragile biodiversity linkages: production and consumption in a nutrient-poor seagrass-dominated intertidal ecosystem, the Banc d'Arguin, Mauritania (NWO-WOTRO)

J. van Gils, T. Piersma, in cooperation with the University of Nouakchott (Mauritania)

- Cost-benefit analysis of flying far and wintering cheaply: comparative demographics of sanderlings in Ghana, Mauritania and the Netherlands (NWO-WOTRO)

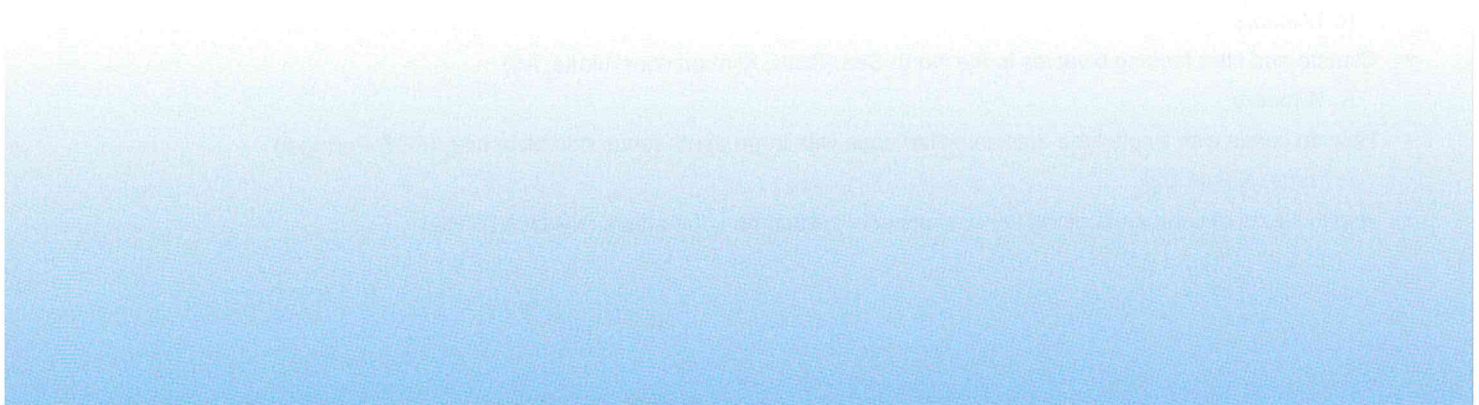
E. Koomson, T. Piersma, in cooperation with the University of Ghana

- KRW Benthos 2006 (KRW, RIKZ)

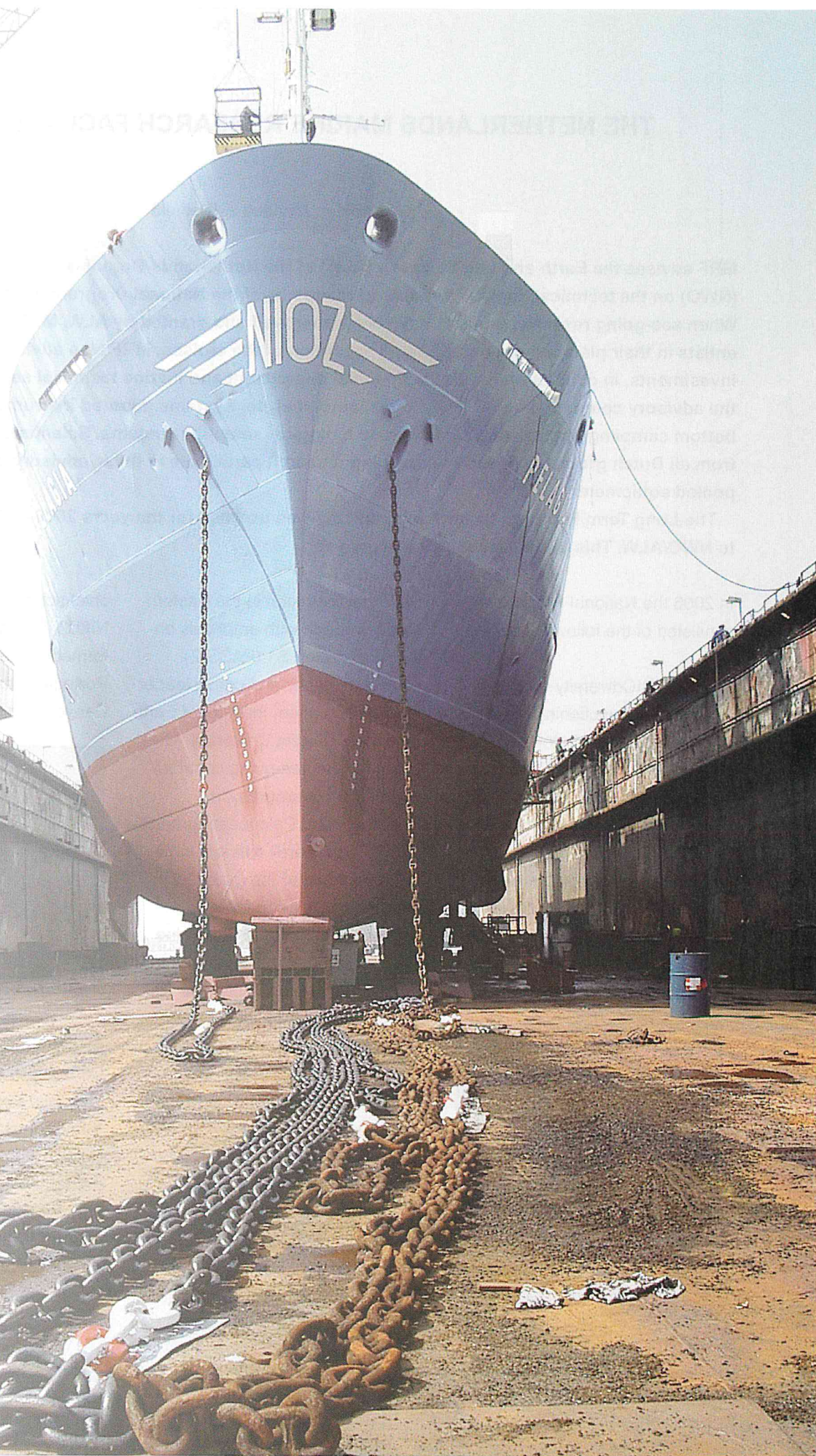
J. Drent

- Structural and functional diversity (SUSUSE, NWO-ALW)

T. Troost, J. van der Meer



SCIENTIFIC SUPPORT SERVICES



THE NETHERLANDS MARINE RESEARCH FACILITIES (MRF)

Contributor: Marieke J. Rietveld

MRF advises the Earth and Life Sciences (ALW) of the Netherlands Organisation for Scientific Research (NWO) on the technical, logistic and financial aspects of the National Programme for sea research. When sea-going research projects have been approved and granted by ALW, MRF assists the chief scientists in their planning, preparation and execution of the cruises. MRF also advises ALW on long-term investments, in consultation with the financial department and marine technical services of NIOZ and the advisory committees on CTD systems, auto-analyser systems, moored instrumentation systems, bottom sampling and seismic systems and biological sampling systems. Scientists and technicians from all Dutch groups involved in sea-going research participate in these advisory committees for pooled equipment.

The Long Term Planning on MRF investments was updated for the years 2006 – 2010 and submitted to NWO/ALW. This update takes place every year.

In 2006 the National Programme consisted of the following cruises:

BIOSYS (BIODiversity and EcoSYStem Functioning of Deep Water Coral Reefs in the Mediterranean and N.E. Atlantic; chief scientist Dr. C. Maier, NIOZ). A 14 day cruise was performed in the North Atlantic Ocean West of Hebrides and Mingulay area on board RV Pelagia. During the cruise aspects of the ecology and biology of cold water coral reefs were studied.



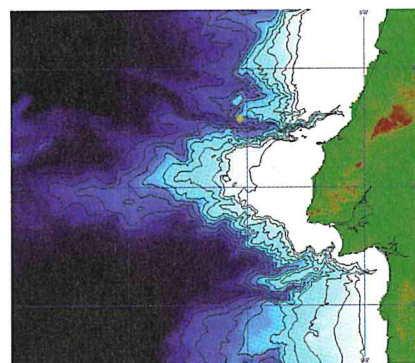
PASS-2 2006, Palaeoceanographic, Palaeoclimatic, Palaeo-environmental and diagenetic Aspects of

Sapropel formation in the Eastern Mediterranean with emphasis on the most recent S1 (PASS-2). Project manager and cruise leader Dr. G.J. de Lange, Institute of Earth Sciences, Utrecht University. The project is the sea-going contribution to the EU-programme Sapropels and Paleoceanography (SAP). The overall aim is a better understanding of the (paleo)-functioning of the Eastern Mediterranean and to determine the role in the global environment by studying the characteristic biogeochemical processes. The Project is a co-operation with Italian research groups.

A 12 day cruise was performed on board the Italian RV *Universitatis*.

HERMES-CANYONS (Hotspot Ecosystem Research on the Margins of European Seas – Canyons off Portugal; project manager Prof.dr. T.C.E. van Weering,

chief scientist Dr. H. de Stigter, NIOZ), a 21 day cruise was performed in the Atlantic Ocean off Portugal in the Nazaré and Setubal Canyons on board RV Pelagia.



ARCHIMEDES (Activity, Rates, Carbon use and High-pressure Microbial Ecology of the DEap Sea; project manager Prof.dr. G. Herndl, NIOZ). A 28 day cruise was performed in the Atlantic Ocean on a transect from the Canary Islands south over the equator till 5° South on board RV Pelagia. A defect on the deep-sea winch limited the scientific outcome of the cruise as



and redeployment of the 4 LOCO moorings in combination with a British, a French and a German group on RRS Discovery in the Irminger Sea.

The MRF advice to NWO/ALW for the National Programme of 2007: For the ongoing project HERMES-CANYONS (Hotspot Ecosystem Research on the Margins of European Seas – Canyons off Portugal); project manager Prof.dr. T.C.E. van Weering, chief scientist Dr. H. de Stigter, NIOZ, a 21 day cruise was advised in the Atlantic off Portugal and West of Ireland (Porcupine Bank) on board RV Pelagia.

deep sea sampling was curtailed to a maximum of 3000 m.

For the investment subsidy NWO-Large two cruises were performed for the LOCO project (Long-Term Ocean Climate Observations).

LOCO/Mozambique (Long-Term Ocean Climate Observations – Mozambique Strait; project manager Dr. Ir. H. Ridderinkhof, NIOZ). A 18 day barter cruise on board the UK research vessel RRS Discovery was performed in March/April 2006 in the Mozambique Strait.

LOCO/IW (Long-Term Ocean Climate Observations – Internal Waves; project managers Dr. H. van Haren and Dr. L. Maas, NIOZ): a 25 day cruise was performed in the Atlantic Ocean Canary Basin on board RV Pelagia.
LOCO/North Atlantic (Long-Term Ocean Climate Observations –

North Atlantic; project manager Dr. H. van Aken, NIOZ): A 19 day combined barter cruise for the recovery



For the remaining ship time of BIOSYS (BIODiversity and EcoSYstem Functioning of Deep Water Coral Reefs in the Mediterranean and N.E. Atlantic); chief scientist Dr. C. Maier, NIOZ, a 7 day cruise was advised in the Skagerrak off the Swedish coast on board RV Pelagia.

For the NWO big-investment grant for the LOCO project (Long-Term Ocean Climate Observations) three ongoing cruises were advised. One cruise for LOCO/North Atlantic (project manager Dr. H. van Aken, NIOZ) for 28 days in combination with the CAMP and VAMOC programme and the German CIS moorings on board the RV Pelagia in the Irminger Sea in the North Atlantic, and for LOCO/IW (Internal Waves), project manager Dr. ir. H. van Haren, a 26 day cruise in the

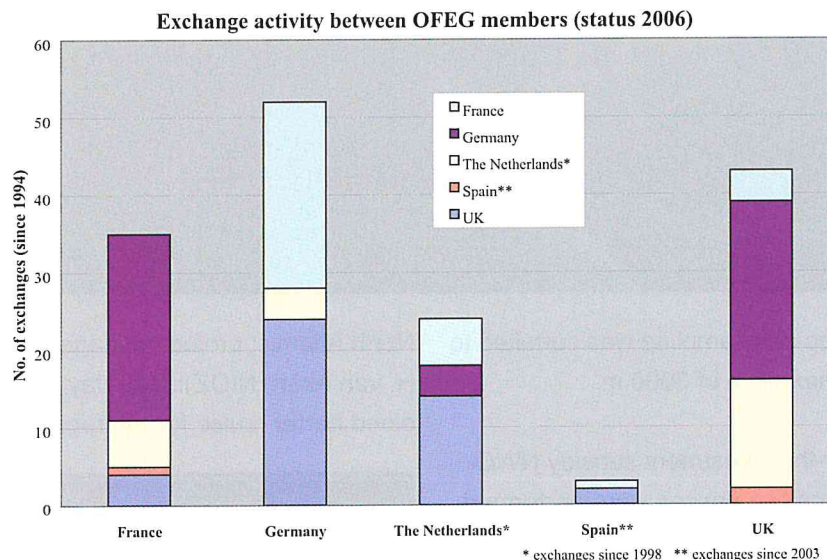
North Atlantic, south of the Canary Islands and east of Brasil on RV Pelagia.

Ocean Facilities Exchange Group (OFEG)

The OFEG was established to use research vessels from different

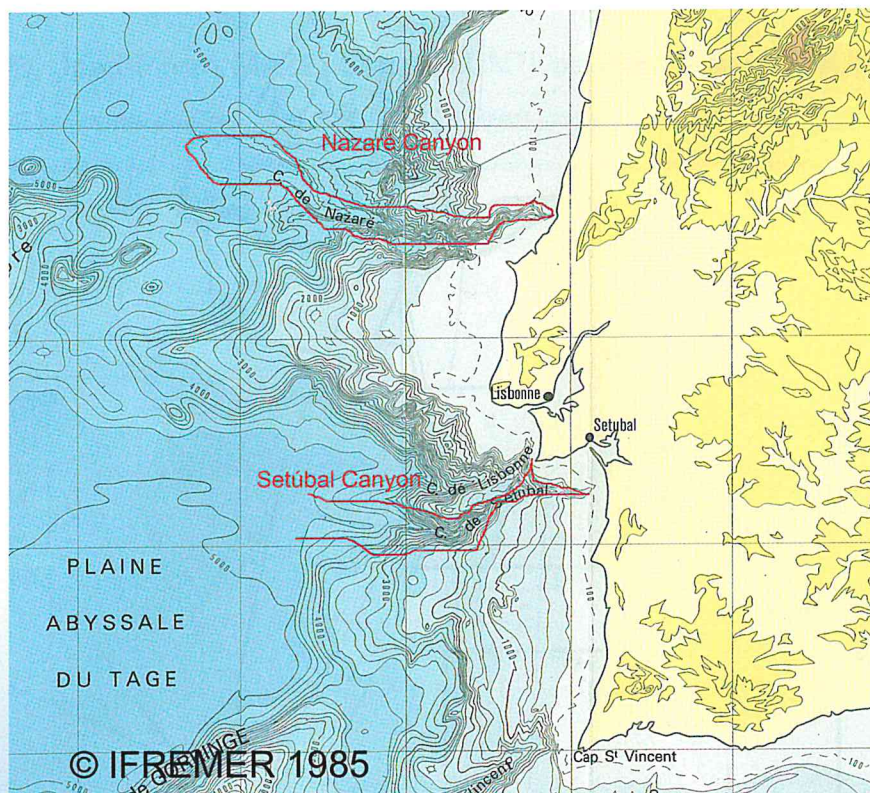
European institutes more efficiently by exchanging shiptime and large equipment.

Participants of OFEG are: NERC and NOCS (UK), IFREMER (Fr), BMBF (De) and NIOZ (NL). UTM-CMIMA of the Spanish research council CSIC, and IMR of Norway



became a full member as of November 2006. The OFEG fleet now consists of 25 research ships.

In 2006 a number of cruises were performed in the OFEG framework. A 24 day cruise for the RANAMOX project of the Queen Mary University of London (Chief Scientist Dr. M. Trimmer/Dr. J. Nicholls) on board RV Pelagia in the Celtic Seas; A 18 day cruise for the NIOZ LOCO/Mozambique cruise on the UK RRS Discovery in the Indian Ocean. A 19 day cruise for the NIOZ LOCO/Irminger Sea cruise on the UK RRS Discovery in the Irminger Sea.

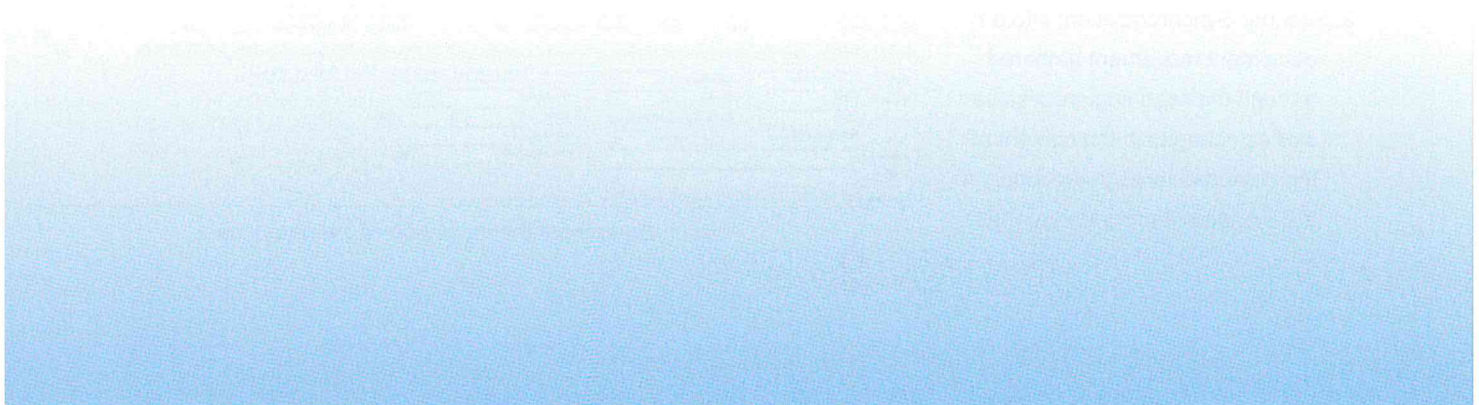


This year the Ocean Facilities Exchange Group (OFEG), met twice, in April in Amsterdam (Netherlands), and in November in Madrid (Spain).

As the stepping down Chair, M.J. Rietveld attended the 20th meeting of the International research Ship Operators Meeting (ISOM), hosted by the Marine Insitute in Galway,

Ireland 25 – 26 October 2006, as well as the ISOM workshop regarding Underwater Sound and Marine Life on the 24th. M.J. Rietveld was one of the editors of the ESF Marine Board Ocean Fleets Working Group (OFWG) report on the European Research Fleets. M.J. Rietveld was an invited guest at the UNOLS/RVOC meeting at the University of Washington in

Seattle. For the Marine Infrastructure Forum (MIF) of the EU/ESF MarinERA programme M.J. Rietveld participated in the meeting in St. Feliu (Spain). In June the European Research Vessel Operators (ERVO) convened at the Marine Research Institute in Reykjavik (Iceland).



TRACK AND TRACE DATABASE

Theo Hillebrand & Margriet Hiehle

Implementation of the LOCO program in 2003 resulted in a strong demand for new administrative tools. A total of 20 sub-surface moorings deployed over the entire globe and to be redeployed on an average period of 18 months required sophisticated planning and management.

Also forced by the growing administrative demands from Customs, the Department of Physical Oceanography initiated the development of a new software package.

This package called Track and Trace, was meant to structure all administrative matters concerning Customs and to hold track on the location history of instruments and equipment. All equipment that undergoes transportation is identified with a barcode. Characteristic features like weight, serial number and manufacturer are stored in a relational database.

The input/output actions for the database are executed by a software package that consists of 4 main parts:

1. Equipment; this is the actual input side of the database, a single line represents the specific features and identifiers of each individual piece of equipment. (see fig.1)

2. Transports, Cruises and Transits. Like individual pieces of equipment also the individual transports, cruises and transits are identified by a unique barcode. Equipment can be virtually moved from one location, transit or cruise to the other by scanning their barcode. Info on cruises and transits needed for the determination of equipments new location are made available through the NIOZ internal internet web pages.

3. Scanner Synchronization; info on equipment movement gathered through the scanning process as well as changes in the content of the database through the input in the Equipment program are inter-

changed with each other through a scanner synchronization program. (See Fig. 2)

4. Reports, this part is functioning as the output side of the database.

Reports on the content of individual locations or movements of equipment or even specific custom documents-if required- can be generated.

The development of the database and the accompanying software was carried out by the Information and Presentation Centre (IPC) and vigorously tested over a period of several years.

To identify and describe existing problems as well as to help find solutions for the problems encountered a small user group was conducted representing most departments involved in the use and transportation of sea going equipment.

name	serial	barcode	customs type	manufacturer	owner	release code	status	type	value	instrument weight	transport weight
Batterij houder draagbox	n.v.l.	3230	consumable	RD Instrume	hll		Operational	Plastic, Ex Sentinel	367		6
Batterij houder draagbox	n.v.l.	3247	consumable	RD Instrume	hll		Operational	Plastic, Ex Sentinel	367		6
Batterij houder draagbox	n.v.l.	3254	consumable	RD Instrume	hll		Operational	Plastic, Ex Sentinel	367		35
Battery 1st ak WHL 75	0	8886	bonded	RD USA	hll		Operational	757H-6051 00	4795		319
Bottom Pressure Sensor	5342447 0016	13154	bonded	Sea-Bird Ele	hll		Operational	SBE 53-BPR	15665		14
box, alu	FysDc 02	0	free	Sy-Tech	hiehle		Operational	groot	30		3
box, alu	FysDc 01	0	free	Sy-Tech	hiehle		Operational	groot	30		3
box, alu	99	1472	free	NIOZ	hiehle		Operational	very small	1000		5
box, alu	FysDc 03	0	free	Sy-Tech	hiehle		Operational	klein	20		2
box, alu	CTD box 7	0	free	Sy-Tech	hiehle		Operational	groot	30		30
C en T recorder	2649	3704	bonded	Sea-Bird Ele	hll		Operational	SBE 37-SM Microcat	4598		3
C en T recorder	2656	3737	bonded	Sea-Bird Ele	hll		Operational	SBE 37-SM Microcat	4598		3
C en T recorder	2655	3780	bonded	Sea-Bird Ele	hll		Operational	SBE 37-SM Microcat	4598		3
C en T recorder	2659	11265	bonded	Sea-Bird Ele	hll		Operational	SBE 37-SM Microcat	4598		3
C en T recorder	2671	925	bonded	Sea-Bird Ele	hll		Operational	SBE 37-SM Microcat	4598		3
C en T recorder	2674	0	bonded	Sea-Bird Ele	hll		Operational	SBE 37-SM Microcat	4598		3
C en T recorder	2676	3162	bonded	Sea-Bird Ele	hll		Operational	SBE 37-SM Microcat	4598		3
C en T recorder	3822	1649	bonded	Sea-Bird Ele	hll		Operational	SBE 37-SM Microcat	4471		3
C en T recorder	4347	12829	bonded	Sea-Bird Ele	hll		Operational	SBE 37-SM Microcat	4243		4
C en T recorder	4346	12838	bonded	Sea-Bird Ele	hll		Operational	SBE 37-SM Microcat	4243		4
C en T recorder	4345	12805	bonded	Sea-Bird Ele	hll		Operational	SBE 37-SM Microcat	4243		4
C en T recorder	4139	5067	bonded	Sea-Bird Ele	hll		Operational	SBE 37-SM Microcat	4243		4
C en T recorder	4140	5050	bonded	Sea-Bird Ele	hll		Operational	SBE 37-SM Microcat	4243		4

Name	Department	Owner	Kind of packing unit / housing	Dimensions (cm)	Weight (kg)	Buoyancy	Max Depth (m)
C en T recorder	FYS	hll	None	3	2.3	7000	

Fig. 1. Equipment; the input side of the database

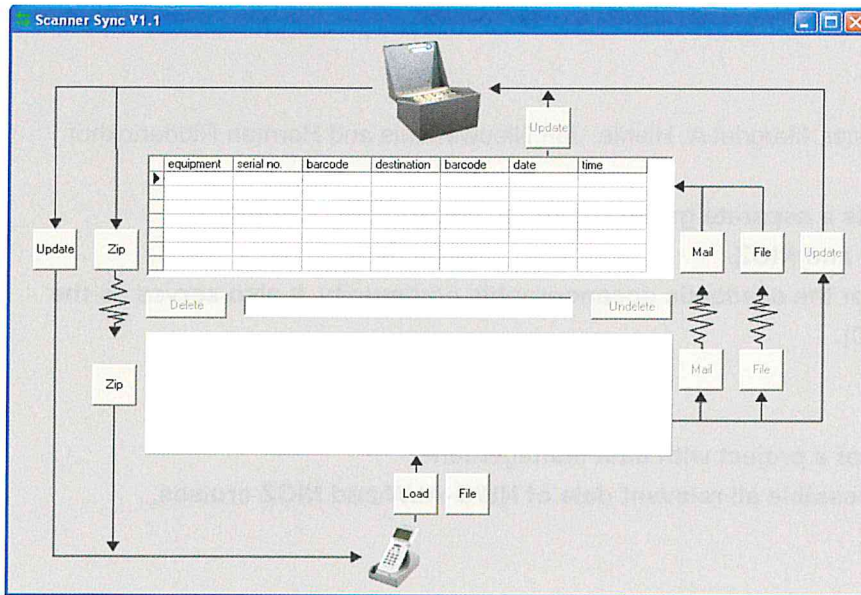


Fig. 2 Database/scanner synchronization program

This group consisted of:

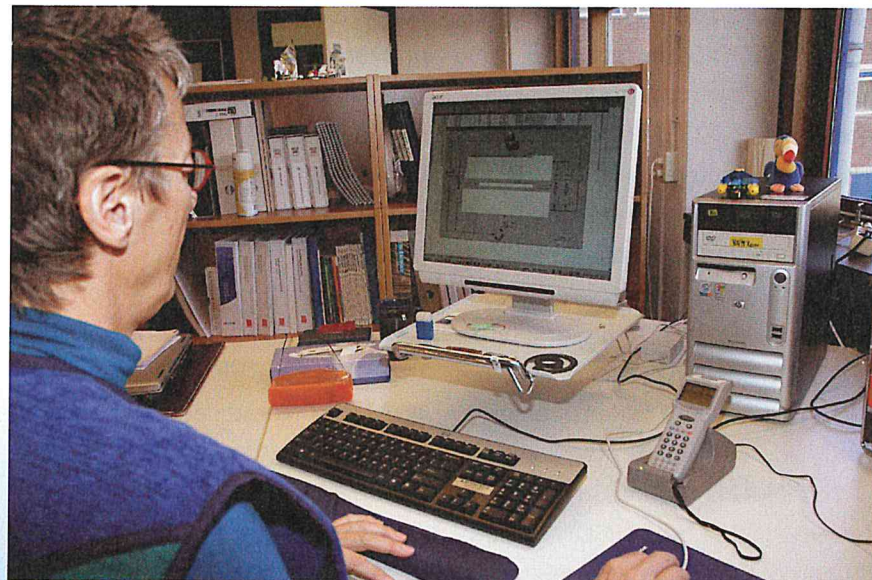
- * Pieter van Kralingen, Head Facility Management, Chairman
- * Wim Pool, Head Information and Presentation Centre, software development
- * Jan Derksen, Information and Presentation Centre, software development
- * Margriet Hiehle, Data Management Group, member/user
- * Peter-Roy Alkema, Department Vessels and Logistics, member/user
- * Jack Schilling, Head Marine Technology Mechanical, member/user
- * Ruud Groenewegen, Marine Technology Electronics, member/user
- * Theo Hillebrand, Physical Oceanography, member/user
- * Anne-Marie Markesteyn, Facility Management, secretary

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The final result of all efforts is:

- a. whenever needed uniform custom documents can be generated just by a few mouse clicks.
- b. up to date administration of the NIOZ custom bonded area just by a few mouse clicks.
- c. production of reports about the present location or entire location history of equipment just by a few mouse clicks.

The programme will be effective from January 2007.



DATA MANAGEMENT GROUP

Taco F. de Bruin*, Ronald X. de Koster, Margriet A. Hiehle, Jan Nieuwenhuis and Herman Ridderinkhof.

The Data Management Group (DMG) is a separate group within the department of Physical Oceanography, funded by NWO-ALW and NIOZ.

It has a national role as data centre for the academic oceanographic community. It also serves as the National Antarctic Data Centre (NADC).

The main tasks of the DMG are to:

- * **assist scientists during all phases of a project with data management**
- * **archive and keep available and accessible all relevant data of NWO-ALW and NIOZ cruises.**

In 2006 the DMG participated actively in several national and international oceanographic data management projects, while continuing to work on the day-to-day activities for the National Cruise Programme and the institute.

One of the highlights of the activities of the DMG in 2006 was the work carried out in the first phase of the national NODC-i project. In this first phase, the DMG successfully implemented a pilot 'data view' on the NIOZ Centralized Oceanographic Data and Information System (CODIS) database, enabling other project partners to access the NIOZ data holdings. The NODC-i project aims to build a national, distributed system of interconnected databases, offering the users seamless access to all partner databases. At the end of 2006, the second phase of this important national project was formally approved.

The DMG has updated the NIOZ Common Data Index (CDI) entries as part of the EU-SeadataNet proj-

ect (the successor to the EU-SeaSearch project). The CDI format provides the meta data of all CTD profiles in the CODIS data base, allowing these CTD data to be viewed and queried through the SeaDataNet/SeaSearch CDI interface at <http://www.sea-search.net/cdi/welcome.htm>. The CDI interface also provides direct access to the data in the CODIS database.

Meanwhile, the day to day work of populating the CODIS data base continued, resulting in an increase of over 20% in contents. The CODIS hydrological database contained 5848 CTD profiles and 1675 sample bottle casts from 142 different research cruises by the end of the year.

COREBASE is another asset of the DMG. COREBASE is an online archive of stored sediment cores, developed in close cooperation with the Department of Marine Chemistry and Geology, to give a detailed inventory of the cores,

their status and the analyses, performed on those cores. COREBASE also contains high resolution images of sediment cores obtained from the XRF-CoreScanner.

Both the CODIS and the COREBASE database prove to be very popular and continue to be used with an increasing frequency. This year, the COREBASE database was accessed 274 times per day on average and the CODIS database 471 times per day.

DMG staff participated in a series of national and international meetings related to oceanographic and Antarctic data management. At these meetings, DMG staff members gave 32 oral presentations and presented 6 posters on various aspects of scientific data management. Three members of the DMG staff took an introductory course on ArcGIS, organized by and at the NIOZ.

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The DMG also maintains a series of databases and project websites and pages. A part of these are dynamically linked. This activity includes the daily update of the cruise diary pages on the NIOZ website www.nioz.nl/cruises. The actual position of RV Pelagia is dynamically obtained from SCRIPPS Institution of Oceanography and shown on an online map. In addition to this, the software to gain an overview of the archive CDs and DVDs was improved and support was given for the in-house developed mooring software.

Another ongoing activity is assistance of scientists with data handling questions. Many requests for data and (graphical) data products, both from within the institute as from outside, were answered. These requests are very diverse and range from questions on the availability of data from scientists within the institute to answering data request from foreign authorities and other data centres. Answering these requests fits perfectly in the end-to-end data man-

agement philosophy, adopted by the DMG since its inception.

Staff of the DMG participated in the LOCO IW (64PE248) and the ARCHIMEDES (64PE251) cruises onboard RV Pelagia, as well as in several 13-hours cruises within the Marsdiep-project. Part of the post processing of the CTD data for these and other cruises, was carried out by the DMG.

All relevant digital data, collected during the Pelagia cruises, have been archived on DVD-RAM and are stored in a safe, for use in case of permanent loss of data by the scientist. Following technical developments and due to the increased size of the collected datasets, the DMG has stopped using CDs for data archiving and has completely transferred to using DVDs. Developments concerning the expected lifetime of both CDs and DVDs are closely watched.

Furthermore, web sites for the secretariats of the NODC and the International Research Ship Operators' Meeting (ISOM) are maintained by the DMG.

The DMG represents NIOZ and the Dutch academic oceanographic community within the National Oceanographic Data Committee (NODC). The DMG representative is the NODC Chairman.

As participant in the NODC, NIOZ actively participates in international projects and organizations such as the EU-SeaDataNet project, the IOC Committee on International Oceanographic Data and Information Exchange (IODE) and the ICES-Working Group on Marine Data Management.

An additional task of the DMG is the development and maintenance of the Netherlands Antarctic Data Inventory (NADI, <http://www.nadi.nl>) for the Antarctic research projects in the Netherlands. Taco de Bruin is the Chief Officer of the Joint Committee on Antarctic Data Management (JCADM), which currently has representation from 30 countries. He is also one of the co-chairs of the International Polar Year Subcommittee on Data Policy and Management.

VESSELS AND LOGISTICS

Contributor: Marieke J. Rietveld

NIOZ owns and operates several marine research facilities, not only to accommodate its own scientific programme but also for the oceanographic community in the Netherlands. As a consequence of its position as a national institute and in relation to its mission NIOZ co-ordinates and takes care of the execution of sea-going research programmes funded by NWO in the framework of the national programme for sea-going research. A report on these MRF activities is given previously.

Research Vessel PELAGIA

The largest sea-going facility is RV Pelagia, a 66 m multipurpose research vessel developed for oceanographic research in coastal seas, on continental shelves and in the blue ocean. R/V Pelagia (built 1991, ISM Certified) is specially designed as a multipurpose research vessel. It is a very stable platform and has most favourable nautical properties. Since 1991 she has experience in CTD-deployment, biological sampling methods, seismic surveys, coring activities (box-, multi-, piston, gravity, vibro-, CPT) as well as in deployment and recovery of deep-sea moorings and bottom landers.

In April 2006 a Swath KONGSBERG EM 300 1 x 2 degree multi-beam echosounder for shallow and deep water was installed. By using new chirped ping technology the system is capable of producing a swath of 4000 m at 5 km depth. After installation the system was successfully tested. More details on the cruise programme below.



Committee Future Pelagia Report

Following the CNTZ recommendation on outsourcing of RV Pelagia, the Committee Future PELAGIA¹ studied the running cost efficiency and management of the Royal NIOZ research vessel Pelagia.

An analysis was made on the operational performance during the past six years, and the operational costs according to the format of the Businessplan 2000, as agreed with NWO/ALW.

Also an assessment was done on the position of NIOZ within the Ocean Facilities Exchange Group (OFEG).

A comparison was made of the operating system and daily cost rate with other OFEG members in Europe and UNOLS (USA). The figures mentioned were checked by the OFEG partners.

The Committee organised an external consultation with a commercial ship operator. The former P&O Nedlloyd (now Maersk) ship management organisation Blue Star Ship Management took up the assignment to review the current fleet management of RV Pelagia.

Blue Star reviewed and analysed the present fleet management of RV Pelagia, and generated recommendations to optimize and

¹ The CFP has the following members: Drs. Marieke J. Rietveld (MRF – Chair), Theo C.J. Buisman (Fleet manager & Logistics), Dr. Herman Ridderinkhof (FYS/Committee Marine Facilities-CMF), Jack Schilling (MTM), Ir. Marck G. Smit (MTc), Prof.dr. Tjeerd C.E. van Weering (MCG/CMF), as off March 2006 John Ellen (Master RV Pelagia)

streamline the NIOZ fleet management organisation.

These recommendations also specified suggestions for better efficiency and cost savings.

Advice was given on the benefits and disadvantages of possible outsourcing of (parts of) the ship management.

Based on the presented evaluation and the Blue Star advice the Committee came to the following main recommendations:

worked also in the German and Danish part of the Wadden Sea.

For the new build RV Nereis (20m) that was planned for delivery early 2004, and after serious delay did not meet the contract requirements, law procedures before the Court in The Hague are still ongoing.

NEREIS was designed to be a small fast (22 kn) aluminum twin hull RV with waterjet propulsion for

a wider range of facilities and equipment than would otherwise be possible, and also it reduces wasted time, and therefore wasted costs on long transit passages. In 2006 Dutch scientists sailed on UK ships under this arrangement, and a team sailed on RV Pelagia for a three week research cruise in the Celtic Sea.

Another favourable development evolving from the partnership is the impulse to international co-operation and exchange of marine technicians for training and support on board.

In 2006 the OFEG was extended with two new members: Spain and Norway.

Recommendations Committee Future Pelagia (CFP)

1. The daily management of RV PELAGIA should be kept within NIOZ.
2. Royal NIOZ should implement suggestions given by the Blue Star review to divide and delineate the management responsibilities in order to improve the management capabilities
 - Put the right responsibilities on the right level
 - Realize the right level of competence
 - Improve the communication between shore organisation and ship's master and officers
3. Royal NIOZ should pursue to find a way to bring its seagoing personnel under a more appropriate Collective Labour Agreement.
4. The high quality of the service of RV PELAGIA to the science community and the high standard of maintenance of the ship should be maintained.
5. The present position and high profile of Royal NIOZ within the OFEG should be maintained.
6. Royal NIOZ should pursue to bring the number of operational days of RV PELAGIA per year to the average of 275 (Full Operational Year), as it had during the past six years.

With the approval of the Royal NIOZ board activities have started to implement the CFP recommendations.

Smaller research vessels

Research Vessel Navicula: NIOZ has a 25 m research ship specially designed for working in the shallow Wadden Sea. She has been built in 1980, and elongated in 1999, with a major upgrade in 2004. RV Navicula sailed for 178 days and

the shallow Wadden Sea (draught: 0.80 m) and nearby coastal work. A shared ship with the Netherlands Organisation for Applied Technology (TNO)

Ocean Facilities Exchange Group

The OFEG's primary objective is bartering shiptime and exchange of major marine equipment without the need to exchange money. This arrangement has significant advantages. It allows scientists access to

Cruise programme 2006

After maintenance, RV PELAGIA sailed for 256 operational days, including 1 barter cruise of 24 days. In August a survey was done in the outer North Sea on a 22 day commercial charter.

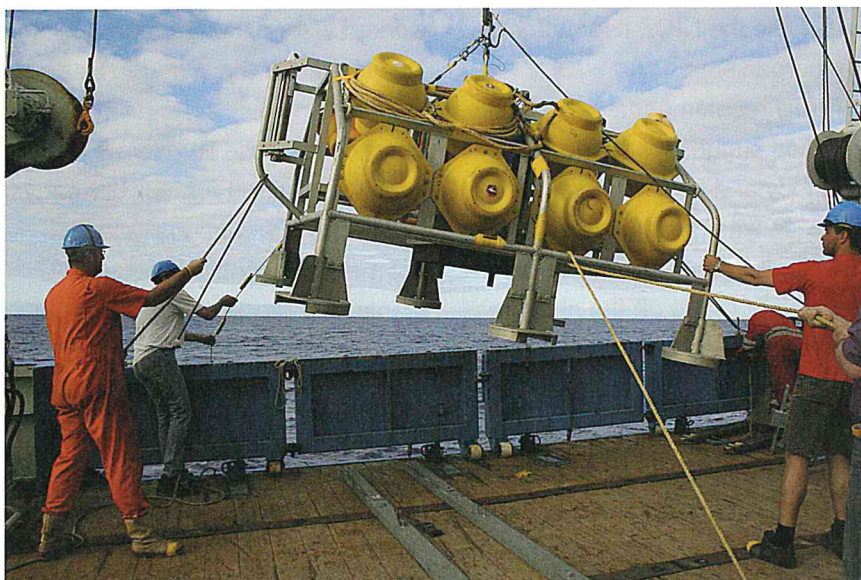
Science projects were funded by the Netherlands Research Council NWO (also funding 67 days shiptime), the European Union (no shiptime funds), and NIOZ (165 days of which 67 days for the NWO national programme and 98 matching EU/IGBP projects). A 6 day test cruise was performed for the new multi beam system.

Deployment of LOCO/IW mooring in the North Atlantic Canary Basin

To accommodate these cruises diplomatic clearance has been

requested from Ireland, Portugal, Spain and UK.

Besides calling at homeport Texel, port calls for change of crew and scientific party as well as (un)loading scientific equipment took place in Tenerife (Canary Islands – Spain), Funchal (Madeira – Portugal), Lisbon and Faro (Portugal), Galway (Ireland), Oban and Aberdeen (Scotland - UK) and Las Palmas (Canary Islands – Spain)



Deployment of LOCO/IW mooring in the North Atlantic Canayr Basin.

CRUISE LIST PELAGIA

64PE246	13/03/2006 Texel	04/05/06 Texel	RANAMOX	Joanna Nicholls
64PE247	05/04/06 Texel	17/05/2006 Tenerife	TEST MULTIBEAM	Henk de Haas
64PE248	18/05/2006 Tenerife	06/12/06 Funchal	LOCO	Hans van Haren
64PE249	21/06/2006 Galway	07/06/06 Oban	HERMES	Gerard Duineveld
64PE250	07/08/06 Oban	23/07/2006 Oban	BIOSYS	Conny Maier
64PE259	29/07/2006	22/08/2006	GEOTEK CHARTER -	
64PE252	31/08/2006 Lisbon	22/09/2006 Lisbon	CANYONS	Stigter, Henko de
64PE253	23/09/2006 Lisbon	19/10/2006 Faro	MICROSYSTEMS	Henk de Haas
64PE245	21/10/2006 Faro	11/09/06 Faro	ESONET/MOVE	Tjeerd v Weering
64PE251	15/11/2006 Las Palmas	13/12/2006 Las Palmas	ARCHIMEDES	Gerhard Herndl

MARINE TECHNOLOGY

Marck Smit*, Henk de Haas and Hans van Haren

The Scientific Peer Review in 2005 was followed by a 'quick scan' review in 2006 by our NWO colleagues from SRON and NIKHEF. Again we were very happy with the outcome: the customer appreciation was "very good to excellent". This continues to support our vision that we are developing in the right direction – shortly expressed by our motto "Effective technology for excellent science".

About 20% of the department's capacity was used to support scientific research cruises at sea, a slight increase of 2% compared to 2005. In 2006 we worked on 306 projects, of which a few are highlighted below.

Installation of Multibeam Echosounder

One of MTec's major projects was the installation of a deep-sea Multibeam Echo Sounder on the RV Pelagia. A Multibeam Echo Sounder is an "acoustic eye" that can look in the water and produce depth charts down to 6.000 m. (For scientific details see MCG)



Eddy Lund of Kongsberg (l) and Tjeerd van Weering sign the contract



Almost 1.000 m of electrical cables had to be laid in the vessel

After an extensive European tender procedure a contract was signed with Kongsberg Maritime A.S. in mid January to purchase the EM-300 Multibeam Echo Sounder. The installation was undertaken 2½ months after the contract was signed, presenting quite a challenge for Kongsberg to produce and deliver the hardware so quickly. They responded well to this challenge, and the installation was completed within just 2½ weeks. Tasks undertaken included



Multibeam training for technicians and operators in Norway



All sensors – in this case GPS antennas – had to be measured within a coordinate system having 1mm accuracy

the installation of the gondola, the mounting and alignment of transducers, and of course installation of a great deal of cabling.

Directly after the Harbour Acceptance Tests, the successful performance of the Sea Acceptance Trials completed our final step.

As a closing testament to the EM-300, an Electronics Engineer reported from the RV Pelagia: "It is surprising how little support multi-beam-operation requires".



Mounting of the sensor-array under the vessel



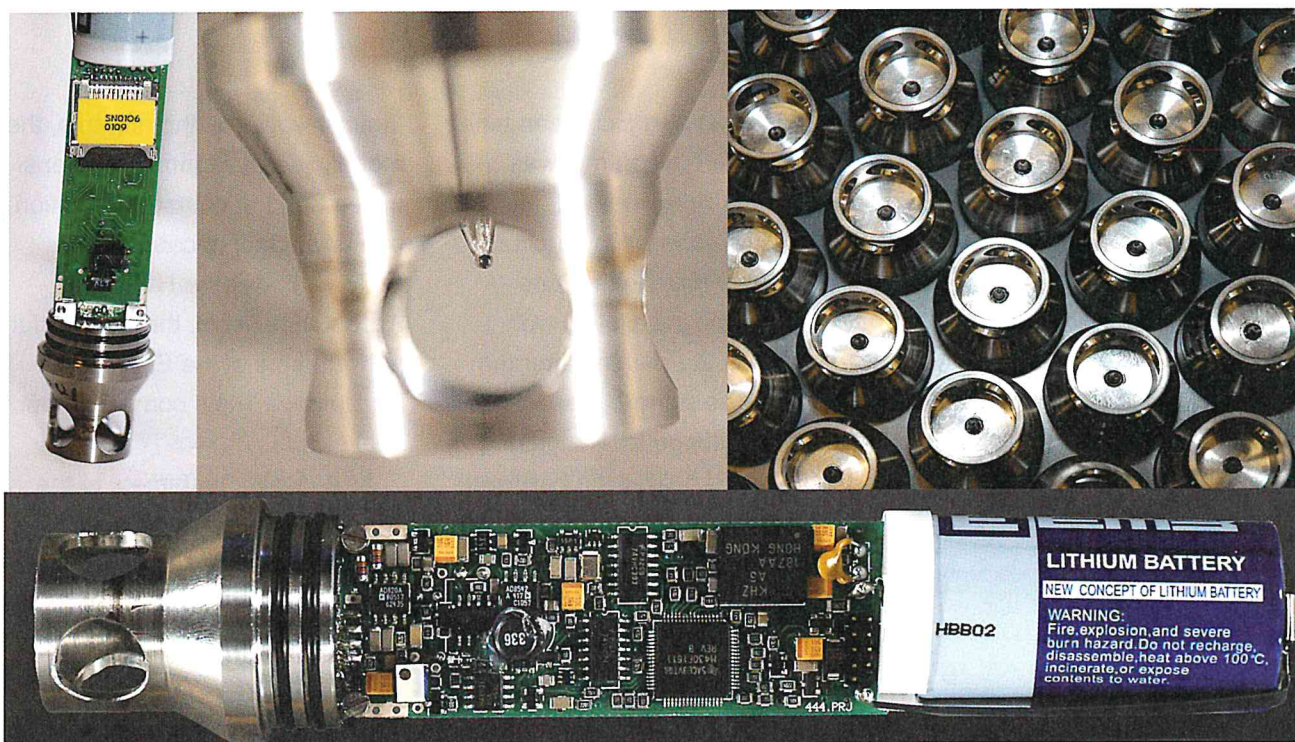
The T-shaped sensor-array mounted in a streamlined gondola under the ship's hull

Visualizing Internal Waves

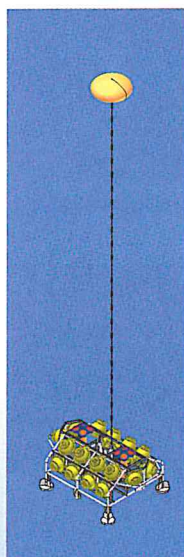
Temperature can be used as a tracer for large water masses. By using a series of fast sampling and accurate thermistors complex real-time dynamics within water masses can be visualized.

Thermistor String Model 3 is a good example of a short duration project. The time between the start of manufacturing and the first ocean deployment was only four months. A new concept resulted in a leading edge technology solution for the field of Physical Oceanography. The main charac-

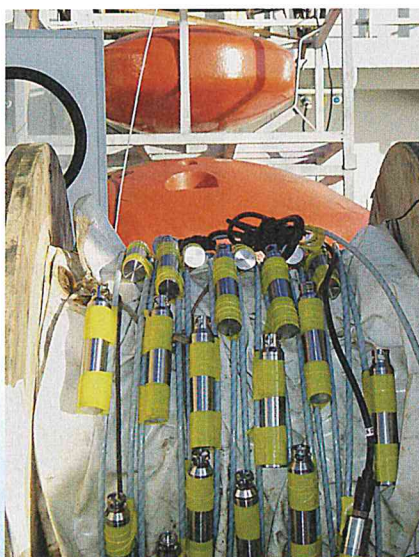
teristics of the instrument are: very accurate (better than 1 mK), no connecting electrical cables, inductive communication using a mooring cable and a 2 year stand alone endurance whilst sampling at a rate of 1 Hz.



Thermistors of Model 3



Lander configuration



On the mooring drum



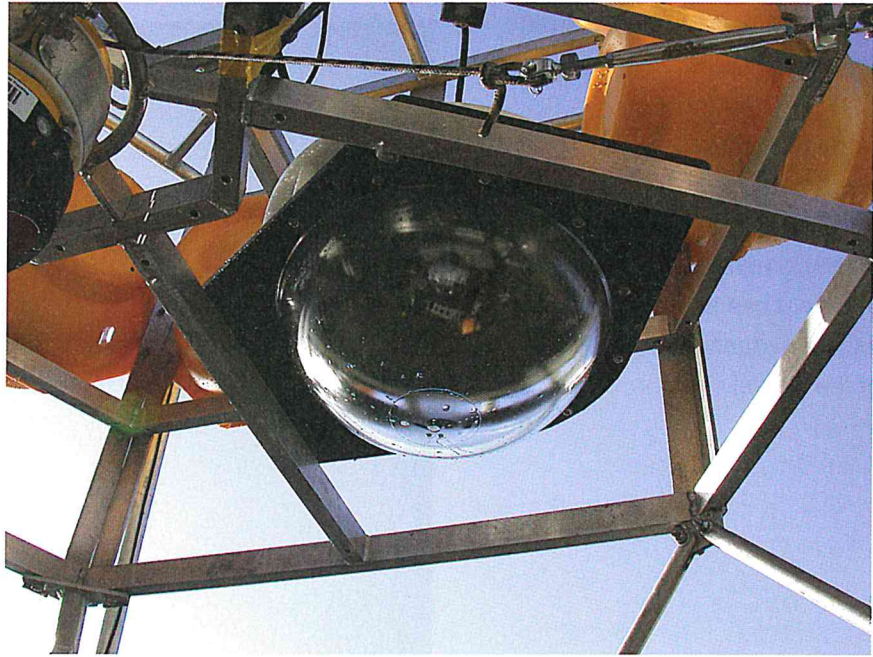
Recovery during the LOCO-IW cruise



Interactive deep sea video images

For the BOBO Bottom Lander a controllable pan and tilt deep sea video system including lighting was developed to enhance the range of the covered area.

This system is particularly valuable as it aids in achieving interactive tasks with the deep sea Bottom Lander.



International outreach

INMARTECH (International Marine Technician Symposium) is one of the leading conferences in the field of marine technology for sea and ocean research.

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At this conference at the Woods Hole Oceanographic Institution (USA) NIOZ presented 6 papers which all received a great deal of attention. The titles of the presentations were:

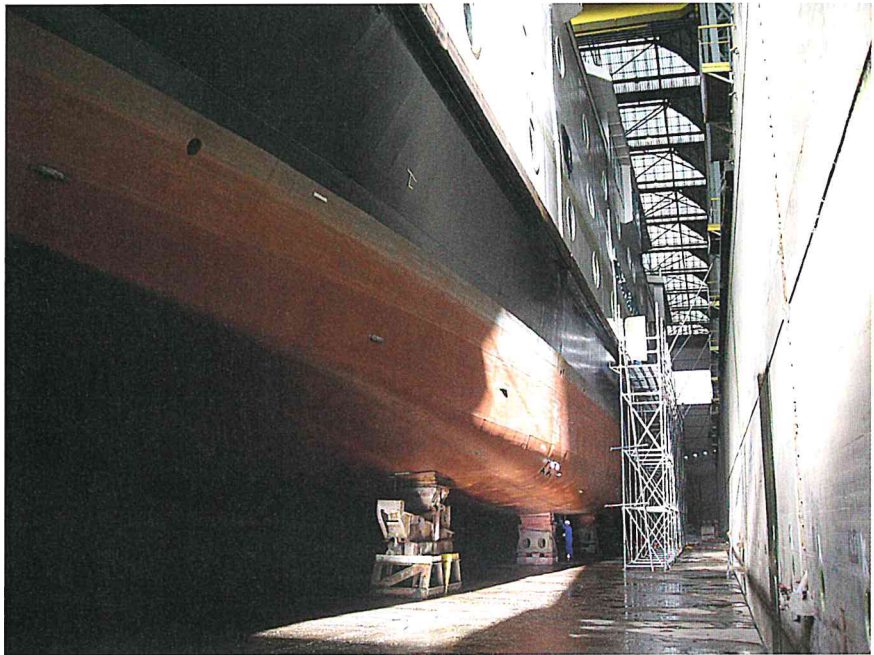
- * Pressure Retaining Deep-sea Sampler
- * A New Ultra Clean CTD-System for Sampling of Trace Elements and Isotopes
- * Fast Thermistor String model 3
- * Improved Mooring Cable Stopper
- * New Water Sampler Valve: High Opening Ratio and Inert Material
- * Hull Penetrating Instrumentation Platform for Ferries



Edwin Keijzer is approached by interested persons after his presentation of the latest model of the NIOZ Fast Thermistor String

Repair of Texel-ferry Scientific Sensor System

In 2005 the new Texel-ferry Dr Wagemaker was equipped with a Hull Penetrating Scientific Measurement Platform. Modifications and repair had to be executed during a dry-dock service of the vessel.

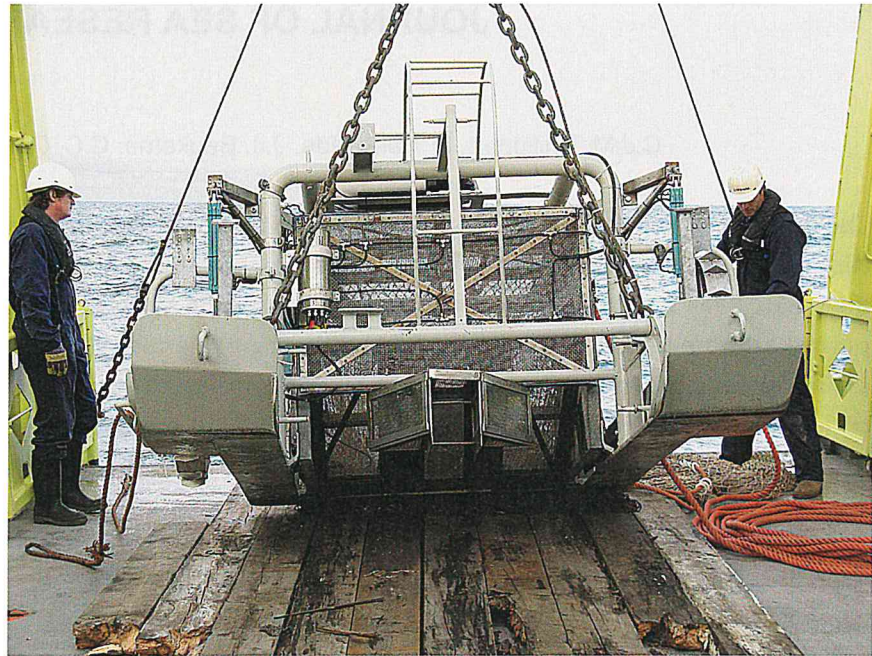


Small men under a large vessel



Shipboard technical support

A busy schedule of Scientific Research Cruises was supported. Apart from the cruises on the RV Pelagia we supported cruises on the RV Discovery (UK), RV Universitatis (Italy) and MV Arca.



On the Rijkswaterstaat vessel MV Arca NIOZ-technicians deploy the Deep Digging Dredge during a combined BSIK and Marine Protected Areas cruise on the North Sea.

JOURNAL OF SEA RESEARCH

C.J.M. Philippart, B. Bak-Gade, J.J. Beukema, G.C. Cadée and H.G. Epping

The Journal of Sea Research is an international and multidisciplinary periodical on marine research, with an emphasis on the functioning of marine ecosystems in coastal and shelf seas, including intertidal, estuarine and brackish environments. As several subdisciplines add to this aim, papers are being published from the fields of marine biology, marine chemistry, marine sedimentology and physical oceanography, provided they add to the understanding of ecosystem processes. In addition to its regular issues, the Journal publishes special issues which bundle articles addressing, and often reviewing, a specific scientific theme.

In 2006, the Journal published volumes 55 and 56, each consisting of four issues and together comprising 51 research papers. The first issue of 2006, viz. 55(1), was a special issue that presented the main results of a workshop organised by the EU BioFlow consortium with regard to exchange processes at the sediment-water interface. The other special issue, viz. 56(2), was dedicated to the application of Dynamic Energy Budget modelling to marine bivalves.

The most downloaded article from the regular issues deals with feeding and condition of larval and juvenile Japanese temperate bass *Lateolabrax japonicus* in relation to spatial distribution in the Japanese Chikugo estuary (Islam et al.

2006). Based on their field observations, the authors hypothesise that by migration to the better foraging grounds of the upper estuary (with higher prey biomass, elevated temperature and reduced salinity), the fish reduce early mortality and attain a better condition. In the second most-downloaded article, a field study on metazoan parasites in intertidal cockles *Cerastoderma edule* from the northern Wadden Sea reported that almost all cockles were infected by parasites and most individuals harboured more than one parasite species (Thieltges & Reise 2006). According to the authors, this would have severe negative effects on the cockle physiology and therefore bear implications on future sampling

designs. The authors of the third most-downloaded article studied the long-term relationship between land-based input of nutrients and primary production in the Baltic entrance region (Rydberg et al. 2006). They found a clear co-variation between primary productivity and land-based nutrient loads on an inter-annual time scale, which was more prominent for nitrogen than for phosphorus.

The first authors of the articles which were published in the regular issues originated from 16 different countries. More than 25% of the first authors were of non-European origin (Australia, Canada, Chile, China, Japan, USA), which underlines the worldwide readership of the Journal.

JAN VERWEY: THE FOUNDER OF NIOZ

Martien Baars and Jan Boon

On the 1st of September 2006, it was 75 years ago that Dr. Jan Verwey (1899-1981) became director of the Zoological Station in Den Helder, which he remained for 34 years until 1965. Verwey played a pivotal role and may be regarded as the 'founder' of the multidisciplinary institute NIOZ. Below an overview of his directorship is given, followed by three items which illustrate the way Verwey operated.

Jan Verwey as director

Jan Verwey studied biology at the Leiden University and did a PhD thesis on protozoan parasites (coccidiosis) in birds, for which he used lighthouse victims. In 1927 Verwey went to the Netherlands Indies (Indonesia) to work at the Institute for Sea Research at Tandjung Priok near Jakarta. The sheer richness of tropical nature in the Bay of Batavia deeply impressed him and he was among the first to study the behaviour and the ecology of inhabitants of the coral reefs and the mangroves. Meanwhile in Holland, the director of the Zoological Station in Den Helder, Redeke, resigned in 1929 and moved to a freshwater fisheries laboratory in Gouda. The Netherlands Zoological Society (NDV) selected Verwey as the new and permanent director of the Zoological Station in 1931. The grey sea and the barren tidal flats looked gloomy after the abundance at the equator but Verwey and his family preferred the Dutch climate to the tropical heat. However, the Zoological Station was impoverished and only a secretary, technician and servant formed the staff. Fortunately, various funds were granted to renovate the building of 1890 and to extend the aquarium and seawater facilities. Verwey reformed the student courses, with a focus much more on animal ecology instead of physiology. He changed the service character of the Station into a laboratory for fundamental marine biological research and started to develop the blueprint for a truly integrated study of the tidal system of the western Wadden Sea. Temperature, salinity and current speed were mapped by cruises on the research vessel 'Max Weber' that came into service in 1933.

Ecological studies of characteristic animals like the mussel were done by PhD students (from various universities) who stayed temporarily at the Station. A series of six theses formed the basic scientific knowledge of the fauna of the Wadden Sea. The Second World War put an end to this promising development. Station and vessel were seized and Verwey, staff and the library moved to Leiden. After the war an immense task of rehabilitation began with very limited means. Verwey himself operated the concrete mixer during the rebuilding of the destroyed aquaria. In 1947 the appointment of chemist Henk Postma



Jan Verwey (left) onboard the new 'Max Weber' during an excursion by the Zoological Society, 28 May 1933. (Photo Jan P. Stribos, collection NIOZ)



The students of the summer course of 1955 around the director of the Zoological Station. (Photo collection NIOZ)

fulfilled Verwey's wish to extend the abiotic studies of the Wadden Sea. The first 'Waddensymposium' was held in Groningen in 1949 and Postma and Verwey gave a key lecture on hydrography. The staff gradually increased and by 1952 comprised 4 scientists plus 9 technicians and others. In 1956 Baerends, the NDV commissioner, and Verwey wrote an ambitious plan to transform the Zoological Station into an oceanographic institute of 150 employees in 15 years time. The rapid approval by the government in the summer of 1957 even surprised the tireless director. In 1960 the name was changed from Zoological Station into Netherlands Institute for Sea Research (NIOZ), to reflect the new mission that

included both the biotic and abiotic aspects of marine sciences. When Verwey retired in 1965, the extension was still in its first phase, with a staff of 60, but all his plans would become true, including the widening of the scientific scope from marine biology to include chemistry, geology, physical oceanography and pollution studies. The new NIOZ on the island of Texel even would surpass the intended size of staff.

102 From Naples to Woods Hole, 1955-1959.

Verwey became member of the Royal Netherlands Academy of Sciences (KNAW, Amsterdam) in 1949 and he played an important role in the founding of three KNAW institutes for fundamental ecology: the Institute for Ecological Research (Arnhem, 1954), the Hydrobiological Institute (Nieuwersluis, 1956) and the Delta Institute (Yerseke, 1956). Verwey's enthusiastic promotion of ecology gave him the goodwill in the government and elsewhere that he needed for the plans for his own Zoological Station. In April 1955, the International Union of Biological Sciences held a small conference in Rome on the organizational aspects of marine biological laboratories. Verwey used this opportunity to get insight in the scope and finances of a broad range of institutes worldwide. At that time the number of marine institutes (including those on oceanography and fisheries research) was already very large in the industrialized northern hemisphere: nearly 100 in Europe (excl. the USSR), 75 in the USA and 25 in Japan. The organizational structures among the marine biological laboratories were diverse. Many of the smaller institutes belonged to universities, but some of the largest like Plymouth Marine Laboratory and the institutions in Woods Hole were owned by associations or corporations, comparable to the ownership of the Zoological Station in Den Helder by the NDV. Governmental funding played a dominant role for all the institutes, even for the Zoological Station in Naples and the Bermuda Biological Station, where bench fees were once the major income. Verwey wrote an account on the discussions in Rome and stated that the funding of fundamental marine biology by the Dutch government was meagre compared to that in similarly sized regions like northern Germany, Scotland or Wales. Verwey concluded that the permanent staff of the Station in Den Helder would have to comprise 10-12 scientists and that substantial funds were also needed for the acquisition of modern equipment. When Verwey was in Rome he also visited the Stazione Zoologica di Napoli and later that year he went along several marine laboratories in England and Wales. After the British tour in the autumn of 1955, Verwey used the summer holidays of 1956 to get an impression of the organization of marine biological research along the Atlantic coast of France. After the government had given the green light for the

new institute, Verwey devoted part of his holidays of 1957 to a tour along the institutes in northern Germany. The next year Verwey had no time to continue these trips - except for spending part of the holidays at the MBL in Plymouth. In 1959 Verwey attended the opening of the new Biologische Anstalt on the island of Heligoland. A Dutch delegation for the Scientific Committee on Oceanographic Research (SCOR) was formed and Verwey, Postma and Duursma went to the first International Oceanographic Congress in New York in September 1959. Verwey and Postma subsequently visited a series of 15 institutes along the east coast of the USA, including the laboratories in Woods Hole. Later that year, Verwey and Postma attended an international conference in Monaco on the problem of discharge of radioactive waste. On this occasion Verwey also visited the marine biological laboratories at Villefranche, Marseille and Banyuls along the Mediterranean coast. All these impressions helped Verwey in drafting the plans for the new institute. Verwey became an important member of the Netherlands Committee for Oceanographic Research (NCZ), founded in 1962. Within the NCZ Verwey became involved in the first oceanographic expeditions by Dutch vessels after the war, i.e. the North Atlantic cruises by the Vening Meinesz Laboratory (geophysical research, Utrecht) and the NAVADO-project 1964/1965 wherein NIOZ and the Royal Netherlands Meteorological Institute participated.



Along the institutes of the east coast of the USA, September 1959: Postma en Verwey (middle) in discussion with one of their hosts. (Photo collection NIOZ)

The move from Den Helder to Texel

The Royal Navy in Den Helder opened a much enlarged harbour in 1954 to accommodate the growing fleet. The tidal gully 'Nieuwe Diep' was barred at one side and the currents running alongside the quay of the Zoological Station decreased dramatically. As a result the water supply for the experimental aquaria varied much more in salinity and turbidity. Nevertheless, the old building remained the base in the plan to transform the Zoological Station into an oceanographic institute. Verwey tried to persuade the municipality of Den Helder to allow him to build next to the existing Station but the Navy denied to sell their soccer field. Meanwhile, alternative locations were inspected as far south as Vlissingen. Verwey finally concluded that the best building site would be close to Den Helder but across the Marsdiep: the small polder 't Horntje on the southern tip of the island of Texel. The intention to move was agreed upon during a famous meeting at the foot of the Texel dike, 25 June 1958, by Verwey, Postma, Baerends and officials from different ministries. The transaction of the ownership of the polder 't Horntje by the local farmer to the NDV passed March 1959. The area was still remote, but the new harbour for the ferry company TESO was planned just west of this location. This would decrease the sailing time between Den Helder and Texel to 20 minutes only and TESO planned an hourly service by ro-ro-f ferries. That part of the staff of the NIOZ that preferred to remain living on the mainland, would be able to com-

mute daily. Verwey envisaged that also the research vessels would lie in the new ferry harbour, but the authorities refused this combined use by TESO and NIOZ. Consequently, the NIOZ plan had to be extended with a separate harbour east of the new building. There was one large problem: no extra budget was available. Personal contact between the new NDV commissioner Lever and the prime-minister of the Netherlands forced a way out of this dilemma. The funds came and the digging of the NIOZ harbour could start in 1963. The architects Pot and Pot-Keegstra designed the harbour sheds and were asked to draw the main building of the institute as well. The first design by the Pot couple comprised 5 floors with a total height of 28 m that dominated the skyline. By 1 September 1965 when Verwey retired (at age 66), only the NIOZ-harbour on Texel was completed. The start by the new director Postma was difficult: the design of the main institute was rejected by the authorities as the height did not fit with new building regulations. In this turbulent period the new biological director Groot quit within two years. The delay in the plans necessitated a temporary laboratory in the polder and the majority of the NIOZ staff moved from Den Helder to this 'provisorium' on Texel in the autumn of 1969. A second design for the main building with 3 floors met again objections, not in the least by the own NIOZ-staff. Only the large 'Aquarium building' for experiments with life marine organisms escaped this new delay and was completed in September 1971. The new guesthouse 'De Potvis' became inhabited in 1971 too and the new RV 'Aurelia' arrived in 1972. This gave a large impulse to the hydrochemical, geological and biological studies of the North Sea. The configuration of the permanent institute was finally approved: the basic units were stretched into a much lower building of 1 or 2 floors only. Construction started in 1975 and the opening was two years later. The transformation from Zoological Station to NIOZ was completed, twenty years after the approval by the government to create an oceanographic institute on Texel.

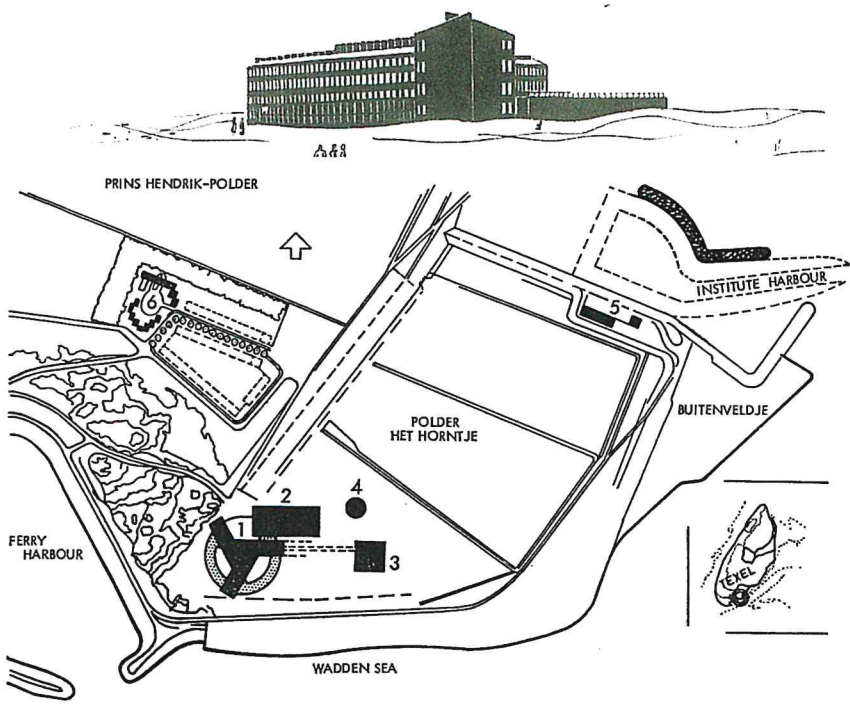


Fig. 1. Situation of the future buildings of the Netherlands Institute for Sea Research.
1. Main building
2. Observation aquarium
3. Experimental aquarium
4. "Oceanarium"
5. Harbour buildings
6. Dormitories

The first design dated summer 1964 for the institute on Texel, comprising a building of 5 floors, just east of the new ferry harbour.

The battle of the Wadden Sea

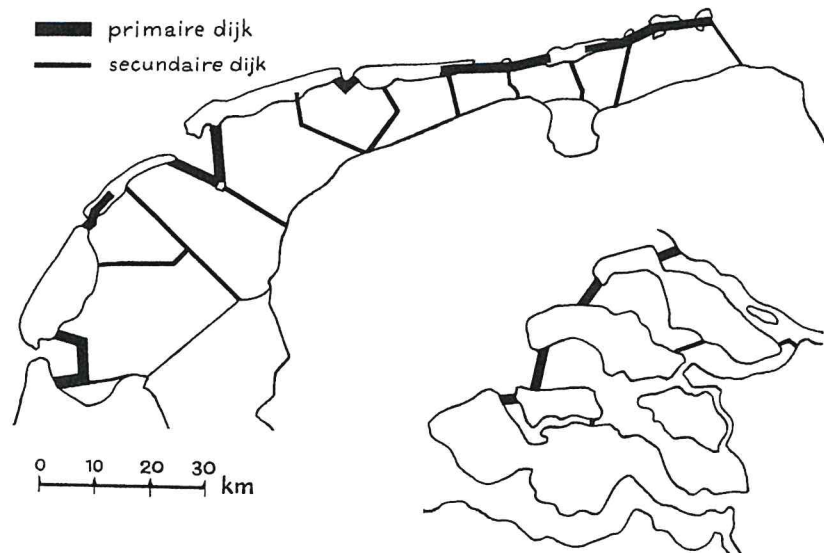
During the storm-surge of 1 February 1953 more than 1700 people drowned in the provinces Zeeland and zuid-Holland when dikes broke and a number of polders flooded. This national catastrophe evoked the Delta Plan, wherein huge dams were planned to close the large inlets to improve safety. Agriculture would profit as well since the brackish, estuarine waters outside the dikes should change into freshwater basins. By the early 1960's, the Delta works in the southwest had started and the heir of Dutch engineers now began to develop

plans to transform the Wadden Sea. The easiest work comprised the 'Ameland Plan' in 1961, which actualized the old 19th century idea to connect Ameland by dams with the mainland. This could be regarded as the first phase of the 'Plan Zandvoort', which leaked into publicity soon thereafter and involved the entire Wadden Sea.

Meanwhile, the unique natural character of the Wadden Sea became clear. The biological values of 31 coastal areas in Europe and North Africa were evaluated during an ornithological conference in the Camargue in southern France in 1962. The top rank was occupied by the Wadden Sea, with by far the

largest numbers of bottom animals and migrating birds. Reclamation of the area would thus have enormous consequences for natural life along the migrating routes in Western Europe and Africa. This international implication was a real eye-opener for Verwey, and urged him to form a small, independent group of Dutch experts, the Working Group Wadden Area (WGWA). The group was founded in Amsterdam on 17 September 1965, chaired by Verwey. One month later, Verwey's retirement symposium organised by the NDV at the Zoological Station in Den Helder comprised only fundamental scientific lectures on the 'Aspects of life in estuarine environments'. Verwey's own contribution was on 'The role of some external factors in the vertical migration of marine animals'. Then, free from his official duties and responsibilities as NIOZ director, Verwey bundled all the scientific knowledge available at the institute and elsewhere, and gave a lengthy talk on 'The rich Wadden Sea' for a much wider audience during a plenary meeting of the National Nature Conservation Committee in Utrecht on 18 December 1965. In an impressive presentation he gave biomass figures for the Wadden Sea and showed the existence of an astonishingly productive biological system on the tidal flats behind the dikes.

The 'Waddenvereniging' was founded in 1966 and Verwey's WGWA very much welcomed its magazine "Waddenbulletin" in order to persuade the general public of the special status of the Wadden Sea. The speakers list of the Wadden Conference in Leeuwarden in April 1968 comprised both pros and cons in the battle for the open Wadden Sea, with naturalists like Verwey and engineers like Zandvoort. Verwey produced another historic talk, 'Destination for thousands', wherein he stressed the Dutch responsibility for the key refuelling area of migrating birds but he also pointed to the economic importance of the mussel culture in the Wadden Sea. Meanwhile, the WGWA delivered a negative advice on the Ameland Plan to the KNAW in October 1968. The disaster of the oil tanker Torrey Canyon that winter helped to alarm the public opinion. The studies of the Wadden Sea by NIOZ and by RIVO, the fisheries research institute in IJmuiden, profited by the support of the International Biological Program (IBP, 1967-1972). A main result of the IBP was the recognition of the Wadden Sea as a nursery area for young flat fish, fed by the rich bottom fauna, e.g. on the Balgzand, sampled bi-monthly by NIOZ-scientist Jan Beukema from 1967 onwards. A threat for this area was its possible reclamation, suggested by the majority of the members of the Wadden Sea Commission in 1974. Not surprisingly, the



Plan for the reclamation of the Wadden Sea, with 100 km primary and 150 km secondary dikes, compared to 22 km resp. 13 km of dikes in the Delta Plan. (Natuur en Landschap 19(4), 1966, p. 174)

WGWG produced an thoroughly argued negative advice on the Balgzand plan. Verweij's extensive network, also outside biological circles, proved essential in contacting some economists, who criticised the economic assumptions in the Balgzand plan. New ideas on the valuation of natural areas had been developed, and taking these into account the Balgzand plan was eventually abandoned. Verwey fought for the preservation of the Wadden Sea also by promoting new scientific cooperation across the border. He visited former colleagues at institutes in Germany and Denmark. The result was the first international Wadden Sea Conference in Bremerhaven in October 1970. In addition, Verwey persuaded the NDV to donate the Veth Legacy to the WGWG. The money had been bequeathed to the NDV by H.J. Veth, a biologist who worked as student at the movable wooden Zoological Station between 1876 and 1888. At the end of 1974 Verwey succeeded in a lobby to get a significant share of the financial result of the nationwide 'Action Nature' donated to the Wadden Sea. One million guilders thus enforced the 'Veth Fund'. This enabled the WGWG to create a new scientific group, hosted on Texel, that should produce an important series of scientific publications on the Wadden Sea as a whole, including the German and Danish parts. Wolff was the first scientist to come over to the island in 1975, followed by others one year later. After this accomplishment, Verwey withdrew from the WGWG in 1975 in the knowledge that the Wadden Sea was much more cared for than 10 years before. The frequency of his trips from his home in Schoorl to Texel dropped but Verwey was one of the main guests, of course, during the opening of the new NIOZ building on 28 April 1977. He was grateful that the directors Postma and Zijlstra had finalized the transformation of the Station into a well-staffed and well-equipped institute. Verwey died on 24 September 1981, at the age of 82. In his birthplace Noordwijk the Jan Verwey Nature Centre was founded in 1985.



DR. J. VERWEY
SCHOORL · HOLLAND

Konrad Lorentz and Nico Tinbergen visit Jan Verwey (right) at home, Schoorl 1965.
(Photo collection Jan Verwey Natuurcentrum, Noordwijk)



Acknowledgements

This overview was inspired by an extensive manuscript by Edward Bonne on Jan Verwey (to appear as NIOZ Rapport in 2008), besides existing sources like the book on the history of NIOZ by Van Bennekom (2001). Edward Bonne and Gerhard Cadée checked the text. Bert Aggenbach helped with the illustrations.

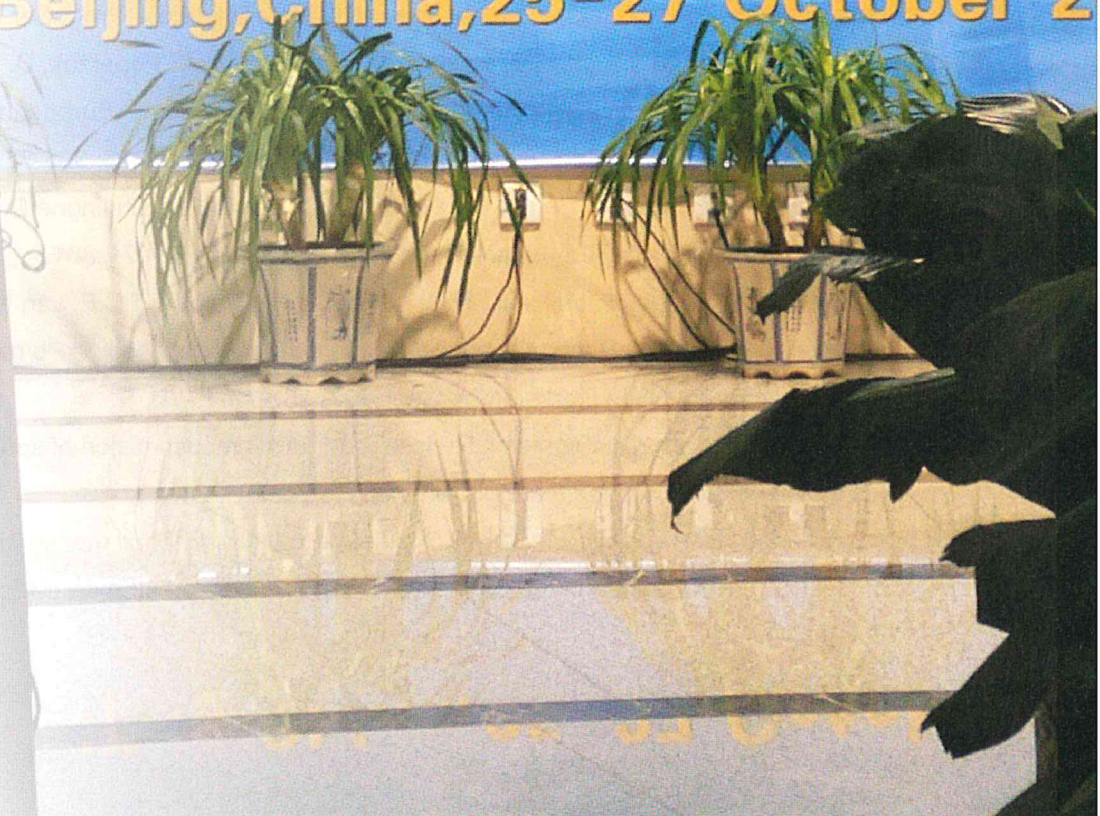
PUBLICATIONS AND
PRESENTATIONS



地年观测分委会及 管理分委会联合

The Joint Meeting of
Subcommittee on Obser
Management and Polic

Beijing, China, 25-27 October 2



DISSERTATIONS

- Reinthal, T. Prokaryotic respiration and production in the open ocean. Groningen University, 128 pp.
- Vahl, W.K. Interference competition among foraging waders. Groningen University, 240 pp.
- van Breugel, Y. Causes for negative carbon isotope anomalies in Mesozoic marine sediments: Constraints from modern and ancient anoxic settings. Ph.D Thesis, Utrecht University, 128 pp.
- Wuchter, C., Ecology and membrane lipid distribution of marine Crenarchaeota: Implications of TEX₈₆ paleothermometry. Ph.D Thesis, Utrecht University, 147 pp.

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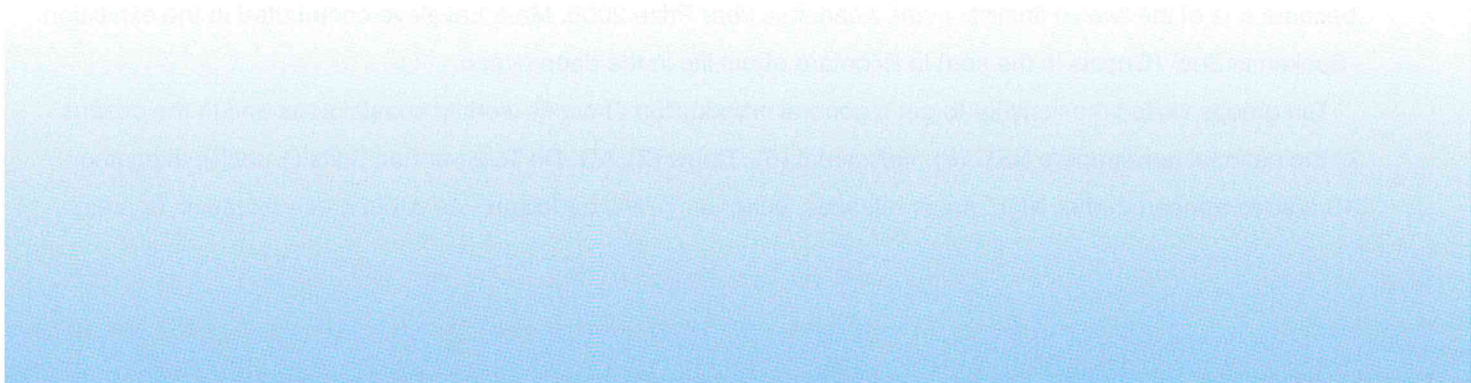
ten Hallers-Tjabbes, C.C. & W.C. Verboom. Marine acoustic windows and human generated noise. Contribution to press conference Ocean Sciences Meeting, 23 February, Honolulu, U.S.A..

ten Hallers-Tjabbes, C.C., Navigation et Biodiversité. (Navigation and biodiversity) In 'Planète Mers, Voyage au coeur de la biodiversité Marine', Ballesta, E. en P Descamps, under the aegis of IUCN, Michel Lafon, Neully-sur-Seine, France, p 332.

ten Hallers-Tjabbes, C.C., Interview, 'Cato ten Hallers-Tjabbes: het milieu van de zee' (Cato ten Hallers, the marine environment), (M. Prins) Buurcontact nr.11; December 2006.

Award:

M.R. Wernand, The "Golden" Ocean Optics Conference Bell for best talk during Ocean Optics Conference 2004, OOXVII Fremantle, Western Australia titled: The Arcane Colouring of Natural Waters; from Bacon to Raman.



A national contest for elementary schools concerned this year the theme 'Oceans'. Five students of grade eight of a school in Heiloo sought advice at NIOZ (Biological Chemical Oceanography) for their design of a laptop-controlled Lego-robot. The team took part in the robot performance contest in Eindhoven where they also showed the development and some ocean science in a powerpoint presentation



as well as self-written/composed rapper-style song expressing concern about the human impact on the oceans. Afterwards, the team of five with some parents visited Royal NIOZ at 23 August including a real 'business lunch' and a grand tour from top (bridge) to bottom (engine room) of RV Pelagia. (H.J.W. de Baar)

www.bo.ingv.it/bfm is a website on which the public-domain ecosystem BFM-model is presented. Potential users find here documentation and the source code of the model. The BFM model is the successor of the ERSEM model and was constructed by an international consortium of institutes in 2 EU projects during 1993-1998. The BFM model is nowadays applied in combined hydrodynamical-ecosystem models of the Mediterranean Sea and the North Sea. (P. Ruardij)

The English version of our website ZeeinZicht **www.SeaonScreen.org** has become available on the internet. The three founding partners of this web-site, NIOZ, Ecomare and Wageningen IMARES as the natural successor of ALTErra- Texel, have decided that they will use ZeeinZicht / SeaOnScreen to inform the general public about important items with regards to the North Sea and the Wadden Sea. On the NIOZ web-site, the window "Research/International projects" was made with respect to the International Polar Year in 2007, in which NIOZ has five individual projects. Public Outreach is a specific item in the IPY and all projects are obliged to have an outreach paragraph. Besides the 'latest news' issue on our own website (**www.nioz.nl/latestnews**), our Flemish colleagues of VLIZ also proved to be a major news outlet on the internet for our institute's work (**www.vliz.be**).

The joint NIOZ geological and biological research group on the formation and ecology of cold water coral reefs in the Atlantic Ocean joined forces with the faculty of Earth Sciences of the Vrije Universiteit Amsterdam and became one of the twelve finalists in the Academic Year Prize 2006. Mark Lavaleye contributed to the exhibition "Spoken in Zee" (Ghosts in the sea) in Ecomare about life in the deep ocean.

Ten groups visited the institute to get a general introduction about its work in coastal seas and in the oceans. In the national newspapers NRC (8), Volkskrant (6), Trouw (2), AD, De Telegraaf en Spits (1 each), altogether 19 articles appeared after NIOZ press releases, either as "NWO berichten", as direct press releases, or press-

releases in combination with partners. Four scientific articles were highlighted most. Together with Earth Scientists from Utrecht University, an article of MBT showed current North Sea-like temperatures in the Arctic in the mid-cretaceous about 90 million years ago, using the TEX₈₆ proxy for sea-surface temperature. Another paleoceanographic highlight was an article in Nature about a huge European river in an otherwise dry English Channel entering the Atlantic Ocean in the Bay of Biscay, which ended abruptly at the filling of the southern North Sea basin at the end of the last ice age only about 20.000 years ago. This article was written together with French partners and also received much attention in the French press. Throughout the entire year, problems on the by-catch of harbour porpoises along the Dutch coast also got continuous attention. This culminated upon the appearance of a joint IMARES-NIOZ research report in December. 53-70% of the stranded harbour porpoises were drowned in any kind of fishing gear. The article causing the most controversy in the press was the article of J. van Gils, T. Piersma and others in PloS on the effects of the mechanical cockle fishery in the 1990's in the Dutch Wadden Sea. This type of fishery has now been forbidden by the government. However the authors warn to be careful with the scale of all types of human activities affecting the precious sea-bottom of the Wadden Sea. The regional papers Texelse Courant (22) and Noord-Hollands Dagblad (15) also published regularly about NIOZ activities. Occasional articles appeared in papers from more distant regions along the Dutch coast. Popular scientific journals quoting NIOZ news or with articles of NIOZ scientists were Bionieuws (7), Natuurwetenschap & Techniek (2) and five others with one article each.

NIOZ scientists also appeared on TV. The most extensive contribution was the recording of an issue of the popular children's programme 'Het Klokhuys' on the life of bivalves, starring our marine biologist Katja Philippart. This issue will be broadcasted in the spring of 2007. Another contribution was of NIOZ toxicologist Jan Boon on the environmental dangers of brominated flame retardants. This documentary was broadcasted on BBC-World. Coral biologist Rolf Bak appeared on the NOS journal commenting on the possibilities and difficulties to grow tropical corals under artificial conditions. Hans Witte appeared on 'TV-Noord-Holland' on the issue of the return of the old 'Zuyderzee herring' in the Wadden Sea. 12 radio-interviews were broadcasted, mostly for the scientific programmes 'TELEAC Hoe?Zo!' and VARA's 'Vroege Vogels' (Early Birds), a very popular Dutch nature programme on Sunday mornings. Hans Witte and Mark Lavaleye have their monthly programme on marine issues on 'Radio Texel'.

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POSTERS

Amaro, T., B. Bett, A. Gooday, H.C. de Stigter & D. Billett. Deep-sea canyon faunas off the Portuguese margin. EGU General Assembly, Vienna, Austria, 2-7 April.

André, L., H. Arlinghaus, J. Bijma, L. Chauvaud, F. Dehairs, J. Erez, F. Jorissen, G.-J. Reichart, S. Schouten & R. Zahn. Development, calibration and application of independent salinity proxies – PaleoSalt. European Geosciences Union Meeting, Vienna, Austria, 2-7 April.

- Arrieta, J.M., H. van Aken & G.J. Herndl. Meso- and bathypelagic community composition of bacteria and archaea in the North Atlantic as revealed by T-RFLP. Ocean Sciences Meeting, Honolulu, Hawaii, USA, 20 – 24 February.
- Bauersachs, T., S. Schouten, L.J. Stal & J.S. Sinninghe Damsté. N₂-fixing cyanobacteria: key organisms in present and past biogeochemical cycles. 8th Nederlands Aardwetenschappelijk Congres (NAC 8), Veldhoven, 24-25 April.
- Blaga, C.I., F. Verbruggen, L.W. Vissers, A.F. Lotter, O. Heiri, G-J. Reichart, G. Muyzer, H.J. Laanbroek & J.S. Sinninghe Damsté. Validation of palaeotemperature proxies in European Lakes. 13th Annual Symposium NSG, Utrecht University, 30 November.
- Boere, A., B. Abbas, J.S. Sinninghe Damsté & M. Coolen. Does natural fragmentation of fossil DNA differ among cell types? Implications for DNA as a novel paleoecological tool. European Geosciences Union Meeting, Vienna, Austria, 2-7 April.
- Bontes, B.M., K.R. Timmermans, I. Neven, J.T.M. Elzenga, P. Boelen, A.G.J. Buma & H.J.W. de Baar. Effects of ocean acidification on Southern Ocean diatoms. CARBOOCEAN meeting, Gran Canaria, Spain, 4 – 8 December.
- Booij, K., R. van Bommel, A. Mets & R. Dekker. SPMD performance under conditions of heavy biofouling. International Passive Sampling Workshop, Bratislava, Slovakia, 3-6 May.
- Brandsma, J., A.M. Langezaal, M. Schmid, S. Schouten, E.C. Hopmans, G.J. van der Zwaan, M.C.M. Jetten & J.S. Sinninghe Damsté. Benthic foraminifera and the nitrogen cycle – The interaction between Globobulimina and nitrate reducing bacteria. 8th Nederlands Aardwetenschappelijk Congres (NAC 8), Veldhoven, 24-25 April.
- Cadée, G.C. Is the increase in tropical drift seeds found on the Dutch coast related to global warming? Annual meeting SWG Haarlem, 22 January.
- Cardoso, J.F.M.F., J. Campos, V. Freitas, S. Santos, J.I.J. Witte & H.W. van der Veer. Intra- and interspecies comparison of energy flow in bivalves by means of Dynamic Energy Budgets (DEB theory). 4th CIMAR Meeting, Peniche, Portugal, 20 - 21 October.
- de Baar, H.J.W., R. Middag & P. Laan. Dissolved aluminium and manganese as source tracers for iron in polar oceans. International Polar Year meeting, The Hague, 16 November.
- de Boer, P.L., M. Harting, A. Mueller & K.J. van der Zwan. Distinction between black shales formed in high-productivity and in stagnant-basin settings. AGU Fall Meeting, San Francisco, California, USA, 11–15 December.
- de Bruin, T.F. & W.T.B. van der Lee. The Netherlands National Oceanographic Data Committee – A model for nationwide oceanographic data management. Oceanology International, Excel, London Docklands, United Kingdom, 21-23 March.
- de Bruin, T.F. Access to oceanographic data in The Netherlands. NODC-*i* – The national infrastructure for opening up oceanographic and marine data and information. Oceanology International, Excel, London Docklands, United Kingdom, 21-23 March.

- de Bruin, T.F. Differences in CTD operations: significant differences in the resulting data? ICES Annual Science Conference, Maastricht, 19-23 September.
- de Bruin, T.F. Netherlands Polar Programme – Organization, science and data management. SCAR Open Science Conference, Hobart, Australia, 12-14 July.
- de Bruin, T.F. The SCAR/COMNAP Joint Committee on Antarctic Data Management (JCADM). SCAR Open Science Conference, Hobart, Australia, 12-14 July.
- de Bruin, T.F. The SCAR/COMNAP Joint Committee on Antarctic Data Management (JCADM). VII Spanish Symposium on Polar Studies, Granada, Spain, 18-20 September.
- de Goeij, J.M. & F.C. van Duyl. Encrusting sponges play a key role in DOM removal in coral cavities. 6th European Meeting International Society for Reef Studies, Bremen, Germany, 18-22 September.
- de Goeij, J.M. & F.C. van Duyl. Sponges feeding mainly on dissolved organic matter (DOM)? 7th International Sponge Symposium, Búzios, Brasil 7-13 May.
- de Haas, H., F. Mienis, T.C.E. van Weering, H.C. de Stigter & T.O. Richter. Carbonate mound provinces and cold water corals along the NE Atlantic margin. EGU General Assembly, Vienna, Austria, 2-7 April.
- de Haas, H., F. Mienis, T.C.E. van Weering, H.C. de Stigter & T.O. Richter. Carbonate mound provinces and cold water corals along the NE Atlantic margin, EGU Geophysical Research Abstracts 8, Vienna, Austria, 2-7 April.
- de Stigter, H.C., W. Boer, T.O. Richter & T.C.E. van Weering. The 1755 Lisbon Earthquake in the sedimentary record of submarine canyons off Portugal. 5th Symposium on the Atlantic Iberian Margin, Aveiro, Portugal, 2-4 November.
- Duineveld, G.C.A., M.S.S. Lavaleye, M. Bergman & F. Mienis. Particle supply to the SW Rockall coral communities. HERMES annual meeting, Mallorca, Spain, 18-21 April.
- Evans, C. & C.P.D. Brussaard. The significance of viruses for polar marine ecosystem functioning. International Polar Year meeting, Den Haag, 16 November.
- Fallet, U., G.-J. Brummer, E. Koning, H. Ridderinkhof, M. Schouten, S. Schouten & J. Zinke. Seasonal isotope and divalent cation fluxes of pelagic and benthic carbonates from the Mozambique Channel. European Geosciences Union Meeting, Vienna, Austria, 2-7 April.
- Fallet, U., G.-J. Brummer, H. Ridderinkhof, M. Schouten & J. Zinke. Seasonal isotope and divalent cation fluxes of pelagic and benthic carbonates from the Mozambique Channel. EGU, Vienna, Austria, 10–14 April.
- Fallet, U., G.J.A. Brummer, H. Ridderinkhof, M. Schouten & J. Zinke. Seasonal isotope and divalent cation fluxes of pelagic and benthic carbonates from the Mozambique Channel. 8th Nederlands Aardwetenschappelijk Congres, Veldhoven, 24-25 April.
- Forster, A., K. Moriya, S. Schouten, P.A. Wilson & J.S. Sinninghe Damsté. The Cenomanian/Turonian transition in the tropics: a dual-proxy sea surface temperature record from the Demerara Rise (ODP Leg 207). European Geosciences Union Meeting, Vienna, Austria, 2-7 April.
- Garrett, C. & T. Gerkema. The hydrostatic assumption in internal tide generation theory. AGU fall meeting, San Francisco, USA, 11-15 December.

- Gerringa, L.J.A., H.J.W. de Baar, P. Laan, C.E. Thuroczy & M. Klunder. Physical and chemical speciation of dissolved Fe in the polar oceans. International Polar Year meeting, The Hague, 16 November.
- Hall, R., J. Huthnance, M. Inall, H. van Haren & R. Williams. Mixing in Faroe- Shetland Channel. Challenger Conference for Marine Science, Oban, UK, 11-15 September.
- Harlander, U. & L.R.M. Maas. Equatorial internal waves and associated boundary layers. Geo. Res. Abstracts, EGU General assembly. Vienna, Austria, 2-7 April.
- Herndl, G.J., T. Reinthaler, E. Teira, J.M. Arrieta & H. van Aken. Role of archaeal and bacterial activity in the carbon cycling of the meso- and bathypelagic realm of the North Atlantic Ocean. Ocean Sciences Meeting, Honolulu, Hawaii, USA, 20 – 24 February.
- Hetzel, A., A. Forster & H.-J. Brumsack. Depositional environment of C/T black shales: implications from trace metal patterns. National IODP-ICDP Colloquium 2006, Greifswald, Germany, 27-29 March. (poster award 1st place) and European Geosciences Union Meeting, Vienna, Austria, 2-7 April.
- Hippler, D., R. Witbaard & A. Immenhauser. Environmental or biological records from bivalve shells (*Mytilus edulis*) of the Dutch Wadden Sea. Geophysical Research Abstracts, Vienna, Austria, 2-7 April.
- Hippler, D., R. Witbaard, D. Bühl, M. Hansen Klünder, D. Frei & A. Immenhauser. Environmentally or biologically controlled proxy records from bivalve shells of the Dutch Wadden Sea. Fall Meeting: San Francisco, California, USA, 11-15 December.
- Hommersom, A., K. Valdmets, S. Peters & M.R. Wernand. Measuring Optical Heterogeneity in the Wadden Sea. OOXVIII Conference, Montreal, Canada.
- Huguet, C., A. Schimmelmann, R. Thunell, L.J. Lourens, J.S. Sinninghe Damsté & S. Schouten. A study of the TEX₈₆ paleothermometer in the water column and sediments of the Santa Barbara Basin, California, Dutch climate variability symposium, Amsterdam, 10th October.
- Huguet, C., M. Thurston & D. Billett. Factors controlling the distribution of decapod crustaceans on the continental slope and abyssal plain, 11th Deep Sea Symposium, Southampton, UK, 9-14 July.
- Jaeschke, A.J., E.C. Hopmans, S.G. Wakeham, S. Schouten & J.S. Sinninghe Damsté. Anaerobic ammonium oxidation in the Arabian Sea. 8th Nederlands Aardwetenschappelijk Congres (NAC 8), Veldhoven, 24-25 April.
- Jesus, C.C., H.C. de Stigter, A. Oliveira & F. Rocha. Fine-fraction mineralogy of Setubal Canyon and adjacent continental margin and slope (SW Portugal). 5th Symposium on the Atlantic Iberian Margin, Aveiro, Portugal, 2-4 November.
- Jonkers, L.P., M.A. Prins, G.-J. Weltje, A. Ganopolski, S. Troelstra, A. Kuipers & G.-J. Brummer. Hysteresis response of thermohaline circulation to fresh-water forcing revealed by an unmixed grain-size record from the North Atlantic. EGU General Assembly, Vienna, Austria, 3-7 April.
- Lotter, A.F., F. Verbruggen, C.I. Blaga, L.W. Vissers, O. Heiri, G.-J. Reichert, G. Muyzer, H.J. Laanbroek & J.S. Sinninghe Damsté. Validation of Palaeotemperature Proxies in European Lakes. 10th International Paleolimnology Symposium, Duluth, Minnesota, USA, 25-29 June.

- Marino, G., E.J. Rohling, S. Schouten & J.S. Sinninghe Damsté. Water column dynamics in the Aegean Sea during MIS5e. European Geosciences Union Meeting, Vienna, Austria, 2-7 April.
- Mienis, F., T. Richter, H. Vonhof, M. van Breukelen, C. van der Land, H. de Haas, H. de Stigter & T.C.E van Weering. Stable isotope chemistry of deep water coral species and associated fauna from carbonate mound areas at the Rockall Trough margin; paleo-oceanographic implications. EGU General Assembly, Vienna, Austria, 2-7 April.
- Mienis, F., T. van Weering, T. Richter, C. van der Land, H. de Haas, H. de Stigter, H. Vonhof & M. van Breukelen. Stable isotope chemistry of deep water coral species and associated fauna from the Rockall Trough margin carbonate mounds; paleo-oceanographic implications. 3rd Euromargins Conference "Processes at the passive continental margins", Bologna, Italy, 4-7 October.
- Mollenhauer, G., J.S. Sinninghe Damsté & T.I. Eglinton. Effects of differential degradation of marine organic compounds on preserved radiocarbon ages and biomarker-based SST-Reconstructions. European Geosciences Union Meeting, Vienna, Austria, 2-7 April.
- Mueller, A., J.S. Sinninghe Damsté, M. Harting, P.L. de Boer, K.J. van der Zwan & S. Kolonic. Conditions and forcing mechanisms for the deposition of black shales during Mid-Cretaceous Oceanic anoxic events (OAEs). 8th Nederlands Aardwetenschappelijk Congres (NAC 8), Veldhoven, 24-25 April.
- Omereg, E.O., H. Niemann, G. de Lange, V. Mastalerz, A. Stadnitskaia, A. Kappler, A., K.L. Straub, J.P. Foucher & A. Boetius. Biogeochemistry of sulfide-oxidizing and iron-oxidizing bacterial mats at the Chefren mud volcano. European Geosciences Union Meeting, Vienna, Austria, 2-7 April.
- Pagani, M., N. Pedentchouk, M. Huber, A. Sluijs, S. Schouten, H. Brinkhuis, J.S. Sinninghe Damsté & G.R. Dickens. Arctic Hydrology during Global Warming at the Palaeocene-Eocene Thermal Maximum. Gordon Research Conference on Organic Geochemistry, Holderness School, Plymouth, NH, USA, 6-11 August.
- Palacz, A., C. Maier, L. Thomsen & G. Duineveld. Flume tank experiments on tentacle behavior and particle encounter of the cold-water coral *Lophelia pertusa* at varying flow speed. 6th European Meeting Int. Soc. Reef Studies (ISRS), Bremen, Germany, 19-22 September.
- Palmer, M., M. Cooper, S. Schouten & G. Reichart. A 30 kyr record of surface water pH, pCO₂ and nutrients in the Northern Arabian Sea. European Geosciences Union Meeting, Vienna, Austria, 2-7 April.
- Parada, V., A.C. Baudoux, C.P.D. Brussaard & G.J. Herndl. Dynamics in virioplankton production in the North Sea. Ocean Sciences Meeting, Honolulu, Hawaii, USA, 20 – 24 February.
- Rampen, S.W., S. Schouten, E. Koning, G.-J.A. Brummer & J.S. Sinninghe Damsté. Lipids from the diatom genus *Proboscia* as palaeoproductivity indicators. Gordon Research Conference on Organic Geochemistry, Holderness School, Plymouth, New Hampshire, USA, 6–11 August.
- Rampen, S.W., S. Schouten, S.G. Wakeham & J.S. Sinninghe Damsté. Lipids from the diatom genus *Proboscia* as palaeoproductivity indicators. TMS Meeting, Utrecht, 9-10 March.

- Rampen, S.W., S. Schouten, S.G. Wakeham & J.S. Sinninghe Damsté. Lipids from the diatom genus *Proboscia* as palaeoproductivity indicators. 8th Nederlands Aardwetenschappelijk Congres (NAC 8), Veldhoven, 24-25 April.
- Rattray, J.E., D. Wöebken, P. Lam, M.M.M. Kuypers, G. Lavik, M. Hamersley, E.C. Hopmans, S. Schouten & J.S. Sinninghe Damsté. A comparison of analytical techniques used for the detection of anaerobic ammonium oxidation in oceanic upwelling systems. Gordon Research Conference on Marine Microbes, Biddeford, Maine, USA, 22-28 July.
- Reinthal, T., E. Sintes & G.J. Herndl. Dissolved organic matter and bacterial production and respiration in the sea-surface microlayer of the open Atlantic and the western Mediterranean Sea. ISME-11 Meeting, Vienna, Austria, 24-29 August.
- Reinthal, T., P.J. leB. Williams, J. Aristegui & G.J. Herndl. Prokaryotic respiration and production in the meso- and bathypelagic realm of the eastern and western North Atlantic Basin. Ocean Sciences Meeting, Honolulu, Hawaii, USA, 20-24 February.
- Rejas M., C. Taberner, J.J. Pueyo, S. Giral, H. de Haas, F. Mienis & T. C. E. van Weering. Isotopic composition of the carbonate crusts from the Penduick Escarpment (Moroccan Atlantic slope, Gulf of Cadiz) implications for the interpretation of methane sources. 3rd Euromargins Conference "Processes at the passive continental margins", Bologna, Italy, 4-7 October.
- Rejas, M., C. Taberner, S. Schouten, M. Baas, P. Mata, J.M. de Gibert, V. Díaz del Río & L. Somoza. Anaerobic methane oxidation and carbonate precipitation in the carbonate crusts from The Gulf of Cadiz. European Geosciences Union Meeting, Vienna, Austria, 2-7 April.
- Rejas, M., C. Taberner, H. de Haas, F. Mienis & T.C.E. van Weering. Origin and characterization of carbonate crusts of Pen Duick Escarpment (Gulf of Cadiz). EGU Geophysical Research Abstracts 8, Vienna, Austria, 2-7 April.
- Sangiorgi, F., H. Brinkhuis, H.J. Brumsack, S. Schouten & G.-J. Reichert. The Arctic Ocean Cenozoic record: first insights into the greenhouse - icehouse transition and its missing sediment record (IODP 302, ACEX). 8th Nederlands Aardwetenschappelijk Congres (NAC 8), Veldhoven, 24-25 April.
- Schmid, M.C., J. van de Vossenberg, M.M.M. Kuypers, J.S. Sinninghe Damsté, N. Risgaard-Petersen, H.J. Op den Camp, M.S. Jetten & M. Strous. Interactions of anaerobic ammonium oxidizing bacteria in the marine nitrogen cycle. 11th International Symposium on Microbial Ecology (ISME-11), Vienna, Austria, 20-25 August.
- Schouten, S., C. Wuchter, B. Abbas, M.J.L. Coolen, L. Herfort, J. van Bleijswijk, E. Teira, G. Herndl, J.J. Middelburg & J.S. Sinninghe Damsté. Archaeal nitrification in the ocean. Gordon Research Conference on Organic Geochemistry, Holderness School, Plymouth, NH, USA, 6-11 August.
- Sligting, M., H.J.W. de Baar, K.R. Timmermans, J. Uitz, M.J.W. Veldhuis, M.R. Wernand & H. van der Woerd. Satellite observations compared to ship borne fluorescence and chlorophyll a measurements near the Isles Kerguelen (Southern Ocean). ASLO Ocean Sciences meeting, Hawaii, USA, 20-24 February.

- Sligting, M.H., J. van der Woerd & M.R. Wernand. Satellite Observations Compared to Ship Borne Fluorescence and Chlorophyll A Measurements near the Isles Kerguelen (Southern Ocean). OOXVIII Conference, Montreal, Canada.
- Stadnitskaia, A., D. Nadezhkin, V. Blinova, M.K. Ivanov & J. Sinninghe Damsté. Formation of methane-related carbonate crust as deduced from geochemical study. The Gulf of Cadiz, NE Atlantic. 8th Nederlands Aardwetenschappelijk Congres (NAC 8), Veldhoven, 24-25 April.
- Stadnitskaia, A., E. Omoregie, A. Boetius & J.S. Sinninghe Damsté. Lipid composition and methanotrophic diversity in different fluid venting environments of the Nile deep-sea fan, Eastern Mediterranean. European Geosciences Union Meeting, Vienna, Austria, 2-7 April.
- Stadnitskaia, A., M.K. Ivanov, T.C.E. van Weering & J.S. Sinninghe Damsté. Biogeochemical Processes Occurring at Fluid/Methane Venting Areas at the Seafloor. 15th Anniversary Training Through Research Post-Cruise Meeting: Geological Processes on Deep-Water European Margins. Moscow/Zvenigorod, Russia, 29 January - 4 February.
- Stadnitskaia, A., M.K. Ivanov, V. Blinova, R. Kreulen & T.C.E. van Weering. Molecular and carbon isotopic variability of hydrocarbon gases from mud volcanoes in the Gulf of Cadiz, NE Atlantic. European Geosciences Union Meeting, Vienna, Austria, 2-7 April.
- Stoica, E. & G.J. Herndl, Links between DMSP-producing algal blooms and bacterioplankton community composition in the northwestern Black Sea (Romanian sector). Int. Symposium on DMSP, Norwich, UK, 2-6 May.
- Timmermans, K.R., H.J.W. de Baar, H. de Porto, S. Ober, M. Bakker, J. Schilling, G. Sarthou, L.J.A. Gerringa & M. Smit. New European facility for ultraclean sampling of trace elements and isotopes in the oceans in the GEOTRACES program. ASLO Ocean Science meeting, Hawaii, 20-24 February; EGU General Assembly, Vienna, Austria, April; AGU Fall Meeting, San Francisco, USA, 12 December.
- van Bentum, E., A. Forster, G.-J. Reichart & J. Sinninghe Damsté. Evolution of the depositional environment and variations in organic matter sources during the Cenomanian/Turonian oceanic anoxic event at Demerara Rise. 13th Annual Symposium NSG, Utrecht University, 30 November.
- van Bentum, E.C., A. Forster, G.-J. Reichart & J.S. Sinninghe Damsté. Evolution of the depositional environment and variations in organic matter sources during the Cenomanian/Turonian oceanic anoxic event at Demerara Rise. 8th Nederlands Aardwetenschappelijk Congres (NAC 8), Veldhoven, 24-25 April.
- van den Hout, P.J., T. Piersma, A. Dekinga, S.K. Lubbe & G.H. Visser. Ruddy turnstones *Arenaria interpres* rapidly build pectoral muscle after raptor scares. XXIV International Ornithological Congress, Hamburg, Germany, 13-19 August.
- van der Land, C., F. Mienis, H. de Haas, M. van der Vorstenbosch & T.C.E. van Weering. Early cementation in carbonate mounds in the Rockall Trough. 13th Annual Symposium NSG, Earth's energy budget in past, present and future. Utrecht University, 30 November.

- van der Land, C., F. Mienis, T.C.E. van Weering, R. Steinacher, H. de Haas, H. de Stigter & T. Richter. Sedimentology of a carbonate mound area on the SW margin of the Rockall Trough. EGU General Assembly, Vienna, Austria, 2-7 April.
- van der Land, C., F. Mienis, T.C.E. van Weering, R. Steinacher, H. de Haas, H. de Stigter & T. Richter. Sedimentology of a carbonate mound area on the SW margin of the Rockall Trough, 8th Nederlands Aardwetenschappelijk Congres, Veldhoven, 24-25 April.
- van der Meer, J., J.F.M.F. Cardoso & H.W. van der Veer. Dynamic energy budgets in bivalves. Gordon Research Conferences, Lewiston, Maine, USA, 9-14 July
- van der Meer, M.T.J., S. Schouten, M. Baas, J. Bijma, I. Zondervan, A. Benthien & J. Sinninghe Damsté. Stable hydrogen isotopic composition of long chain alkenones: Biological controls and applications. Gordon Research Conference on Organic Geochemistry, Holderness School, Plymouth, NH, USA, 6-11 August.
- van Haren, H. & C. Millot. Gyroscopic waves in the Mediterranean Sea. Ocean Sciences Meeting, Honolulu, HI, USA, 20-24 February.
- van Haren, H. & I. Taupier-Letage & C. Millot. Fast deep sinking in Mediterranean eddies. Ocean Sciences Meeting, Honolulu, HI, USA, 20-24 February.
- van Haren, H. Tidal and Near-Inertial peak variations around the diurnal critical latitude. Ocean Sciences Meeting, Honolulu, HI, USA, 20-24 February.
- van Leeuwen, S., S. Dye, D. Mills, J.W. Baretta & P. Ruardij. Modelling the influence of climate change on stratification and near bottom oxygen depletion. International Symposium on Research and Management of Eutrophication in Coastal Ecosystems, Nyborg, Denmark, 20-23 June.
- Veldhuis, M.J.W. & J.P. Boon. NIOZ; a research facility for strategic Ballast Water Research. Exhibition Shipbuilding, Machinery & Marine Technology (SMM), Hamburg, Germany, 26 – 29 September.
- Veldhuis, M.J.W., G. Dubelaar & P. Gerritzen. Silico-imaging: a new application flow cytometry. ASLO meeting, Vancouver, Canada, 11-15 June.
- Vézina, F., K. Jalvingh, A. Dekinga & T. Piersma. Fattening knots do better in the cold. Wader Study Group meeting, Falsterbo, Sweden.
- Vézina, F., K. Jalvingh, A. Dekinga & T. Piersma. Thermoregulatory side effects of migratory predisposition in shorebirds. American Physiological Society, Virginia Beach, USA.
- Weijers, J., S. Schouten, E. Schefuss, J.C. van den Donker & J.S. Sinninghe Damsté. A new proxy for continental palaeo temperature reconstruction based on membrane lipids of soil bacteria in marine sediments. European Geosciences Union Meeting, Vienna, Austria, 2-7 April.
- Weijers, J.W.H., Continental paleo pH and temperature reconstruction with membrane lipids from soil bacteria, Gordon Research Conference on Organic Geochemistry, Holderness School, Plymouth, NH, USA, 6-11 August.
- Weijers, J.W.H., S. Schouten, J.C. van den Donker, E. Schefuß & J.S. Sinninghe Damsté. A new proxy for continental palaeo temperature reconstruction based on membrane lipids of soil bacteria in marine sediments. 8th Nederlands Aardwetenschappelijk Congres (NAC 8), Veldhoven, 24-25 April.

- Weinbauer, M.G., M. Agis, O.O. Lee, C. Maier & P.-Y. Qian. Bacterial and archaeal phylotypes of octocorals from temperate and deep coral bioherms. 6th European Meeting Int. Soc. Reef Studies (ISRS), Bremen, Germany, 19-22 September.
- Wernand, M.R. & M.J.W. Veldhuis, H.J. van der Woerd. Estimating phytoplankton biomass in case ii waters using a flh 2-band algorithm. OOXVIII Conference, Montreal, Canada.
- Wilhartitz, I., R.L. Mach, G. Ryzinska, A.K.T. Kirschner, H. Stadler, G.J. Herndl, U. Szewzyk & A.H. Farnleitner. Biogeochemical significance of stable microbial endokarst communities in spring water and alpine karst aquifers. ISME-11 Meeting, Vienna, Austria, 24-29 August.
- Zemmelink H.J., L. Houghton, J.W.H. Dacey, D. O'Toole, N. Bates, C. Brussaard, & H.J.W. de Baar. Gradients in alkalinity and dissolved inorganic carbon near the sea surface of the subtropical north Atlantic. CAR-BOOCEAN meeting, Gran Canaria, Spain, 4-8 December.

ORAL PRESENTATIONS

- Bak, R.P.M. Coral Reef Ecosystems (Master Course Limnology and Oceanography) Lecture series, Amsterdam University, November.
- Bak, R.P.M. Long term reef dynamics in Bonaire reefs. Foundation for National Parks STINAPA, Bonaire, 8 March.
- Bak, R.P.M., G. Nieuwland & M.N. Nugues. Variation in vitality components through coral reef systems. International Society for Reef Studies, Bremen, Germany, 23-27 September.
- Baretta-Bekker, J.G., T.C. Prins & C.J.M. Philippart. Dutch long-term time series. Meeting of the ICES Workgroup on Eutrophication, Denmark, 11-15 September.
- Beckmann, B., P. Hofmann, S. Schouten, J.S. Sinninghe Damsté & T. Wagner. Biomarker evidence from Demerara Rise for surface and deep water redox conditions in the mid Cretaceous Western Equatorial Atlantic. AGU Fall Meeting, San Francisco, USA, 11-15 December.
- Beckmann, B., S. Schouten, J.S. Sinninghe Damsté, T. Wagner & P. Hofmann. What controlled black shale sedimentation in the Coniacian-Santonian western tropical Atlantic? – Indicators for land-ocean interaction on Milankovitch time-scales during the Oceanic Anoxic Event 3. European Geosciences Union Meeting, Vienna, Austria, 2-7 April.
- Bendle, J.A., J.S. Sinninghe Damsté, J.W. Weijers, M. Maslin, E.C. Hopmans, C. Boot & R.D. Pancost. A 35,000 year record of microbial membrane lipid proxies in Amazon Fan sediments: changes in terrigenous and marine temperatures and sources of organic carbon. AGU Fall Meeting, San Francisco, USA, 11-15 December.
- Bergman, M.J.N. Offshore Windpark Egmond aan Zee (OWEZ): effects on settlement and survival of benthic fauna. Amsterdam, 1 May
- Boom, L. Hull Penetrating Instrumentation Platform for Ferries. Inmartech 2006. Bi-annual Symposium on Marine Technology for Sea Research at Woods Hole Oceanographic Institution, USA, 17-19 October.

- Booij, K. Chemical and toxicological background of the MARPOL treaty. Course "Sustainable Sea, Sustainable shipping", NIOZ, 26 September.
- Booij, K., J.N. Huckins & J.D. Petty. Human errors and scientific uncertainties in the calculation of aqueous concentrations from SPMD-absorbed amounts. International Passive Sampling Workshop, Bratislava, Slovakia, 3-6 May.
- Bouruet-Aubertot, P., P. LeLong & H. van Haren. Breaking of inertia-gravity waves as inferred from in-situ measurements and direct numerical simulations. AGU Fall Meeting, San Francisco CA, USA, 11-15 December.
- Brinkhuis, H., A. Sluijs, F. Sangiorgi, S. Schouten & the (extended) ACEX Science Party. The Paleogene history of the Lomonosov ridge; results of the first Arctic drilling. Climate and Biota of the Early Paleogene Conference, Bilbao, Spain, 12-20 June.
- Brinkhuis, H., S. Schouten, M.E. Collinson, A. Sluijs, J.S. Sinninghe Damsté, G.R. Dickens, M. Huber, T.M. Cronin, J.P. Bujak, R. Stein, J.S. Eldrett, I.C. Harding & F. Sangiorgi. A giant arctic freshwater pond at the end of the Early Eocene – Implications for ocean heat transport and carbon cycling. 8th Nederlands Aardwetenschappelijk Congres (NAC 8), Veldhoven, 24-25 April.
- Brummer, G.-J.A. Marine carbonates: divalent cations and isotope tracers. NWO-DFG annual meeting, NIOZ, 12 January.
- Brummer, G.-J.A. Particle fluxes. NEBROC-ECOLMAS Introductory Course in Marine Sciences. NIOZ, 15 November.
- Brummer, G.-J.A., L.P. Jonkers, G.M. Ganssen & F.J.C. Peeters. Tying modern to past ocean variability in Atlantic meridional overturning circulation as documented by sedimentary records. Cambridge, UK, 8 May.
- Brummer, G.-J.A., U. Fallet & S. Schouten. Decoupling temperature and salinity effects in biogenic carbonates. Paleosalt kick-off meeting, Brussels, Belgium, 17 May.
- Brussaard, C.P.D. Collection, processing and preservation for direct counts and flow cytometry. SCOR Working Group 126 Virus Ecology in Marine Systems. Workshop on Methods, Vancouver, BC, Canada, 1-3 June.
- Brussaard, C.P.D. Viral lysis rates of *Phaeocystis globosa* affected by virus abundance. ASLO Summer Meeting, Victoria, BC, Canada, 4-9 June.
- Brussaard, C.P.D. *Phaeocystis* viruses. Practical Workshop on virus ecology methods, Marine Biological Association of the UK, Plymouth, 23-28 July 2006.
- Buijsman, M.C. (non-) Tidal water transport in the Marsdiep inlet. Netherlands Centre for Coastal Research (NCK). Kijkduin, March.
- Buijsman, M.C. The relation between currents and seasonal sand-wave variability as observed with ferry-mounted ADCP. Physics of estuaries and coastal seas (PECS). Astoria, USA, September.
- Cadée, G.C. Popularisation of Marine Biology 1600 – 1950. Gesch. Oceanografie Club, Utrecht, 23 March; KNNV Den Helder, 13 October; Texel, 2 November.

- Campbell, H.R. & T.F. de Bruin. Data Management for SCAR Scientific Research Programmes. SCAR Open Science Conference, Hobart, Australia, 12-14 July.
- Camphuysen, C.J. European seabirds – what is it we are protecting? Workshop on impact of oil spills on seabirds, A Coruña, Spain, 7-9 September.
- Camphuysen, C.J. Gekleurde zilvermeeuwen: droomproject of nachtmerrie? 47e ringersdag, Arnhem, 9 December.
- Camphuysen, C.J. On the spot descriptions of the sensitivity of sea areas regarding oil spills and forecasting shifts in the abundance of the most sensitive species. Workshop on impact of oil spills on seabirds, A Coruña, Spain, 7-9 September.
- Camphuysen, C.J. Seabirds and marine mammals in the Southern Bight under pressure or utilizing opportunities? 9th Intern. Seabird Group Conf. 'North Atlantic Seabird Populations.' Aberdeen University, Scotland, 1-3 September.
- Camphuysen, C.J. Walvissen in Nederland 1900-2005: de noodzaak tot zorgvuldige registratie in tijden van verandering. 4th Symposium Walvisstrandingen in Nederland, Naturalis, Leiden, 29 September.
- Camphuysen, C.J. Whales, dolphins and porpoises in the southern North Sea. TNO-FEL workshop, Den Haag, 7 March.
- Camphuysen, C.J. Zeevogels in de Noordzee: veranderingen in voedselaanbod en broedsucces op korte en lange termijn. Landelijke Dag SOVON/Vogelbescherming Nederland, Nijmegen, 25 November.
- Campos, J., K. Peijnenburg, P. Luttikhuisen, J. van Bleijswijk & H.W. van der Veer. Phylogeography of the common shrimp *Crangon crangon* in European waters 41st European Marine Biology Symposium, Cork, Ireland, 4-8 September.
- Cardoso, J.F.M.F., J. Campos, V. Freitas, S. Santos, J.I.J. Witte & H.W. van der Veer. Intra- and interspecies comparison of energy flow in bivalves by means of Dynamic Energy Budgets (DEB theory). 4th CIMAR Meeting, Peniche, Portugal, 20 - 21 October.
- Coolen M. Preserved DNA in Holocene lake sediments: A window on past microbial communities and paleoenvironments. 10th International Paleolimnology Symposium, Duluth, Minnesota, USA, 25-29 June.
- Coolen, M.J.L., B. Abbas, S.G. Wakeham & J.S. Sinninghe Damsté. Ammonia-oxidizing planktonic crenarchaeota in the Black Sea. Ocean Science Meetings, Honolulu, HI, USA, 20-24 February.
- de Baar, H.J.W. & R.F. Anderson. GEOTRACES in the International Polar Year. EGU General Assembly, Vienna, Austria, 4 April; AGU Fall Meeting, San Francisco, USA, 11 December.
- de Baar, H.J.W. Antarctica. Rotary Service Club, Bergen, 28 February.
- de Baar, H.J.W. Iron makes diatoms blooming but cannot change atmospheric CO₂ or climate. Netherlands-Flemish Ecologists Society (NECOV), Brussels, Belgium, 16 February.
- de Baar, H.J.W. Modern iron fertilization experiments in the Southern Ocean. BE-POLES meeting, Belgian Research in Polar Regions, Brussels, Belgium, 24 March.

- de Baar, H.J.W. The role of iron in plankton growth and carbondioxide uptake in the Antarctic Ocean (De Rol van ijzer in algengroei en CO₂-opname in de Antarctische Oceaan). Odd Fellows Service Club, Groningen, 13 February.
- de Baar, H.J.W., K.R. Timmermans, B.S. Twining, D. Wolf-Gladrow, Y. Bozec, L.J. Gerringa, M.J. Rijkenberg & P. Laan. Iron makes big diatoms blooming, but cannot change carbon dioxide and climate. AGU/ASLO Ocean Sciences, Hawaii, USA, 20-24 February.
- de Bruin, T.F. & M.A. Parsons. Data Management for the International Polar Year – Ensuring the Legacy. SCAR Open Science Conference, Hobart, Australia, 12-14 July.
- de Bruin, T.F. Antarctic and Southern Ocean Data Management by the Joint SCAR/COMNAP Committee on Antarctic Data Management, CODATA2006, Beijing, China, 23-25 October.
- de Bruin, T.F. Antarctic Data Management as Part of the IPY Legacy. AGU Fall Meeting 2006, San Francisco, USA, 11-15 December.
- de Bruin, T.F. Data management for MarinERA. Ad-hoc meeting of MarinERA, Brussels, Belgium, 29 March.
- de Bruin, T.F. De Nationale Oceanografische Data Commissie – Het Nationaal Platform voor oceanografisch data management. Vergadering Directie Team RIKZ, Den Haag, 24 January.
- de Bruin, T.F. De Nationale Oceanografische Data Commissie – Het Nationaal Platform voor oceanografisch data management. NODC-i Klankbord Groep bijeenkomst, Utrecht, 7 February.
- de Bruin, T.F. Do differences in CTD operations affect science? – Results from the questionnaire on CTD operations. ICES Working Group on Marine Data Management (WGMDM) annual meeting, Copenhagen, Denmark, 8-10 May.
- de Bruin, T.F. European Marine Observation and Data Network: De EU wil iets gaan opzetten, wat al grotendeels bestaat. Kennisbijeenkomst consultatie EU-Groenboek, Den Haag, 30 November.
- de Bruin, T.F. IPY Data management in Nederland en internationaal. Vergadering Nationaal IPY Committee, Den Haag, 21 September.
- de Bruin, T.F. IPY Data: Free and open access, and on the shortest feasible timescale. IPY-NL Information Meeting, Den Haag, 16 November.
- de Bruin, T.F. JCADM and the SCAR Scientific Research Programmes. SCAR Life Sciences Business Meeting, Hobart, Australia, 8-11 July.
- de Bruin, T.F. JCADM and the SCAR Scientific Research Programmes. SCAR Geo Sciences Business Meeting, Hobart, Australia, 8-11 July.
- de Bruin, T.F. JCADM Chief Officer Report, JCADM-10 annual meeting, Hobart, Australia, 8-11 July.
- de Bruin, T.F. JCADM, SCAR, SCOR, IODE, POGO, WDC and the Southern Ocean database. IODE Data Centers meeting, BODC, Liverpool, United Kingdom, 10-11 April.
- de Bruin, T.F. JCADM, SCAR, SCOR, POGO, IODE and the Southern Ocean database. IPY Data Management Workshop, British Antarctic Survey, Cambridge, United Kingdom, 3-4 March.
- de Bruin, T.F. NODC-i – A National Infrastructure for access to oceanographic and marine data and information in The Netherlands. IODE Data Centers meeting, BODC, Liverpool, United Kingdom, 10-11 April.

- de Bruin, T.F. NODC-i – Een Nationale Infrastructuur voor toegang tot oceanografische en mariene gegevens en informatie. Workshop Bruggen bouwen tussen Ruimte voor Geo-Informatie en Klimaat voor Ruimte, Amsterdam, 14 June.
- de Bruin, T.F. NODCi – The National Infrastructure for access to oceanographic and marine data and information in The Netherlands, ICES Annual Science Conference, Maastricht, 19-23 September.
- de Bruin, T.F. Oceanographic data management for the International Polar Year (IPY). IODE Data Centers meeting, BODC, Liverpool, United Kingdom, 10-11 April.
- de Bruin, T.F. Oceanographic Data Management for the International Polar Year (IPY). ICES Working Group on Marine Data Management (WGMDM) annual meeting, Copenhagen, Denmark, 8-10 May.
- de Bruin, T.F. Oceanographic Data Management for the International Polar Year (IPY), SeaDataNet First Plenary Meeting, Heraklion, Greece, 8-10 June.
- de Bruin, T.F. Report from the IPY Data Policy and Management Subcommittee. IPY Data Management Workshop, British Antarctic Survey, Cambridge, United Kingdom, 3-4 March.
- de Bruin, T.F. Report from the IPY Data Policy and Management Subcommittee. 1st meeting of IPY Observations Subcommittee, Potsdam, Germany, 27-28 March.
- de Bruin, T.F. Report from the IPY Data Policy and Management Subcommittee. 3rd Meeting of the IPY Joint Committee, Cambridge, United Kingdom, 20-22 April.
- de Bruin, T.F. Report from the IPY Data Policy and Management Subcommittee. IPY Consultative Forum, Hobart, Australia, 8 July.
- de Bruin, T.F. Report of the SCAR/COMNAP Joint Committee on Antarctic Data Management. SCAR Delegates Meeting, Hobart, Australia, 17-19 July.
- de Bruin, T.F. Report of the SCAR/COMNAP Joint Committee on Antarctic Data Management. SCAR Executive Meeting, Hobart, Australia, 11 July.
- de Bruin, T.F. Some thoughts and remarks on an integrated Southern Ocean database from a data manager's perspective. Southern Ocean Observing System (SOOS) workshop, Hobart, Australia, 15 July.
- de Bruin, T.F. The role of the IPY DIS to get hold of old data and keep track of new data. Joint SCAR/SCOR Oceanography Group Meeting, Hobart, Australia, 10-11 July.
- de Bruin, T.F. The SCAR/COMNAP Joint Committee on Antarctic Data Management (JCADM). IPY Data Management Workshop, British Antarctic Survey, Cambridge, United Kingdom, 3-4 March.
- de Bruin, T.F. The SCAR/COMNAP Joint Committee on Antarctic Data Management. JCADM capacity building workshop, Hobart, Australia, 11 July.
- de Jong, M.F. & H.M. van Aken. Intermediate layer variability and local convective mixing in the Irminger Sea. Buys Ballot Autumn Symposium, Koudekerke, 1-3 November.
- de Jong, M.F. & H.M. van Aken. Variability and possible convective mixing in the Irminger Sea. ICES Annual Science Meeting, Maastricht, 19-23 September.
- de Jong, M.F. & H.M. van Aken. Variability and re-ventilation of LSW in the Irminger Sea. CLIVAR Workshop on Multi Decadal to Centennial Global Climate Variability, Honolulu, Hawaii, USA, 15 – 17 November.

- de Stigter, H.C., W. Boer, G.-J. Brummer, H.G. Epping, F.A. Koning, G. van den Bergh & T.C.E. van Weering. Physical and chemical characterization of benthic environments in the Nazaré Canyon. HERMES 2nd Annual Meeting, Majorca, Spain, 18-22 April.
- Dekker, R. Key processes in marine ecosystems. Marine habitats – tidal flats. NEBROC-Ecolmas course on Marine Sciences, Texel, 6-17 November.
- Dorschel, B., A.J. Wheeler, H. de Haas & V.A.I. Huvenne. Current induced seabed features along the eastern Rockall Trough, NE Atlantic – an interpretation of TOBI side-scan sonar imagery. EGU General Assembly, Vienna, Austria, 2-7 April.
- Drent J. Vooruitzichten van het nonnetje (*Macoma baltica*) in een veranderend klimaat. NECOV winter symposium, Brussels, Belgium, 15-16 February.
- Drijfhout, S. & L. Maas. Impact of channel geometry and rotation on the trapping of internal tides, EGU, Vienna, Austria 6 April.
- Ettwig, K.F., A.A. Raghoebarsing, A. Pol, A. Smolders, K.T. van de Pas-Schoonen, J.S. Sinninghe Damsté, H.J. Op den Camp, M.S. Jetten & M. Strous. Coupling the nitrogen and carbon cycles in freshwater ecosystems. 11th International Symposium on Microbial Ecology (ISME-11), Vienna, Austria, 20-25 August.
- Fang, J., S. Arakawa, C. Kato & S. Schouten. Mobial diversity of cold-seep sediments in Sagami Bay, Japan as determined by 16S rDNA and lipid analyses. AGU Fall Meeting, San Francisco, USA, 11-15 December.
- Forster, A., K. Moriya, S. Schouten, P.A. Wilson & J.S. Sinninghe Damsté. A dual-proxy sea surface temperature record of the Cenomanian/Turonian transition in the tropics (Demerara Rise, ODP Leg 207). National IODP-ICDP Colloquium 2006, Greifswald, Germany, 27-29 March.
- Forster, A., S. Schouten, K. Moriya, P.A. Wilson & J.S. Sinninghe Damsté. Tropical warming & intermittent cooling during the mid-Cretaceous Oceanic Anoxic Event 2 (Demerara Rise, ODP Leg 207). National IODP Symposium 2006 drilling extreme climates, Utrecht, 17 March.
- Forster, A., S. Schouten, M. Baas, K. Moriya, P.A. Wilson & J.S. Sinninghe Damsté. The Cretaceous Thermal Maximum and Oceanic Anoxic Event 2 in the tropics: sea-surface temperature and stable organic carbon isotopic records from the equatorial Atlantic. AGU Fall Meeting, San Francisco, USA, 11-15 December.
- Frade, P. & R.P.M. Bak. Functional diversity of *Symbiodinium* in closely related coral species with large depth distributions. International Society for Reef Studies, Bremen, Germany, 19-22 September.
- Freitas, V., J. Campos, M. Fonds & H.W. van der Veer. Potential impact of climate change on the functioning of temperate estuaries as fuelling stations for wading birds. 41st European Marine Biology Symposium, Cork, Ireland, 4-8 September.
- Gerkema, T. Earth rotation and ocean dynamics: the Coriolis force revisited. NIOZ, 21 September.
- Gerkema, T. Geophysical Fluid Dynamics. NEBROC-ECOLMAS Introductory Course in Marine Sciences. Texel, 6 November.
- Gerkema, T. L'approximation traditionnelle en dynamique des fluides géophysiques. LODYC (Paris VI), France, 26 September.

- Gerkema, T. L'influence de la rotation sur la réflexion des ondes internes. Journée "Marée interne". ENS-Lyon, France, 25 January.
- Gerkema, T. The ill-posed and non-separable world of internal waves. NDNS+ workshop "Mathematics and Earth Sciences". Groningen University, 30 November.
- Handley, L., E. Hawkins, D. Steart, M. Collinson, A. Scott, E. Crouch, J. Sinninghe Damsté & R. Pancost. The carbon isotope stratigraphy of the PETM – new records from bacterial and higher plant biomarkers. Goldschmidt Conference, Melbourne, Australia, 27 August -1 September.
- Harlander, U. Rossby waves: classical solutions and new problems. NDNS+ workshop "Mathematics and Earth Science", Groningen University, 30 November.
- Harlander, U. Schlecht-gestellte Randwertprobleme in Ozeanographie und Meteorologie. „Arbeitskreis fuer Theoretische Meteorologie“, Schoental, Germany.
- Harlander, U. & L.R.M. Maas. Hyperbolic boundary value problems of Geophysical fluid Dynamics. Geo. Res. Abstracts, EGU General Assembly.
- Herndl, G.J. Bacterial and archaeal functioning and diversity in the major deep water masses of the North Atlantic. Institut für Ostseeforschung Warnemünde, Germany, 1 November.
- Herndl, G.J. Integrating prokaryotic microdiversity into ecosystems function theory. Int. Census of Marine Microbes Annual Meeting, Noordwijkerhout, 12 – 15 June.
- Herndl, G.J. Planktonic Archaea (and Bacteria) in the North Atlantic: what are they doing in the deep waters? Institute of Ecology and Hydrology, University of South Bohemia, Ceske Budejovice, Czech Republic, 26 January.
- Herndl, G.J. The invisible biomass in the North Sea: role of Bacteria and Archaea in ecosystem functioning and its biodiversity. Noordzeedagen, Noordwijkerhout, 5 – 6 October.
- Herndl, G.J. What we learned from the JGOFS program about the role of microorganisms in the carbon cycle. Seminar on Past and Future Carbon Cycling, Paris, France, 7 February.
- Herndl, G.J., H. van Aken, T. Reinthaler, E. Teira, M. Varela, E. Sintes & J.M. Arrieta. Patterns of bacterial and archaeal production and diversity in the deep water masses of the North Atlantic. EGU meeting, Vienna, Austria, 3 – 7 April.
- Herndl, G.J., H. van Aken, T. Reinthaler, E. Teira, M. Varela, E. Sintes, J.M. Arrieta, J. van Bleijswijk & H. Witte. Bacterial and archaeal function and diversity in the major deep water masses of the North Atlantic. Workshop 'Marine Genomics meets Marine Diversity', Bremen, Germany, 8 – 9 June.
- Herndl, G.J., T. Reinthaler, E. Teira, M. Varela, E. Sintes & H.M. van Aken. Distribution of archaeal activity in the meso- and bathypelagic realm of the North Atlantic. ISME-11 Meeting, Vienna, Austria, 24 – 29 August.
- Hippler, D., R. Witbaard & A. Immenhauser. Investigating Ca isotope fractionation and trace metal ratios in modern and fossil bivalve shells. CASIOPEIA kick-off meeting, IfM-Geomar, Kiel, Germany, 24-26 January.
- Hofmann, P., I. Stuesser, T. Wagner, S. Schouten, J.S. Sinninghe Damsté & K. Wallmann. Rapid climate change and associated black shale deposition during past greenhouse conditions: The lower Albian Oceanic Anoxic Event 1b. AGU Fall Meeting, San Francisco, USA, 11-15 December.

- Holmes, S.P. & J. van der Meer. Population genetics and dispersal: can one be used to predict the other? ICES Statutory Meeting, Maastricht, 19 September.
- Huckins, J.N., D.A. Alvarez, R.W. Gale, W.L. Cranor, R.C. Clark, K. Booij & M.E. Bartkow. Some fundamentals of performance reference compounds (PRCs) and other aspects of passive sampling. International Passive Sampling Workshop, Bratislava, Slovakia, 3-6 May.
- Huguet, C. Use of glycerol dibiphytanyl glycerol tetraether lipids in paleoclimate. Institute of Chemical and Environmental Research, Barcelona. Spain, 20 December.
- Huguet, C., B. Martrat, J.O. Grimalt, J.S. Sinninghe Damsté & S. Schouten. Reconstruction of sea surface temperature variations in the Western Mediterranean between 145 and 250 Kyr using the Uk'₃₇ and TEX₈₆ organic proxies. European Geosciences Union Meeting, Vienna, Austria, 2-7 April.
- Jansen, J.H.F. Paleoceanography, General circulation. NEBROC-ECOLMAS Introductory Course in Marine Sciences. NIOZ, 16 November.
- Jansen, J.H.F. Paleoceanography, Terrigenous proxies. NEBROC-ECOLMAS Introductory Course in Marine Sciences. NIOZ, 16 November.
- Jetten, M.S., M. Wagner, T. Rattei, D. Le Paslier, J. Weissenbach, J.S. Sinninghe Damsté, M.M. Kuypers, H.J. Op den Camp, M. Strous. Anaerobic Ammonium Oxidation. 11th International Symposium on Microbial Ecology (ISME-11), Vienna, Austria, 20-25 August.
- Jonkers, L.P., M.A. Prins, G.-J. Weltje, A. Ganopolski & G.-J. Brummer. Geological evidence for hysteresis of the Atlantic meridional overturning circulation in response to freshwater forcing. Rapid Climate Change, International Science Conference, Birmingham, UK, 24-27 October.
- Jonkers, L.P., M.A. Prins, G.-J. Weltje, A. Ganopolski, S. Troelstra, A. Kuipers & G.-J. Brummer. Hysteresis response of thermohaline circulation to fresh-water forcing revealed by an unmixed grain-size record from the North Atlantic. NAC8, Veldhoven, 24-25 April.
- Jonkers, L.P., M.A. Prins, G.-J. Weltje, A. Ganopolski, S. Troelstra, A. Kuipers & G.-J. Brummer. Hysteresis response of thermohaline circulation to fresh-water forcing revealed by an unmixed grain-size record from the North Atlantic. VAMOC-meeting, Cambridge, UK, 8-9 May.
- Jonkers, L.P., M.A. Prins, G.-J. Weltje, A. Ganopolski, S. Troelstra, A. Kuipers & G.-J.A. Brummer. Hysteresis response of thermohaline circulation to fresh-water forcing revealed by an unmixed grain-size record from the North Atlantic. EGU General Assembly, Vienna, Austria, 24-25 April.
- Kaur, G., M. Hall, B. Mountain, L. Benning, S. Schouten & R. Pancost. Using microbial lipids in ancient sinters to elucidate past geothermal chemistry and microbiology. Goldschmidt Conference, Melbourne, Australia, 27 August-1 September.
- Keijzer, E. Fast Thermistor String model 3. Inmartech 2006. Bi-annual Symposium on Marine Technology for Sea Research at Woods Hole Oceanographic Institution, USA, 17-19 October.
- Keijzer, E. New Water Sampler Valve: High Opening Ratio and Inert Material. Inmartech 2006. Bi-annual Symposium on Marine Technology for Sea Research at Woods Hole Oceanographic Institution, USA, 17-19 October.

- Kim, J.-H., S. Schouten, R. Buscail, W. Ludwig, J. Bonnin, F. Bourrin, L. Herfort & J.S. Sinninghe Damsté. Validation study of terrestrial biomarker proxy (BIT index) in the Gulf of Lions (NW Mediterranean). European Geosciences Union Meeting, Vienna, Austria, 2-7 April.
- Koho, K.A., T.J. Kouwenhoven, H.C. de Stigter, H.G. Epping, F.A. Koning, T.C.E. van Weering & G.J. van der Zwaan. Vertical distribution and microhabitat of benthic foraminifera in Nazaré Canyon: relation to physical disturbance. EGU General Assembly, Vienna, Austria, 2-7 April.
- Laan, P., K. Timmermans, H. de Baar, H. de Porto, S. Ober, M. Bakker, J. Schilling, G. Sarthou, L. Gerringa & M. Smit. Development of ultra clean sampling for GEOTRACES in the international polar year. SOLAS/IMBER/GEOTRACES Workshop, KNAW, Amsterdam, 9 May.
- Lavaleye, M.S.S. & G.C.A. Duineveld. The trophic positions of the main biota in a cold-water coral community of the SE Rockall Bank. HERMES annual meeting, Mallorca, 18-21 April.
- Lavaleye, M.S.S. Deep sea. Introductory course marine sciences, NEBROC, Texel, 13 November.
- Luttikhuisen, P.C., J. Campos, K. Peijnenburg, J. van Bleijswijk & H. van der Veer Phylogeography of the common shrimp *Crangon crangon* in European waters. Naturalis, Leiden, 29 November.
- Maas, L.R.M. Is fair weather drowning caused by dead-water? NDNS+ workshop "Mathematics and Earth Sciences", Groningen University, 30 November.
- Maas, L.R.M. Wave attractors, Geometric and Multiscale Methods for Geophysical Fluid Dynamics, Lorentz Center Leiden University, 5 Oktober.
- Maas, L.R.M. Wave attractors: theory and experiments, Technische Universität München, Germany 6 December.
- Maas, L.R.M. Waves in rotating fluids: geometric effects, Oberwolfach, Germany, 20-26 August.
- Maier, C., A. Hoogstraten, J. Hegeman, F.C. van Duyl & M.G. Weinbauer. Abundance and productivity of prokaryotes associated to the cold water corals *Lophelia pertusa* and *Desmophyllum* sp from Rockall Trough and Mingulay Reefs, NE Atlantic. 6th European Meeting Int. Soc. Reef Studies (ISRS), Bremen, Germany, 18-22 September.
- Marino, G., E.J. Rohling, W.I.C. Rijpstra, F. Sangiorgi, H. Brinkhuis, S. Schouten & J.S. Sinninghe Damsté. The role of ceased deep water ventilation in massive organic carbon sedimentation. AGU Fall Meeting, San Francisco, USA, 11-15 December.
- Martínez Martínez, J. & C.P.D. Brussaard. *Micromonas pusilla*-specific viruses: characteristics in relation to geographical origin. ASLO Summer Meeting, Victoria, BC, Canada, 4-9 June.
- Mazurenko, L., V.A. Soloviev, M.K. Ivanov, A.E. Logvina, A.N. Stadnitskaya & T.C.E. van Weering. Gas hydrate forming fluids of Kovalesky, Kazakov and Odessa Mudvolcanoes. Geological processes on Deep water European Margins, 15th Training Through Research Conference, Moscow, Russia, 29 January-4 February.
- Mienis, F. Cold water corals around Europe. KNAW workshop, Amsterdam, 9 May.

- Mienis, F., H. de Stigter, H. de Haas, C. van der Land & T. van Weering. Environmental controls on carbonate mound development along the European continental margin. EGU General Assembly, Vienna, Austria, 2-7 April.
- Mienis, F., H. de Stigter, H. de Haas, C. van der Land & T. van Weering. Environmental controls on carbonate mound development along the European continental margin. 8th NAC Congres, Veldhoven, 24-25 April.
- Mienis, F., H. de Stigter, H. de Haas, T. Richter, C. van der Land & T. van Weering. Environmental controls on carbonate mound development along the European continental margin. International conference and 15th TTR post-cruise meeting, Moscow, Russia, 30 January-4 February.
- Mienis, F., T. van Weering, B. Boekschoten, H. Vonhof, H. de Moel, J. Scholten, C. Spliethof & R. Nagtegaal. Koudwaterkoralen van de diepzee. Academische Jaarprijs 2005/2006, Amsterdam, 15 May.
- Mueller, J.F., S. Stephens, M.E. Bartkow, K.E. Kennedy, M. Shaw, U. Bauer, K. Booij, J.N. Huckins & P.A. Berqvist. Do our models appropriately represent the way passive samplers behave. International Passive Sampling Workshop, Bratislava, Slovakia, 3-6 May.
- Ober, S. A New Ultra Clean CTD-System for Sampling of Trace Elements and Isotopes. Inmartech 2006. Bi-annual Symposium on Marine Technology for Sea Research at Woods Hole Oceanographic Institution, USA, 17-19 October.
- Pagani, M., N. Pedentchouk, M. Huber, A. Sluijs, S. Schouten, H. Brinkhuis, J.S. Sinninghe Damsté & G.R. Dickens. The Nature of the negative carbon isotope excursion during the PETM: A view from the Arctic. Climate and Biota of the Early Paleogene conference, Bilbao, Spain, 12-20 June.
- Palmer, M., M. Cooper, S. Schouten & G.-J. Reichert. A 30 kyr record of surface water pH, pCO₂ and nutrients in the northern Arabian Sea. European Geosciences Union Meeting, Vienna, Austria, 2-7 April.
- Parada, V. & G.J. Herndl. Dynamics of newly produced virioplankton in the North Sea. Verwey-days, NIOZ, 31 January.
- Parsons, M.A. & T.F. de Bruin. Data Management for the International Polar Year. EGU General Assembly, Vienna, Austria, 4 April.
- Parsons, M.A. & T.F. de Bruin. Data Management for the International Polar Year – Ensuring the Legacy. IEEE International Geoscience and Remote Sensing Symposium, Denver, Colorado, United States of America, 31 July – 4 August.
- Parsons, M.A. & T.F. de Bruin. The Challenge of and Approach to IPY Data Management– Building the Legacy. AGU Fall Meeting 2006, San Francisco, USA, 11-15 December.
- Philippart, C.J.M. & K. Guizien. Responsive Mode Project 4.3: Pan-European gradients in propagation and settlement events. MarBEF Annual Meeting, Lecce, Italy, 2-5 May.
- Philippart, C.J.M. & M. Edwards. Climate change – phenology: shifts in timing as signals of climate change (North Sea & Wadden Sea). RAK/Darwin Symposium 'Impact of global climate variability on regional marine ecosystems'. Amsterdam, 16 May.
- Philippart, C.J.M. Draagkracht van de Waddenzee: nieuwe inzichten vanuit een beschrijvende aanpak, een blik op de toekomst en knagende vragen. Noordzeedagen, Vlissingen, 5-6 October.

- Philippart, C.J.M. Filter-feeding bivalves: an outstanding example of benthic-pelagic couplers. Benthic-pelagic coupling Symposium, Nieuwersluis, 25 September.
- Philippart, C.J.M. Network of excellence, marine biodiversity and ecosystem functioning responsive mode project 4.3: MarPACE, Marine propagation along the coasts of Europe. Intercalibration workshop, Banyuls, France, 8-9 June.
- Philippart, C.J.M., J. Beukema, G.C. Cadée, R. Dekker, P. Goedhart, J. van Iperen, M. Leopold & P. Herman. The P-hypothesis: Observed changes in the Wadden Sea food web were determined by variation in phosphorus loads. Workshop Long-Term Changes Wadden Sea. Texel, 10 April.
- Philippart, C.J.M., R. Anadón, R. Danovaro, J. Dippner, K. Drinkwater, S. Hawkins, T. Oguz & C. Reid. Climate change impacts on European marine and coastal environments: general trends and sea-specific expectations. Climate change and the European dimension. EC- JRC Workshop, Ispra, Italy, 26-27 April.
- Piersma, T. Energy budgets and phenotypic flexibility of animals. Topmaster course in adaptation, biocomplexity and conservation, Groningen University, November.
- Piersma, T. Dierecologie: habitatkeus en aantalsveranderingen van dieren in een veranderende wereld / Animal ecology: habitat choice and changing numbers of animals in a changing world. Inaugural lecture, Groningen University, 21 February.
- Piersma, T. Ecological niches of the Wadden Sea: soft effects of climate changes, hard effects of men's actions. Symposium Waddenvereniging, Leeuwarden, 7 April.
- Piersma, T. Feeding ecology of waterbirds in the Wadden Sea: is it the bottleneck for birds feeding on shellfish or worms? Symposium Nationalpark Niedersachsen, Wilhelmshaven, Germany, 31 August.
- Piersma, T. Intertidal foodweb studies. NEBROC course, NIOZ, Texel, 13 November.
- Piersma, T. The benthic life of Roebuck Bay. Seminar Groningen University, 18 September.
- Piersma, T. The importance of wilsternetting for applied and fundamental population-ecological research. Symposium Utrecht University, 27 April.
- Piersma, T. The physiology of long-distance migration. Plenary lecture at the Conference of the American Physiological Society, Virginia Beach Convention Center, USA, 8 October.
- Piersma, T. The role of disease in the distribution and abundance of free-living animals. Seminar Erasmus Medical Centre, Rotterdam, 1 March.
- Piersma, T. Using the power of comparison to explain habitat use and migration strategies of shorebirds world-wide. Plenary Lecture, 24th International Ornithological Congress, Hamburg, Germany 19 August.
- Piersma, T. Wader research in northern Netherlands. Women's Club Gaast, Gaast, 31 January.
- Piersma, T. What it's like to be a knot? Towards a cognitive ecology of shorebirds. Whitherby Lecture, Annual conference of the British Trust for Ornithology, Swanwick, U.K., 9 December.
- Piersma, T. Why do shorebirds need a whole world to survive? Lecture Scholierenacademie, Groningen University, 1 December.

- Piersma, T. World-wide conservation connectors: community involvement in the study of migrant shorebirds under pressure. Symposium in honour of Heineken Prize laureate Stuart Pimm, Wageningen University, 29 September.
- Powers, L.A., T.C. Johnson, J.P. Werne, I.S. Castañeda, E.C. Hopmans, J.S. Sinninghe Damsté & S. Schouten. Recent effects of climate forcing on Lake Malawi surface temperatures: A possible shift in tropical climate response. HOLIVAR 2006 open science meeting, London, UK, 12-15 June.
- Raghoebarsing, A.A., A.J.P. Smolders, M.S.M. Jetten, J.S. Sinninghe Damsté, M. Strous, H.J.M. Op den Camp. Symbionts provide carbon for photosynthesis in peat bogs. 11th International Symposium on Microbial Ecology (ISME-11), Vienna, Austria, 20-25 August.
- Reinthal, T., E. Sintes & G.J. Herndl, Dissolved organic matter, bacterial production and respiration in the sea-surface microlayer of the open Atlantic and the western Mediterranean Sea. SOLAS/IMBER/GEOT-RACERS meeting, Amsterdam, 9 May.
- Richter, T.O., N. Caillon, E. Cortijo, L. Labeyrie, F. Peeters & T.C.E. van Weering. Late Holocene (0-2.4ka BP) surface water temperature and salinity variability, Feni Drift, NE Atlantic Ocean (56°N 14°W). Dutch Climate Variability Symposium, Amsterdam, 10 October.
- Richter, T.O., N. Caillon, E. Cortijo, L. Labeyrie, F. Peeters, F. Mienis, H.C. de Stigter & T.C.E. van Weering. High-resolution 0-2.4ka BP surface water temperature and salinity reconstructions, Feni Drift, NW Atlantic Ocean (56°N 14°W), based on $\delta^{18}\text{O}$ and Mg/Ca in planktonic foraminifera. European Geosciences Union General Assembly, Vienna, Austria, 2-7 April.
- Ridderinkhof, H. Observations from the new ferry dr. Wagemaker on the route den Helder-Texel in the Dutch Wadden Sea, Ferrybox meeting, Oslo, 23 October.
- Ridderinkhof, H. The need for long-term sustained observations in the Dutch coastal zone. RAK symposium, KNAW, Amsterdam, 16 Mei.
- Sangiorgi, F., H.-J. Brumsack, S. Schouten, H. Brinkhuis, M.A. Kaminski, G.-J. Reichart, C. E. Stickley, D. A. Willard & J.S. Sinninghe Damsté. The gap in the Arctic Cenozoic record: expect the unexpected. AGU Fall Meeting, San Francisco, USA, 11-15 December.
- Schilling, J. Improved Mooring Cable Stopper. Inmartech 2006. Bi-annual Symposium on Marine Technology for Sea Research at Woods Hole Oceanographic Institution, USA, 17-19 October.
- Schouten, S. Molecular fossils: From organisms to ancient seawater temperatures. Geoflex student group, Free University of Amsterdam, Amsterdam, 9 February and University of California, Riverside, USA, 3 April.
- Schouten, S. Tetraether membrane lipids. From nitrifying archaea to Cenozoic temperatures. University of Bristol, Bristol, UK, 3 November.
- Schouten, S., J. Weijers, E. Hopmans, J. van den Donker & J.S. Sinninghe Damsté. Development and application of a novel organic proxy for continental paleotemperature reconstructions. STOPFEN-symposium, Free University of Amsterdam, Amsterdam, 20 October.
- Sinninghe Damsté, J.S. & S. Schouten. Werking van de TEX₈₆ palaeothermometer. ACEX press conference. Utrecht, 29 May.

- Sinninghe Damsté, J.S. Application of molecular organic chemistry in biogeochemistry, palaeoclimatology and chemical evolution. Bristol University, Bristol, UK, 13 March.
- Sinninghe Damsté, J.S. De rol van Archaea in de mariene stikstofcyclus. Lezing voor de sectie Aardwetenschappen van de KNAW. Trippenhuis KNAW, Amsterdam, 30 January.
- Sinninghe Damsté, J.S. Determining ancient sea surface temperatures with fossil archaeal lipids. Mozaik bijeenkomst, Utrecht, 13 April.
- Sinninghe Damsté, J.S. Een wetenschappelijke blik op het boek "Life: A journey through Time" van Frans Lanting. Naturalis, Leiden, 22 September.
- Sinninghe Damsté, J.S. Fossiele membraanlipiden van archaea ontrafelen het aardse klimaat van 50-100 miljoen jaar geleden. Chemistry BC symposium. University of Nijmegen, Nijmegen, 16 March.
- Sinninghe Damsté, J.S. Microbial lipids as ecological tracers: Examples from crenarchaeota, anammox bacteria and methanotrophs. Max Planck Institute for Marine Microbiology, Bremen, Germany, 29 June.
- Sinninghe Damsté, J.S. Moleculen uit een ver verleden. Oratie Universiteit Utrecht. Utrecht University, Utrecht, 13 January.
- Sinninghe Damsté, J.S. Oceanen vol Archaea: hun rol in de stikstofcyclus en toepassing in palaeothermometries van de "broeikasgas" aarde. Trippenhuis KNAW, Amsterdam, 18 December.
- Sinninghe Damsté, J.S., A. Forster & S. Schouten. Oceanic Anoxic Events: current understanding from an organic geochemical perspective. AGU Fall Meeting, San Francisco, USA, 11-15 December.
- Sinninghe Damsté, J.S., J. Ossebaar & S. Schouten. TEX₈₆ palaeothermometry of Lake Challa sediments: results from the first year. Challacea project meeting. Trippenhuis KNAW, Amsterdam, 20 September.
- Sinninghe Damsté, J.S., J. Ossebaar, S. Schouten & D. Verschuren. A new palaeoproxy for lake temperatures based on crenarchaeotal lipids: application in Lake Challa, East Africa. European Geosciences Union Meeting, Vienna, Austria, 2-7 April.
- Sinninghe Damsté, J.S., J. Ossebaar, S. Schouten & D. Verschuren. A new palaeoproxy for lake temperatures based on crenarchaeotal lipids. 8th Nederlands Aardwetenschappelijk Congres (NAC 8), Veldhoven, 24-25 April.
- Sinninghe Damsté, J.S., S. Schouten, S. Rampen, B. Abbas & G. Muyzer. De evolutie van kiezelwieren: Een reconstructie met behulp van chemische fossielen en moleculaire fylogenie. Paleobiologische Kring. Naturalis, Leiden, 17 February.
- Sintes, E. & G.J. Herndl. Bacteria in the sea-surface microlayer: response to solar radiation and DOM utilization. Ocean Sciences Meeting, Honolulu, Hawaii, USA, 20-24 February.
- Sluijs, A., H. Brinkhuis, S. Schouten, J.C. Zachos, S. Bohaty, C. John, R. Deltrap, G.-J. Reichart, J. Sinninghe Damsté & E. Crouch. Global warming leads the carbon isotope excursion at the Paleocene-Eocene thermal maximum. AGU Fall Meeting, San Francisco, USA, 11-15 December.
- Sluijs, A., S. Schouten, H. Brinkhuis, J.S. Sinninghe Damsté, G.R. Dickens, M. Huber, G.-J. Reichart, M. Pagani & L.J. Lourens. A subtropical North Pole during the late Paleocene - early Eocene. European Geosciences Union Meeting, Vienna, Austria, 2-7 April.

- Sluijs, A., S. Schouten, H. Brinkhuis, M. Pagani, J.S. Sinninghe Damsté, G.R. Dickens, M. Huber, G.-J. Reichert & L.J. Lourens. Subtropical late Paleocene - early Eocene sea surface temperatures on the North Pole. 8th Nederlands Aardwetenschappelijk Congres (NAC 8), Veldhoven, 24-25 April.
- Smit, M.G. Pressure Retaining Deep-sea Sampler. Inmartech 2006. Bi-annual Symposium on Marine Technology for Sea Research at Woods Hole Oceanographic Institution, USA, 17-19 October.
- Stadnitskaia, A. Data from different settings: Occurrence and structural control of gas hydrates in the Black Sea, the Gulf of Cadiz and other fluid venting areas. Vrije Universiteit Amsterdam (VU), NSG - Netherlands Research School for Sedimentary Geology course for PhD students "Gas hydrates – why do they matter? Fiction and facts about gas hydrates systems", Vrije Universiteit, Amsterdam, 14 September.
- Stadnitskaia, A., Anaerobic oxidation of methane and related carbonate precipitation. Vrije Universiteit Amsterdam (VU), NSG - Netherlands Research School for Sedimentary Geology course for PhD students "Gas hydrates – why do they matter? Fiction and facts about gas hydrates systems", Vrije Universiteit, Amsterdam, 14 September.
- Stadnitskaia, A. & J.S. Sinninghe Damsté. Shifts in methanotrophic community as a response to different fluid venting environments. Nile deep-sea fan, Eastern Mediterranean. 8th Nederlands Aardwetenschappelijk Congres (NAC 8), Veldhoven, 24-25 April.
- Stadnitskaia, A. Biogeochemical processes at deep-sea fluid/methane venting environments – Geochimica Actie – Geochemistry seminars, Utrecht University, Utrecht. 28 October.
- Stüsser, I., P. Hofmann, T. Wagner, S. Schouten & J.S. Sinninghe Damsté. Rapid climate response to the Lower Cretaceous Oceanic Anoxic Event 1b. European Geosciences Union Meeting, Vienna, Austria, 2-7 April.
- Ten Hallers-Tjabbes, C.C. & W.C. Verboom. Overview of gaps in science knowledge. Paper presented at Conference 'Underwater Sound and Marine Life.' Organised by the Inter-Agency Committee for Marine Science and Technology (IACMST) and the Institute of Marine Engineering, Science and Technology (IMarEST), London, UK, 9 October.
- Ten Hallers-Tjabbes, C.C. Ballast Water Scoping Study, North Western Europe. ICES/IOC/IMO Working Group on Ballast Water and Other Ship Vectors (WGBOSV), Oostende, Belgium, 13-15 March.
- Ten Hallers-Tjabbes, C.C. Bioprovinces, concepts and realities; recent developments (Ocean Sciences Meeting, February 2006). ICES/IOC/IMO Working Group on Ballast Water and Other Ship Vectors (WGBOSV), Oostende, Belgium, 13-15 March.
- Ten Hallers-Tjabbes, C.C. Impact and Interaction of Contaminants in the Ems-Dollard Estuary Ecosystem. Nature and shipping developments Ems, NL Institute for Coastal Management (RIKZ-RWS), Haren, 28 March.
- Ten Hallers-Tjabbes, C.C., W.C. Verboom & R.A. Kastelein. Marine animal acoustic windows and human-generated noise; what activities pose a risk and which organisms are vulnerable. Ocean Sciences Meeting, Honolulu, USA, 20-24 February.

- Thomsen, L., P. Mendes, R. Novoa, H.C. de Stigter & T.C.E. van Weering. Organic rich particle transport in submarine canyons. EGU General Assembly, Vienna, Austria, 2-7 April.
- Vahl, W.K. Competition and the spatial distribution of foraging animals. International Ornithological Union, pre-symposium on 'seabirds and their food stocks', Texel, 9 August.
- Vahl, W.K. Interference Competition and the Dynamics of Populations. Top master course in advanced evolutionary ecology. Groningen University.
- Vahl, W.K., G.S. van Doorn & F.J. Weissing. Why do foragers fight for food? Unifying models of interference competition. 11th International Behavioral Ecology Congress, Tours, France, 23-29 July.
- van Aken, H.M. & M.F. de Jong, Deep Convection in the Irminger Sea. Galway, Ireland 19-22 April.
- van Aken, H.M. & M.F. de Jong. Hydrographic variability of the Irminger Sea, with focus on the intermediate water masses, Colloquium in commemoration of the 65th birthday of Prof. Dr. Jens Meincke, Institut für Meereskunde, Universität Hamburg, Germany 11-12 October.
- van Aken, H.M. & M.F. de Jong. New evidence for deep convective mixing in the Irminger Sea, Ocean Sciences Conference, Honolulu, 20-25 February, Abstract 1201, paper number OS24G-04.
- van Aken, H.M. LOCO, The Netherlands. OCEANSITES International Time Series Science Team meeting, Honolulu, Hawaii, USA, 16-19 February.
- van Aken, H.M. On the climatic variability of the thermohaline circulation. Club du Soleil, KNAW, 13 April.
- van Aken, H.M. The Atlantic Thermohaline Circulation and its variability. RAK/DARWIN Centre symposium, 16 May.
- van Bommel, R. Gebromeerde vlamvertragers en de overslag naar mariene milieu. Texel Bijeenkomst Nederlandse Vereniging Veiligheidskundigen Regio Noordwest Nederland, 14 December.
- van der Meer, J., I.M. Smallegange & W.K. Vahl. Interference competition and the spatial distribution of foragers. Invited lecture, Current Themes In Ecology 11: Ecological implications of adaptive behavior, Wageningen, 3 November.
- van der Meer, J. Flow of energy and matter in marine benthic animal populations. Lecture series in student course on marine ecosystem ecology, Groningen University, 8-9 June.
- van der Meer, J. Interference competition. Seminars in ecology, environmental studies and geology, Umeå University, Sweden, 6 December.
- van der Meer, J. The Metabolic Theory of Ecology (MTE) and the theory of Dynamic Energy Budgets (DEB) (and more). NVTB Symposium on New developments in mathematical biology: Physiology based models and adaptive dynamics, Vrije Universiteit Amsterdam, 7 November.
- van der Meer, J. Waargenomen veranderingen gedurende de laatste decaden in het ecosysteem van de Waddenzee en de Noordzee-kustzone en mogelijke oorzaken. One-day symposium on long-term trends in the Wadden Sea and North Sea, Texel, 10 April.
- van der Meer, M.T.J. & S. Schouten. Controls on the stable hydrogen isotopic composition of alkenones: Towards an organic paleosalinity proxy? Paleosalt kick-off meeting, Brussel, Belgium, 17-18 May.

- van der Veer, H.W., S. Skreslet, J. Cardoso, J. Campos & V. Freitas. The functioning of coastal ecosystems: progress made by the joint research project of NIOZ, CIIMAR and HIBO. CIIMAR annual meeting, Portugal, 19-21 October.
- van Duyl, F.C. Microbial ecology of coral reefs. Amsterdam University, 16 November.
- van Duyl, F.C. Promise-Sea support and stable isotope studies on the trophoecology of Caribbean coral reef sponges. 1st Annual Meeting of the EU Sponges project. Tallinn, Estonia, 4 November.
- van Duyl, F.C., J.M. de Goeij, A. Hoogstraten, C. Maier & M.M. van Oostveen. Sponge-associated prokaryotes: abundance, community composition and their possible role in the nutrition of the host. 7th International Sponge Symposium, Búzios, Brasil, 7-13 May.
- van Duyl, F.C., L. Moodley, J.M. de Goeij, G. Nieuwland, A. de Kluijver, L. van IJzeloo & R. Rutgers. Isotope tracer studies on the trophoecology of the cryptic encrusting coral reef sponge *Halisarca caerulea*. 6th European Meeting Int. Soc. Reef Studies (ISRS), Bremen, Germany, 18-22 September.
- van Haren, H. Inertial-tidal shear and internal wave band broadening in the ocean. Sixth International Symposium on Stratified Flows, Perth WA, Australia, 11-14 December.
- van Haren, H. Near-inertial internal wave propagation and shear in different ocean areas. SEOS, University of Victoria, B.C. Canada, 1 March.
- van Haren, H. Sloping bottom processes in the Faeroe-Shetland Channel. SAMS, Oban, UK, 17 January.
- van Haren, H., M. Inall & J. Huthnance. Solibore induced slope mixing in the Faeroe-Shetland Channel. Ocean Sciences Meeting, Honolulu, HI, USA, 20-24 February.
- van Soest, R.W.M., F.C. van Duyl & C. Maier. Rockall Bank deepwater sponge population. 7th International Sponge Symposium, Búzios, Brasil, 7-13 May.
- van Soest, R.W.M., M.S.S. Lavaleye, G.C. Duineveld, C. Maier & F.C. van Duyl. Diversity of sponges in bathyal coral reefs of the North East Atlantic. 7th International Sponge Symposium, Búzios, Brasil, 7-13 May.
- van Weering, T.C.E. Challenges in Marine Research, Geological processes on Deep water European Margins. 15th Training Through Research Conference, Moscow, Russia, 29 January-4 February.
- van Weering, T.C.E. Pockmarks and Gashydrates, Short Course on Gashydrates, Vrije Universiteit Amsterdam, 14 September.
- van Weering, T.C.E. Sedimentary systems, Course Vrije Universiteit Amsterdam, Febr-March.
- van Weering, T.C.E., F. Mienis, T. Richter, C. van der Land, H. de Haas, H.C. de Stigter, H. Vonhof & M. van Breukelen. Coldwater corals and associated fauna from Rockall Trough Margin Carbonate Mounds: stable isotope chemistry and paleoceanographic application. International Society for Reef Studies Meeting, Bremen, Germany, 19-22 September.
- Varela, M.M., H.M. van Aken & G.J. Herndl. Bacterial and archaeal utilization of enantiomeric amino acids in the deep North Atlantic Ocean. ISME-11 Meeting, Vienna, Austria, 24 – 29 August.
- Veldhuis, M.J.W. Addressing viability in planktonic water and in particular for ballast water research. Northeast Midwest Institute, Washington D.C., Duluth, USA, 15 June.

- Veldhuis, M.J.W., J.P. Boon, F. Fuhr & C.C. Ten Hallers-Tjabbes. Treatment of ballast water: how to test a system with a modular concept. WGBOSV/ICES, Oostende, Belgium, 13 -15 March.
- Veldhuis, M.J.W. To stop the invasion of the aliens; how can marine scientists help to clean the ballast water of ships? Bigelow Laboratory of Ocean Sciences, Boothbay Harbour, USA, 20 November.
- Vézina, F. Conditions écologiques hivernales et ajustements physiologiques chez le bécasseau maubèche (*Calidris canutus*). Canadian Wildlife Service, Québec city, Canada.
- Vézina, F. Conditions écologiques hivernales et ajustements physiologiques; l'exemple du bécasseau maubèche (*Calidris canutus*), un oiseau au phénotype très flexible. Université de Sherbrooke, Sherbrooke, Canada; Université du Québec à Rimouski, Canada.
- Vézina, F., K. Jalvingh, A. Dekinga & T. Piersma. Ajustements physiologiques associés à l'acclimatation au froid chez le bécasseau maubèche. Société Québécoise pour l'Étude Biologique du Comportement, Montréal, Canada.
- Wagner, T., B. Beckmann, S. Floegel, P. Hofmann, S. Schouten, J.S. Sinninghe Damsté & K. Wallmann. Timescales and Mechanisms of Rapid Redox Change in the Mid-Cretaceous Ocean. AGU Fall Meeting, San Francisco, USA, 11-15 December.
- Walker, P., C.J.M. Philippart & A.P. Oost. Other fish to fry: or how to reach sustainable fishery in the North Sea during a period of climate change? ICES annual meeting, Maastricht, 20 September.
- Weijers, J.W.H., S. Schouten, E.C. Hopmans, J.C. van den Donker and J.S. Sinninghe Damsté. Continental temperature and soil pH reconstruction with membrane lipids from soil bacteria, Gordon Research Conference on Organic Geochemistry, Holderness School, Plymouth, NH, USA, 6-11 August.
- Wernand, M.R. De geheimzinnige kleuring van water. Vanaf Bacon tot Raman. Sonnenborgh - museum & sterrenwacht, Utrecht, 26 October.
- Wernand, M.R. Estimating phytoplankton biomass in case ii waters using a flh 2-band algorithm. OOXVIII Conference, Montreal, Canada.
- Werne, J. Temperature quantitatively in lacustrine systems: Development and application of the TEX₈₆ paleothermometer. 10th International Paleolimnology Symposium, Duluth, Minnesota, USA, 25-29 June.
- Witte, J.I.J. Bloemdieren. Stichting de Heimanshof, Hoofddorp, 2-3 December.
- Witte, J.I.J. Harder en zeebaars in de NIOZ fuik. Visvereniging 't Kuitje. Breezand, 27 oktober.
- Zemmelink H.J., B. Delille, E.J. Hintsa, L. Houghton & J.W.H. Dacey. CO₂ deposition over the multi year ice of the western Weddell Sea. 1st ISPOL Workshop, Tvärminnen, Finland, 9 - 12 March.
- Zemmelink H.J., L. Houghton, J.W.H. Dacey, J. Stefels, B.P. Koch, M. Schröder, A.S. Wisotzki, A. Scheltz, D.N. Thomas, S. Papadimitriou, H. Kuosa & T. Dittmar. The biogeochemistry of subsurface lead water in pack ice. 4th International Symposium on Biological and Environmental Chemistry of DMS(P), Norwich, UK, 2-6 May.

EXTERNAL PROFESSIONAL FUNCTIONS

R.P.M. Bak

- Professor Tropical Marine Biology, Amsterdam University
- Member International Advisory Board. Center for Tropical Ecology, Bremen
- Editorial Advisor Marine Ecology Progress Series
- Member Board Foundation for Scientific Research Surinam and the Netherlands Antilles

M.J.N. Bergman

- Member ICES Working group on benthos ecology
- Member ICES Working group on ecosystem effects of fishing activities
- Member Raad van overleg voor het fysisch-oceanografisch onderzoek Noordzee - overleggroep Bodem

G.C. Cadée

- Editor Journal of Sea Research
- Associate editor ICHNOS
- Board member 'Nederlands Vlaamse Kring van Diatomisten
- Associate editor Senckenbergiana Maritima
- Member commissie voor de geschiedenis van de aardwetenschappen, KNAW
- Editorial board Natura, KNNV

C.J. Camphuysen

- Member editorial board Marine Ornithology
- Editor Atlantic Seabirds
- Coordinator EC project on Impact of oil spills on seabirds, DG Environment
- Member of the ICES Working group on seabird ecology

C.J.M. Philippart

- Editor-in-Chief Journal of Sea Research
- Co-ordinator "MarPACE: Marine Propagation Along the Coasts of Europe" (Responsive mode project of the EU Network of Excellence on Marine Biodiversity and Ecosystem Functioning)
- Lecturer Marine biology course, IBED, Amsterdam University.
- Lecturer Marine sciences course, Utrecht University
- Member Commissie MER working group 'Aardgaswinning Waddenzeegebied vanaf lokaties Moddergat, Lauwersoog en Vierhuizen'
- Member Commissie MER working group 'PKB Derde Nota Waddenzee'

- Chair of the Working Group of the Marine Board of the European Science Foundation on 'Climate Change Impacts on the European Marine and Coastal Environment'
- Member of the Working Group of the Joint Research Council of the European Commission on "A European Marine and Coastal Dimension to Climate Change"

M.S.S. Lavaleye

- Member of the ICES Study Group on the North Sea Benthos Project

T. Piersma

- Professor in Animal Ecology, Groningen University
- Vice-chairperson of the International Wader Study Group
- Chairman of the Biologysk Wurkferbân of Fryske Akademy, Ljouwert
- Editor of Journal of Avian Biology
- Member editorial board Current Ornithology, Plenum Press, New York
- Member editorial board of Journal of Ornithology
- Board member of the Centre for African Wetlands, University of Ghana, Accra, Ghana
- Member of Committee of Experts for Natuurmonumenten
- Member of board It Fryske Gea
- Member of the Conseil Scientifique of the Parc National du Banc d'Arguin, Mauritania
- Chairman of the Global Flyway Network

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J. van der Meer

- Member of the Scientific Advisory Board SOVON
- Honorary Research Fellow of the School of Biological Sciences, University of Aberdeen

H.W. van der Veer.

- Associate professor of zoology, North Carolina State University, Raleigh. USA
- Adjunct associate professor of marine science, University of South Carolina, Columbia, USA
- Member of the ICES working group on recruitment processes
- Member organizing committee 7th International Symposium on Flatfish Ecology. Lisbon, Portugal
- Guest editor Proceedings 6th International Symposium on Flatfish Ecology

T.C.E. van Weering

- Professor Paleoceanography Free University, Amsterdam
- Adjunct Professor Marine Geosciences International University of Bremen
- Member Editorial Board of: Marine Geology
- Member Editorial Board Boreas

- Member Editorial Board International Journal of Earth Sciences/Geol.Rundschau
- Guest Editor Special issue of JASES Red River Delta
- Guest editor Special Issue Marine Geology Canyons
- Chairman GAG Bodem systemen en seismiek (NWO/ALW)
- Chair joint Gebruikersgroepen MRF
- Lid commissie Mariene Faciliteiten(NWO/ALW)
- Lid commissie Toekomst Pelagia (NIOZ)
- Lid commissie "East Kalimantan Programme for Coastal Zone Research Netherlands/ Indonesia" (NWO/KNAW)
- Lid beoordelingscommissie Promotiebeurzen IWT, Brussel

J.H.F. Jansen:

- Member NIOC (Netherlands Integrated Ocean Drilling Program Committee).
- Member Working Group INQUA Nederland.
- Member Peer Review Committee of the Hanse Wissenschaftskolleg in Delmenhorst, Germany.

G.-J. Brummer

- Coordinator Bilateral Cooperation Programme NWO-DFG "Divalent cations: development and validation of proxies"
- Advisory member ESF-EUROCLIMATE programme
- Member NWO/ALW 'Gebruikers-adviesgroep verankerde instrumentatie'
- Member Steering Group NIOP II
- Member EuroClimate "Paleosalt" advisory committee
- Co-promotor of PhD-thesis of S.-M.H. Conan at the Vrije Universiteit

A. Forster

- Corresponding member "Deutsche Subkommission für Kreide-Stratigraphie" (Cretaceous stratigraphic sub-commission Germany)

S. Schouten

- Associate editor Organic Geochemistry
- Member of the editorial board of Geology
- Member of the steering committee International Census of Marine Microbes
- Member of the scientific committee of NEBROC.
- Member of review panel BioGeosphere, Open Competition Program, NWO-ALW

J.S. Sinninghe Damsté

- Professor University of Utrecht, Faculty of Geosciences
- Member of the Royal Dutch Academy of Science (KNAW)
- Member of the scientific steering committee of the Darwin Centre for Biogeology
- Member of the Science Committee of the NIOO
- Member of the VICI selection committee of ALW-NWO
- Member of the equipment committee of ALW-NWO
- Associate editor *Geochimica et Cosmochimica Acta*

C.C. Ten Hallers-Tjabbes

- Advisor to IUCN for the London Convention 1972
- Advisor to IUCN for the International Maritime Organization, London (IMO)
- IUCN Representative for the Marine Environment Protection Committee of the IMO
- Lady Chairman Animal Navigation Group, Royal Institute of Navigation, London, UK
- Representative for IUCN at the Global Project Task Force – GloBallast Partnership PDF-B Project

H.M. van Aken

- Member ICES Oceanography Committee
- Member ICES Working Group on Oceanic Hydrography
- Chairman ALW “gebruikersadviesgroep CTD-systemen”
- Member OCEANSITES International Time Series Science Team

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T.F. de Bruin

- Chair - Netherlands National Oceanographic Data Committee (NL-NODC)
- Chair - Joint SCAR/COMNAP Committee on Antarctic Data Management (JCADM)
- Co-Chair – International Polar Year (IPY) Data Policy and Management Subcommittee (IPY-SCDPM)
- IODE national coordinator for data management
- Member – ICES Working Group on Marine Data Management (ICES-WGMDM)
- Member Steering Committee of the Marine Metadata Interoperability (MMI) project
- Member Ad Hoc SCAR Advisory Committee on the International Polar Year (IPY)
- Member National IPY Committee of the Netherlands
- Member Review Team of the British Oceanographic Data Centre for the NERC Quinquennial review of science programmes at the Marine Centres – OCEANS 2025 proposal
- Theme Leader Session: Strategies for Data Presentation and Management – SCAR Open Science Conference
- Co-convenor data session at CODATA2006: The International Polar Year (IPY): An Opportunity for Innovation in International Data Exchange and Interdisciplinary Science

T. Gerkema

- Associate member SCOR Working-Group 121 on Deep-ocean mixing
- Co-directeur de thèse (Rudy Maugé, Université de Bretagne Occidentale, France, 21 December)

L.R.M. Maas

- Member thesis defence committee of Louis Gostiaux, Ecole Normale et Supérieure Lyon

H. van Haren

- Member editorial board Journal of Sea Research
- Topic editor Ocean Science.
- Chairman 'ALW gebruikersadviesgroep Verankerde Instrumentatie'
- Co-convenor AGU 13th Ocean Sciences Meeting session 'Ocean mixing', Honolulu, Hawaii, USA

H. Ridderinkhof

- Member 'Beleidsadviescommissie Aardwetenschappen ALW - NWO'
- Member 'Programma commissie NCK'
- Member 'Raad voor Aarde en Klimaat (RAK – KNAW)'
- Member 'commissie Milieu Effect Rapportage (MER)'

M.R. Wernand

- European Science Foundation, Marine Board Working on the Remote Sensing of Shelf Sea Ecosystems
- NIOZ-representative European Association of Remote Sensing Laboratories
- Member of Light and Water working group The Netherlands
- Member of Historische Oceanografie Club

J.T.F. Zimmerman

- Professor Physical Oceanography, Utrecht University.

G.J. Herndl

- Professor of Biological Oceanography, Dept. of Marine Biology, Univ of Groningen
- Member of the IMBER/SOLAS working group on Carbon Research
- President of the Microbiology Section of the CIESM (Commission of the Scientific Exploration of the Mediterranean Sea)
- Appointed Reviewer for and Adviser to the Research Council of Norway for Terrestrial and Aquatic Microbial Ecology and Biotechnology (2000-2003, 2004-2007)
- Member of the VENI review panel for ALW/NWO

- Associate member of the SCOR working group 126: Role of viruses in marine ecosystems
- Associate Editor of Aquatic Microbial Ecology
- Associate Editor of P.S.Z.N.I.: Marine Ecology
- Associate Editor of Limnology & Oceanography: Methods

M.J.W. Veldhuis

- Associate member SCOR working group 120: Phaeocystis
- Member ICES/IOC/IMO Working Group on Ballast Water and other Ship Vectors (WGBOSV)
- Member ICES/IOC/IMO Working Group on Introduction and Transfer of Marine Organisms
- Member working group IMO-Globallast working group on Ballast water issues
- Member external advisory board Northeast Midwest Institute, Washington D.C. USA

M.A. Baars

- Advisor Rijkswaterstaat project: Towards Remote Sensing Supported Monitoring of the North Sea (ToRSMoN, National Program GO)

F.C van Duyl

- Member European Scientific Diving Committee
- Appointed reviewer for the International Science Foundation (IFS)
- Appointed reviewer Marine Ecology Progress Series

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C.P.D. Brussaard

- Core member of the SCOR working group 126: Role of viruses in marine ecosystems

K.R. Timmermans

- Member Board WG Aquatic Ecology, Nederlands-Vlaamse Vereniging voor Ecologie (NECOV)

H.J.W. de Baar

- Professor of Oceanography, and Chair Ocean Ecosystems Department, Groningen University
- Associate editor Marine Chemistry
- Member international Scientific Steering Committee GEOTRACES
- International coordinator GEOTRACES initiative, International Polar Year
- Member International Joint SCAR/SCOR Expert Group for Oceanography
- Chairman Netherlands SCOR Committee, Royal Netherlands Academy of Sciences (KNAW)
national delegate to SCOR
- Member Netherlands SCAR Committee, Royal Netherlands Academy of Sciences (KNAW)
- Member Global Change Committee, Royal Netherlands Academy of Sciences (KNAW)

- Member Scientific Steering Committee Netherlands-Bremen Oceanography (NEBROC-2)
- Vice-chair Scientific Steering Committee CarboOcean Integrated Project, EU Framework Program VI
- External adviser Belgian research Carbon uptake in the ANTArctic Ocean (BELCANTO)
- Chairman Users Advisory Group Nutrients Analyses, national Marine Research Facilities
- Member Users Advisory Group CTD systems, national Marine Research Facilities
- Life member Clare Hall College, Cambridge

J.W. de Leeuw

- Professor in Organic Geochemistry, Dept. of Earth Sciences, Utrecht University
- Professor in Molecular Biogeology, Dept. of Biology, Utrecht University
- Member Board of European Association of Organic Geochemistry (EAOG)
- Member Editorial Advisory Board Organic Geochemistry
- Member Royal Dutch Academy of Sciences (KNAW)
- Exec. Board member Marine Board European Science Foundation (MB/ESF)
- Member CLIVARNET/Klimaatvariabiliteit committee NWO
- Member Partnership Observation of the Global Oceans (POGO). Chair POGO since 01/12/2004
- CoPI of Census of marine Life programme ICoMM (International Census of Marine Microbes)
- Chair Club du Soleil (RAK/KNAW)
- Member Scientific Committee Plymouth Marine Lab. (UK)
- Member foresight committee Energy conversion
- Member evaluation team ECORD/IODP

H.J. Lindeboom

- Member Committee Polar Research

M.J. Rietveld

- Chair International research Ship Operators Meeting' (ISOM)
- Member Ocean Facilities Exchange Group (OFEG)
- Member European Research vessel Operators (ERVO)
- Member ESF Marine Board Ocean Research Fleets Working Group (OFWG)
- Member POGO Working Group Research Vessels and Cruises Database
- Member Interdepartementaal Overleg Zeegaande Vaartuigen (IOZV)

MEETINGS, COURSES AND COLLOQUIA HELD AT THE NIOZ

Meetings

Annual meeting ICES Working Group on Seabird Ecology, 3-7 April.

Workshop ICES Study Group on the North Sea Benthos Project, 10-13 April.

Annual meeting NWO-DFG Bilateral Cooperation Programme "Divalent cations: development and validation of proxies". NIOZ, 12-13 January.

VAMOC/RAPID 2nd annual meeting. Cambridge, UK, 8-9 May.

Paleosalt kick-off meeting, Brussels, Belgium, 17-18 May.

"6C" (EU) concluding meeting, Cabara, France, 12-15 September.

Annual meeting of the EU-FP5 project "C6", Texel, January.

Courses

Course 'Marine Ecosystems' (RUG), 12 -30 June. Contact person prof. dr. G.J. Herndl.

During the first week, lectures were given at the University of Groningen (RUG) on the composition and regulation of pelagic and benthic food webs in the different ecological provinces of the world's oceans in general and the North Sea in particular. The second and the third week were devoted to practical work performed at NIOZ in the BIO and MEE departments. The 24 students were distributed over 9 different topics. Some of the topics were more lab-oriented, others involved more extensive field work. The program comprised research on the metabolism of selected benthic organisms and pelagic communities. Sampling was performed in the North and Wadden Sea with the RV Navicula. Underlying research questions, the methods used and the results obtained were discussed during powerpoint presentations by each group at the end of the course and reported in paper-like manuscripts.

Course 'Introduction to Oceanography' (RUG), 20-31 March. Contact person prof. dr. ir. H.J.W. de Baar.

This annual course started already in 1931 at the Zoological Station in Den Helder, and from 1965 onwards it has been a joint course between NIOZ and the University of Groningen. In 2006 there were 29 students participating including 2 foreign students. The first part comprised introductory lectures and workshop style lectures (mostly presented by the students themselves), followed by a written examination at Groningen, 6-17 February. The practical part coordinated by dr. H. Zemmeling was held at Royal NIOZ from 20 March through 31 March. About 20 NIOZ colleagues contributed to various parts of the course. Three teams of 7-8 students were doing fieldwork in a rotating scheme between (i) two day cruises with RV Navicula in the Wadden Sea, (ii) two day time series biology at the jetty, and (iii) two days time series chemistry at the jetty. Another, fourth, team of 6 students pursued two parallel projects on (iv) organic contaminants and (v) marine optics. The combined datasets of observations on interacting physics, chemistry and biological primary productivity were assembled, interpreted and finally reported by the students in a suite of powerpoint presentations.

Introduction to Marine Science, a NIOZ – Nebroc - Ecolmas Course

Co-ordinator Dr. J. H. Fred Jansen.

The annual course is given to introduce young marine scientists employed as Ph.D students and post-docs into the main fields of marine sciences, i.e. physical and chemical oceanography, marine and benthic ecology as well as marine geochemistry and paleoceanography. The programme is multidisciplinary, all disciplines will be discussed as components of one integrated system. The topics are: the physics of ocean circulation, waves and tides, the chemistry of sea water and benthic processes, the biology of pelagic and benthic ecosystems, the basics of paleoceanography, and socioeconomic aspects of marine research. The course is an established joined course of the Netherlands-Bremen Oceanography (NEBROC) co-operation in marine sciences between NIOZ and four marine institutions in the State of Bremen. Our German partners are the Alfred Wegener Institute for Polar and Marine Sciences (AWI), the Department of Geosciences of the University of Bremen, the Max Planck Institute for Microbiology (MPI), and the Centre for Marine Tropical Ecology (ZMT). During the course, the participants have presented their own research in brief lectures.

The course of 2006 took place at NIOZ from 6 to 17 November, and was attended by 31 PhD students from the Universities of Bremen, Groningen, Utrecht, Vrije Universiteit Amsterdam and Barcelona, the Alfred Wegener Institute in Bremerhaven, and the Royal NIOZ. Other participants came from the Fisheries Research Institute, Maputo, Moçambique, Charles University in Prague, and NITG-TNO, Utrecht.

Advanced Organic Biogeochemistry. ECOLMAS PhD graduate course. Contact Person Dr. S. Schouten

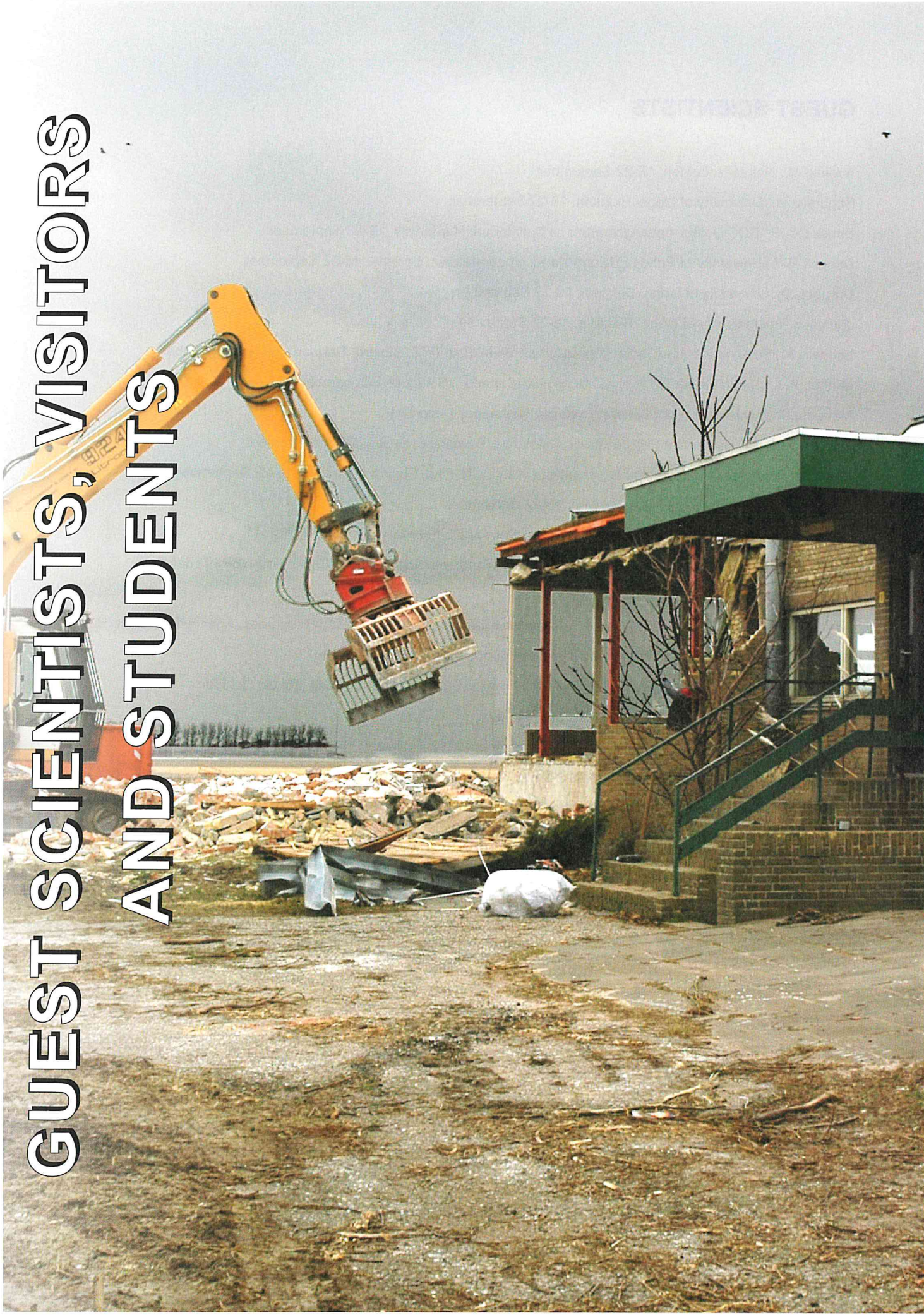


COLLOQUIA

- 9 January. Hein de Baar (NIOZ-BIO). Iron makes big diatoms blooming, but cannot change carbon dioxide and climate.
- 11 January. Dale Kiefer (University of Southern California, USA). Applications of an Oceanographic Information System.
- 12 January. Marck Smit en Ruud Groenewegen (NIOZ-MT). Developments in Marine Technology.
- 26 January. Bruno Ens (Alterra-Texel). Competition for large-sized shellfish between birds and man in a changing ecosystem.
- 2 February. Javier Aristegui (Univ. Las Palmas, Gran Canaria). The biological pump: balancing carbon inputs and respiration in the dark ocean Peter Williams (Univ. Wales). Auditing the ocean's organic carbon budget – should we file for bankruptcy?
- 8 February. Joris van Enst (ASTRON). LOFAR sensor networks for observing the Wadden Sea.
- 8 February. Tom Johnson (Univ. Minnesota, USA). Climate variability in East Africa since the last glacial maximum: ties to the North Atlantic thermohaline circulation?
- 9 February. Nils Volkenborn (AWI-Sylt). Ecosystem engineering in intertidal sand by lugworms as revealed by large scale experimental exclusion: results and perspectives.
- 16 February. Jack Middelburg (NIOO-CEME). Deliberate stable isotope additions to elucidate carbon and nitrogen flows in coastal ecosystems.
- 23 February. Marc Lavaleye (NIOZ-MEE). Deep water coral research in the NE Atlantic.
- 28 February. Rich Pancost (University of Bristol). Applications of organic geochemistry to geomicrobiological investigations: From arsenic in aquifers to hot springs.
- 2 March. Lucas Stal (NIOO-CEME). Current perspectives on the ecology of oceanic N_2 fixation.
- 9 March. Astrid Forster (NIOZ-MBT). Rapid warming & cooling in the mid-Cretaceous tropics: Sea surface temperature records through the Cenomanian/Turonian transition in the equatorial Atlantic.
- 16 March. Klaas Timmermans (NIOZ-BIO). Marine phytoplankton in their dynamic environment: effects of varying nutrient concentrations (N, P, Si, Fe, CO_2) or varying light conditions on (Antarctic) diatoms, picophytoplankton and *Emiliana huxleyi*.
- 23 March. Eva Sintès (NIOZ-BIO). Bacteria in the sea-surface microlayer: response to solar radiation and DOM utilization.
- 30 March. Johan Weijers (NIOZ-MBT). Membrane lipids of soil bacteria as palaeo-environmental indicator.
- 11 April. Jorge Machado (Univ. Porto, Portugal). An Overview on Shell Formation in the Freshwater Clam, *Anodonta cygnea*.
Manuel Lopes- Lima (Univ. Porto, Portugal). Proteoglycan role on the biomineralization mechanisms of the bivalve shell of *Anodonta cygnea*.
- 13 April. Paul Zonneveld (NTI-NLP). “Inward looking out” (How can improved internal communications support your outward look, your processes and your output?).

- 20 April. Tjeerd van Weering (NIOZ-MCG). Continental margins: of more than marginal importance.
- 10 May. Joan Grimalt (CSIC Barcelona, Spain). Recent advancements in the characterization of abrupt climate changes using organic molecular markers.
- 11 May. Theunis Piersma (NIOZ-MEE). Comparative ecology of shorebird populations and the coastal ecosystems they inhabit.
- 24 May. Carme Huguet (NIOZ-MBT). TEX₈₆ Proxy validation.
- 1 June. Kai-Uwe Hinrichs (Univ. Bremen). Molecular-isotopic strategies to study carbon flow and microorganisms in deep subsurface ecosystems.
- 8 June. Fleur van Duyl (NIOZ-BIO). The overlooked role of cryptic habitats in carbon and nitrogen cycling in coral reefs and the remarkable contribution of cryptic sponges and sponge-associated prokaryotes therein
- 15 June. Gerard van der Schrier (KNMI). Bjerknes' hypothesis on the coldness of the "Little Ice Age" revisited.
- 16 June. Mike Jetten (Radboud Univ. Nijmegen). Biodiversity and life style of marine and fresh water anammox bacteria.
- 22 June. Isabel Smallegange (NIOZ-MEE). Crabs in space: where do they forage and why?
- 21 September. Theo Gerkema (NIOZ-FYS). Earth rotation and ocean dynamics: the Coriolis force revisited.
- 28 September. Dirk K. Callebaut (Universiteit van Antwerpen) & Kees de Jager (NIOZ). Recent violent solar activity; causes and effects on Earth
- 5 October. Kees Camphuysen (NIOZ-MEE). Cetacean strandings in the The Netherlands, 1200-2006, and recent changes in the abundance of whales, dolphins and porpoises in the Southern North Sea
- 17-22 September. Mardik Leopold (IMARES Texel) & Kees Camphuysen (NIOZ-MEE). Preliminary results of necropsies performed in the NIOZ harbour (), on stranded harbour porpoises collected in The Netherlands
- 11 October. Martin Könneke (University of Oldenburg). Isolation of a marine mesophilic crenarchaeon implies archaeal nitrification and autotrophy in the Ocean
- 19 October. Joerg Ott (Univ. of Vienna, Austria). Marine thiotrophic symbioses: from mangroves to medicine.
- 2 November. Gerhard Herndl (NIOZ-BIO). Bacterial and archaeal function and diversity in the major deep water masses of the North Atlantic.
- 16 November. Jan W. de Leeuw (NIOZ-MBT). On the natural sequestration of CO₂
- 23 November. Marcel van der Meer (NIOZ-MBT). Stable hydrogen isotopic composition of long chain alkenones: Biological controls and applications
- 30 November. Alejandro Purgue (Cornell University, USA). A model for the physics of whale sound production and the development of a telemetry system to validate the model

GUEST SCIENTISTS, VISITORS AND STUDENTS



GUEST SCIENTISTS

Addink, M., Naturalis, Leiden, 18-22 September.

Beguerie, H., University of Liege, Belgium, 18-22 September.

Bunskoek, P., SOS Dolfijn, opvangcentrum bij Dolfinarium Harderwijk, 18-22 September.

Daoust, P.-Y., University of Prince Edward Island, Charlottetown, Canada, 18-22 September.

Drouget, O., University of Liege, Belgium, 18-22 September.

Jauniaux, T., University of Liege, Belgium, 18-22 September.

Lehnert, K., Forschungs- und Technologiezentrum Westküste-FTZ, Büsum, Germany, 18-22 September.

Mathot, K.J., Simon Fraser University, Vancouver, Canada, 15 August-1 December

Mendes, Dr. L., University of Coimbra, Portugal, November-December

Morell Ybarz, M., Universitat Politècnica de Catalunya, Barcelona, Spain, 18-22 September.

Prahl, S., Forschungs- und Technologiezentrum Westküste-FTZ, Büsum, Germany, 18-22 September.

Schnitzler, J., University of Liege, Belgium, 18-22 September.

Faulwetter, R. Inst. f. Meteorologie, Univ. Leipzig, Germany 5 February – 1 April.

Syamsudin, dr. ir. F. Indonesian Agency for the Assessment and Application of Technology (BPPT) Jakarta,

1 January-10 April.

Novi Susetyo Adi MSc, Research Center for Maritime Territories and Non-Living Resources, Agency for Marine Research,

Ministry of Marine Affairs and Fisheries in Jakarta, Indonesia 1 February-19 April

Bouruet-Aubertot, Dr. P. LOCEAN, Univ. Paris VI, France, 6-8 March, 26-28 June, 16- 20 October.

Wilhartits, I., University of Vienna, Austria, 2-8 February.

Cho, B., University of South Korea, Seoul, South Korea, 4 – 17 February.

Baltar, F., Univ. of the Canary Islands, Las Palmas, Spain, 1 – 31 May.

Grote, J., Institute of the Baltic Sea, Warnemünde, Germany, 1 May-9 June.

Alvarez Salgado, A.X., Dept. Oceanography, Consejo Superior de Investigaciones Científicas (CSIC), Vigo, Spain,

13-19 May.

Spyres, G., Hellenic Center for Marine Research, Athens, Greece, 1-31 May, 29 September – 15 October.

Gogue, A., Dept. of Marine Science, University of the Aegean, Mytilene, Lesvos, Greece, 1 – 7 October.

Teresa Amaro, National Oceanographic Center Southampton, UK, 15 September - 30 November.

Fuhr, F., Voigt Consultance, Kiel, Germany, 15 September – 31 October

VISITORS

Klasing, prof. dr. K.C., University of California – Davis, USA, 9 November

Stephens, prof. dr. D.W., University of Minnesota, St. Paul, USA, 9 November

Handel, dr. C.S., US Geological Survey, Anchorage, Alaska, USA, 19 October

Gill, R.E., US Geological Survey, Anchorage, Alaska, USA, 19 October

Baker, prof. dr. A.J., Royal Ontario Museum, Toronto, Canada, 10 September, 7 December.

Brommer, M. Delft University of Technology, 14-17 March.

Moros, M. & T. Leipe. Institute for Baltic Sea Research, Rostock-Warnemünde, Germany, 3-6 July and 18-21 December.

Giraudeau, J. & P. Martinez. Département de Géologie et Océanographie, Université Bordeaux I, France, 30 October.

van Cappellen, prof. dr. P. Utrecht University, 7 June.

Loucaides, S. Utrecht University, 7 June.

Bijma, J. AWI, Bremerhaven, Germany, 12-13 January.

Conan, S-M.H. Faculty of Earth and Life Sciences, Vrije Universiteit, Amsterdam, 8 February.

Zinke, J. Faculty of Earth and Life Sciences, Vrije Universiteit, Amsterdam, 30 May.

Beckmann, B., University of Cologne, Germany, 26 April – 11 May.

Bendle, J., School of Chemistry, Bristol University, Bristol, UK, 12 – 17 June.

Benthien, A., AWI, Bremerhaven, Germany, 24 – 29 July.

Blaga, C., Utrecht University, 17 – 21 April and 2 – 7 October.

Dijkman, N., NIOO-CEME, Yerseke, 20 November – 2 December.

Grimalt, J., CSIC, Barcelona, Spain, 10 May.

Johnson, T., Large Lakes Observatory, University of Minnesota Duluth, USA, 8 February.

Kraal, P., Dept. Earth Sciences – Geochemistry, Faculty of Geosciences, Utrecht University, 14 September.

Koper, C., Netherlands Forensic Institute, Rijswijk, 13 April.

Könneke, M., University of Oldenburg, Germany, 11-12 September.

Malkoc, M., Institut für Geologie, University Bochum, Germany, 9 – 20 January.

Mollenhauer, G., AWI, Bremerhaven, Germany, 17 – 22 July.

Mutterlose, J., Institut für Geologie, University Bochum, Germany.

Nederbragt, S., University College London, UK, 30 January – 10 February.

Niedermeyer, E., University of Bremen, Germany 16- 17 November.

Pancost, R.D., School of Chemistry, Bristol University, Bristol, UK, 27-28 February.

Saenz, J., Woods Hole Oceanographic Institute, USA, 23 January – 3 February.

Sangiorgi, F., Utrecht University, 11 – 16 September.

Slomp, C., Dept. Earth Sciences – Geochemistry, Faculty of Geosciences, Utrecht University, 14 September.

Sluijs, A., Utrecht University, 8 – 18 May.

Speelman, E., Utrecht University, 8 – 16 September and 25 – 27 October.

Woltering M., Large Lakes Observatory, University of Minnesota Duluth, USA, 24 July – 9 August.

Dalziel, S. Cambridge University, 14-16 June

Kiefer, D. USC, 11 – 13 January

Williams, prof. P.J. leB., School of Ocean Sciences, University of Bangor, Menai Bridge, Wales, UK, 1-3 February.

Aristegui, prof. J., University of the Canary Islands, Las Palmas, Spain, 1-4 February.

Jürgens, prof. K., Institute of the Baltic Sea, Warnemünde, Germany, 21-24 May.

Taichi Yokokawa, Univ of Kyoto, Japan, 1-2 September.

Moodley, dr L., Netherlands Institute of Ecology, 3 March

Sidri, dr M., Wageningen University, 22 February, 3 Augustus

Mendola, D. , Wageningen University, 3 Augustus

Osinga, dr R., Wageningen University, 22 February

Petersen, dr D. , Rotterdam Zoo, 2 May

Laterveer, M., Rotterdam Zoo, 2 May

UNDERGRADUATE UNIVERSITY STUDENTS

Boekhout, S., Hogeschool Larenstein, 15 July -15 October.

Boer, V., Utrecht University, 1 November – 31 December.

Bouwe, R., NOVA College, Beverwijk, 1 January – 12 April.

Faria, J., University of Lisbon, Portugal, 1 August – 31 December.

Franken, L., Utrecht University, 1 November – 31 December.

Hanenburg, A., Hogeschool Zeeland, Vlissingen, 1 February – 30 June.

Hunt, V., Cornell University, New York, 1 June - 1 August.

Plata, P., Amsterdam University, 1 February – 30 June.

van Dijk, A., Utrecht University, 1 November – 31 December.

Vermeulen, F., Hogeschool Leiden, 1 January – 31 March.

Vos, A., Groningen University, 1 February – 30 June.

Winkelhagen, A., Amsterdam University, 1 January – 31 March

Verhagen, I. Vrije Universiteit Amsterdam, 1 April – 1 July.

Wildanto Putera Nusatenggara, Technology Institute Bandung (ITB), 12 August – 27 September.

Dijkstra, N. Vrije Universiteit Amsterdam, 1 June – 5 September.

Terhzaz, L. University of Rabat, 15 June -15 September.

van den Vorstenbosch, M. , Amsterdam University, 1 May - 1 December.

Brink, M., Hogere Laboratorium Opleiding, Nijmegen, 1 January – 1 July.

Folstar, M., Mondriaan College, Delft, 1 January – 15 June.

Huibers, L., Utrecht University, 26 May-16 June.

Malykh, J., Moscow State University, Russia, 1 June – 7 December.

Nadezhkin, D., Moscow State University, Russia, 1 January – 1 March.

Van den Donker, J., Utrecht University, 1 January – 15 June.

Van Houten, R., Mondriaan College, Delft, 4 September – 1 January.

Verwer, E. Utrecht University, 1 January – 23 January.

Huussen, T. University of Amsterdam, 1 January – 1 February.

van Breevoort, P. Utrecht University, 1 September – 31 December.

Smit, N. TH Rijswijk, Haagse Hogeschool, 1 January – 23 January.

Kruijt, M. Twente University, 1 September – 1 December.

Robertson, C., School of Ocean Sciences, Menai Bridge, UK, 1 January - 30 June.

Nobbe, I., Hogeschool Alkmaar, 1 January - 30 June.

van Lierop, D., Fontys Hogescholen Eindhoven, 1 July - 15 October.

Veuskens, T., Fontys Hogescholen Eindhoven, 1 July - 15 October.

Guichelaar, M., Hogeschool InHolland, Delft, 10 February – 30 June.

de Kluijver, A., Utrecht University, 15 January-15 April.

Sinke, M., HLO, Hogeschool Zeeland, 1 January – 30 June.

Chollet, S., Institut Universitaire Européen de la Mer, Univ. de Bretagne Occidentale, Brest, France, 4 January-3 June.

Verbeek, T., MLO Drenthe College, Emmen, 1 January – 3 February

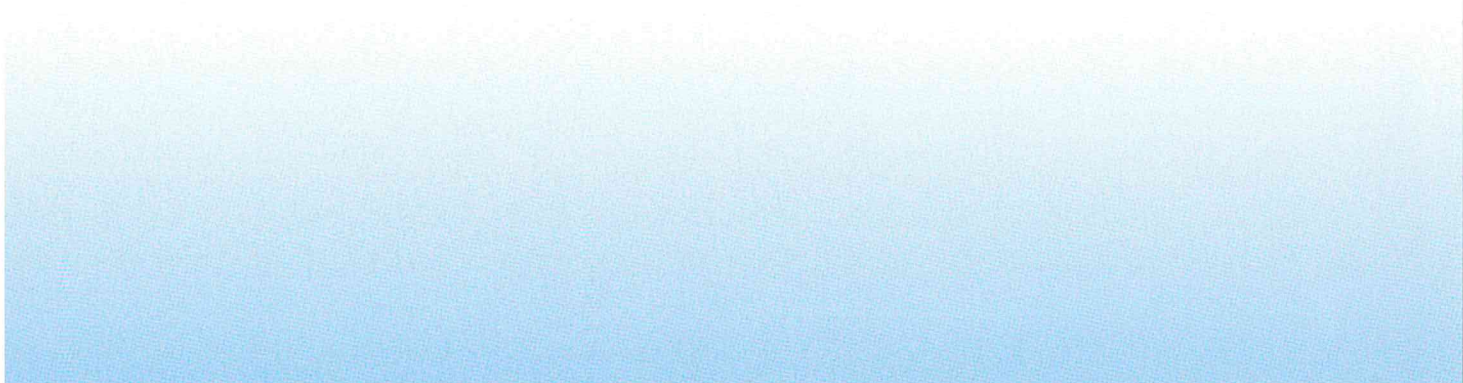
Sterken, M., MLO Drenthe College, Emmen, 6 September – 31 December

Frijling, E., MLO Drenthe College, Emmen , 4 December – 31 December

de Haan, J. Vrije Universiteit, Amsterdam, 5 September-31 December

GROUPS VISITING

10 januari	Saxion College, studierichting Chemie
29 maart	Open Universiteit o.l.v. prof. Bert Boekschoten (VU-falw)
29 mei	NWO, afd. Voorlichting en &Communicatie
2 juni	Leiden Pre University College
14 oktober	Universiteit van Amsterdam, studenten Sociologie
15 november	Habbema groep
14 december	Veiligheidskundigen Noord-Holland



SOCIAAL JAARVERSLAG



BESTUUR EN WETENSCHAPCOMMISSIE

Bestuur Stichting Koninklijk NIOZ

Per 31 december 2006 was het bestuur als volgt samengesteld:

prof.dr.ir. P. Vellinga, voorzitter	Vrije Universiteit van Amsterdam, Faculteit Aard- en Levenswetenschappen
prof.dr. E.A. Koster	Universiteit van Utrecht, Faculteit Geowetenschappen
prof.dr. L.E.M. Vet	NIOO-KNAW
prof.dr. J.T.M. Elzenga	CEES, Rijksuniversiteit Groningen
G. van der Kamp	Naarden

Per 24 november is prof.dr. J. Middelburg teruggetreden.

Het bestuur kwam in het verslagjaar 2006 zesmaal met de directie in vergadering bijeen, op 1 januari te Amsterdam, op 16 maart, 19 mei, 27 juni en 21 september te Texel en op 24 november te Den Haag.

De vergaderingen werden namens de algemeen directeur van NWO bijgewoond door drs. R.J.P. Dekker (NWO-CPI).

Genotuleerd werd door mevrouw C.S. Blaauboer-de Jong.

68 Wetenschapcommissie NIOZ

De Wetenschapcommissie adviseert het bestuur en de directie over het algemene wetenschappelijke beleid van de Stichting en het Instituut, zij evalueert periodiek het wetenschappelijke programma van het instituut.

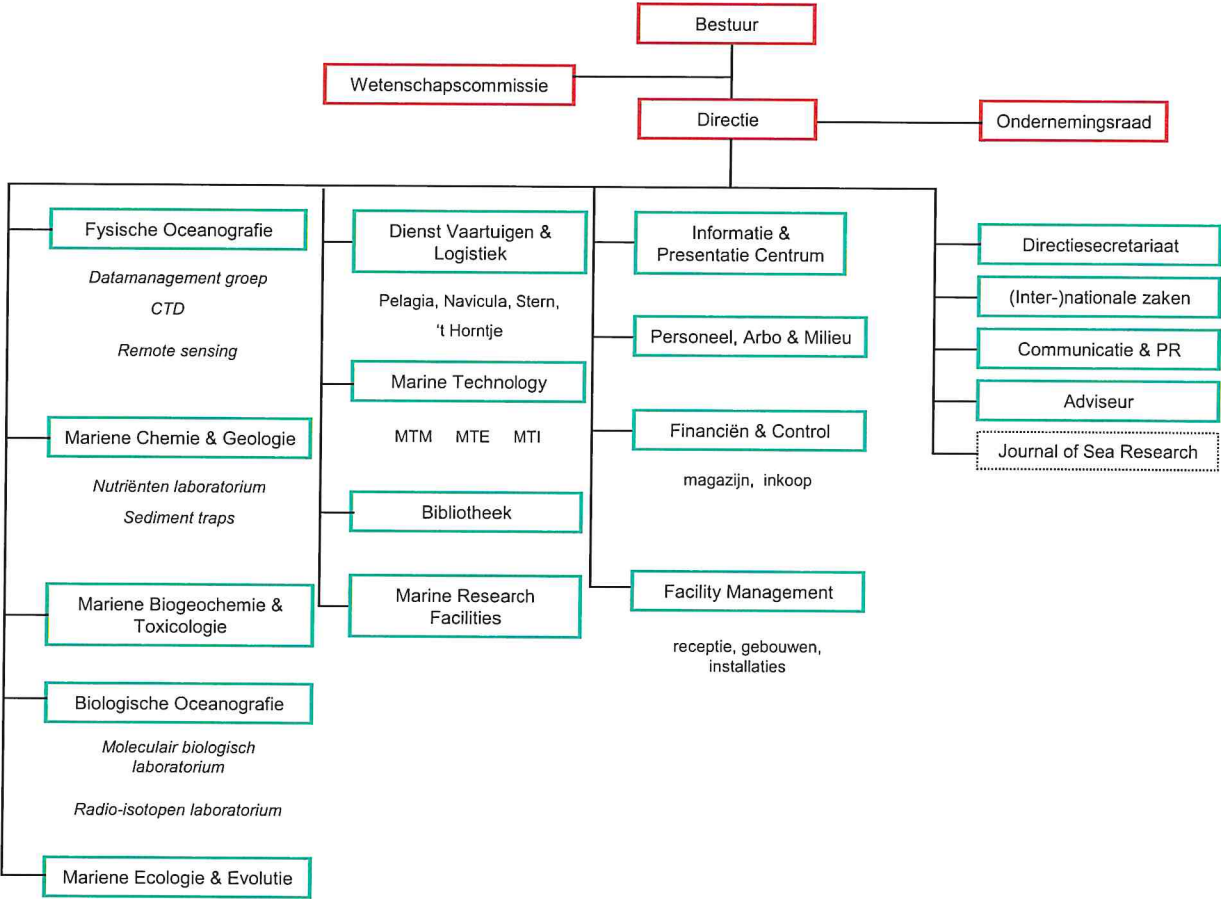
De Wetenschapcommissie was per 31 december 2006 als volgt samengesteld:

prof.dr. P. Herman (wnd. voorz.)	Afdeling Spatial Ecology, NIOO-KNAW CEME
prof.dr. J.-P. Henriët	RCMG/Mariene Geologie, Universiteit Gent, België
prof.dr. J. Simpson	School of Ocean Sciences/UCNW, Bangor, Groot-Brittannië
prof.dr. L. Labeyrie	Laboratoire des Sciences du Climat et de l'Environnement, Université Paris Sud-Orsay, Gif sur Yvette, Frankrijk
prof.dr. K. Richardson-Kristensen	Marin Økologi, Biologisk Institut, Aarhus Universitet, Århus, Denemarken
prof.dr. T.D. Jickells	School of Environmental Sciences, University of East Anglia, Norwich, Groot-Brittannië

Prof.dr. J. Middelburg is per 24 november teruggetreden als voorzitter.

De Wetenschapcommissie is in 2006 bijeengekomen op 19 mei.

ORGANOGRAM 31 DECEMBER 2006



PERSONEELSLIJST 31-12-06

DIRECTIE

Meulenkamp J.E. prof. dr.	scientific director	tot 01-07
Smit J. ir.	managing director	tot 01-07
Rietveld M.J. drs.	directie-secretaris	
Heip C.H.R. prof. dr.	algemeen directeur	m.i.v. 01-10
Geerken B.M. dr. ir.	zakelijk directeur	
Ridderinkhof H. dr.	scientific director ad interim	01-07 - 30-09
Blaauboer-de Jong C.S.	dir. secretaresse	
Boon J.P. dr.	communicatie & PR	
Leeuw J.W. de prof. dr.	(inter-) nationale zaken	
Lindeboom H.J. dr.	senior onderzoeker	

STAFEENHEDEN

Personeels-, Arbo en Milieuzaken

Vooys P.C.	hoofd	
Bredewold J.J.H.	personeelsfunctionaris	
Dapper R.	medewerker	50%
Kuip T.	arbocoördinator	
Mulder-Starreveld J.P.	medewerker	

Finance, control & contracts

Vos T.	hoofd/controller	
Arkel M.A. van drs.	projectcontroller	
Gootjes J.P.	hoofd financiële administratie	
Kalf J.	medewerker magazijn	
Keijser A.	medew. financiële administratie	
Kooijman-Biermans M.H.M.	medew. financiële administratie	
Nieuwenhuizen J.M.	medewerker magazijn	
Poleacov-Maraiala C.	medew. financiële administratie	
Tuinen H.A. van	medew. financiële administratie	
Witbaard R. dr.	ass. projectcontroller	tot 18-08
Wernand-Godee I.	medew. project-administratie	

WETENSCHAPPELIJKE AFDELINGEN

AFDELING FYSISCH OCEANOGRAPHIE

Ridderinkhof H. dr.	hoofd	
Aken H.M. van dr.	senior onderzoeker	
Bruin T.F. de drs.	datamanager MRF	
Buijsman M.C.	projectmedewerker	
Eijgenraam F.	automatiseringsdeskundige	
Gerkema T. dr.	postdoc	
Haren J.J.M. van dr.	senior onderzoeker	
Harlander U. dr.	postdoc	
Hazewinkel J.	OIO	m.i.v. 01-02
Hiehle M.A.	medewerker Data Management Group	
Hillebrand M.T.J.	senior onderzoekmedewerker	
Jong M.F. de	OIO	
Koster R.X. de	medewerker Data Management Group	
Maas L.R.M. dr.	senior onderzoeker	
Nauw-van der Vegt J.J. dr.	postdoc	m.i.v. 01-05
Nieuwenhuis J.	medewerker Data Management Group	
Ober S. Ing.	senior onderzoekmedewerker	
Schouten M.W. dr.	postdoc	tot 01-08
Smit N.S.	medewerker	m.i.v. 15-05 tot 14-06
Verwer E.E.	OIO	m.i.v. 01-03 tot 01-09
Veth C. drs.	senior onderzoeker	
Wernand M.R.	senior onderzoekmedewerker	
Zimmerman J.T.F. prof. dr.	senior onderzoeker	

AFDELING MARIENE CHEMIE EN GEOLOGIE

Weering T.C.E. van prof. dr.	wnd hoofd	m.i.v. 01-05
Epping H.G. dr.	wnd hoofd	tot 01-05
Bakker K.M.J.	onderzoekmedewerker	
Bergh G. van den dr.	postdoc	m.i.v. 01-04
Boer W. ing.	senior onderzoekmedewerker	
Brummer G.-J.A. dr.	senior onderzoeker	
Crayford S.J.	senior laboratoriummedewerker	
Fallet U.	OIO	
Gonzalez S.R.	onderzoekmedewerker	
Haas H. de dr.	projectmedewerker	

Iperen J. van	onderzoekmedewerker
Jonkers L.P.	OIO
Keuning M.E.	OIO
Koning F.A. dr.	onderzoeker
Land C. van der	OIO
Mienis F.	OIO
Ooijen J.C. van	senior onderzoekmedewerker
Richter T.O. dr.	onderzoeker
Schogt N.	onderzoekmedewerker
Stigter H.C. de dr.	projectonderzoeker
Weerlee E.M. van	senior laboratoriummedewerker
Witte A.J.M.	senior laboratoriummedewerker

AFDELING MARIENE BIOGEOCHEMIE EN TOXICOLOGIE

Sinninghe Damsté J.S. prof. dr. ir.	hoofd	
Abbas B.A.	senior laboratoriummedewerker	
Baas M.	senior onderzoekmedewerker	
Bauersachs T.	OIO	m.i.v. 01-01
Boere A.C.	OIO	
Bommel R. van	onderzoekmedewerker	
Booij K. dr.	onderzoeker	
Boumann H.A. dr.	postdoc	
Brandsma J.	OIO	
Breugel Y. van drs.	postdoc	tot 01-03
Coolen M.J.L. dr.	postdoc	
Forster A. drs.	postdoc	tot 01-08
Herfort L.M.C.C. dr.	postdoc	tot 01-02
Hopmans E.C. dr.	onderzoeker	
Huguet M.C.	OIO	
Jaeschke A.	OIO	
Kienhuis M.V.M.	onderzoekmedewerker	
Kim J.H. dr.	postdoc	m.i.v. 01-03
Klimiuk A.M.	OIO	m.i.v. 08-10
Meer M.T.J. van der dr.	postdoc	m.i.v. 15-02
Mets A.	senior laboratoriummedewerker	
Mueller A.	OIO	
Ossebaar J.	laboratoriummedewerker (gedetacheerd)	

Panoto F.E.	senior laboratoriummedewerker	
Pitcher A.M.	OIO	m.i.v. 01-05
Rampen S.W.	OIO	
Rattray J.E.	OIO	
Rietkerk M.D.A.	senior laboratoriummedewerker	tot 17-05
Rijpstra W.I.C.	senior onderzoekmedewerker	
Schouten S. dr. ir.	senior onderzoeker	
Stadnitskaia A. drs.	postdoc	tot 01-12
Weijers J.W.H.	OIO	

AFDELING BIOLOGISCHE OCEANOGRAPHIE

Herndl G.J. prof.dr.	hoofd	
Agogu� H.M.E. dr.	postdoc	m.i.v. 01-05
Baar H.J.W. de prof. dr. ir.	senior onderzoeker	
Baars M.A. dr.	senior onderzoeker	
Baudoux A.C.	OIO	tot 01-02
Bleijswijk J.D.L. van dr.	hoofd mol. lab.	
Brink M.	laboratoriummedewerker	m.i.v. 12-06
Brussaard C.P.D. dr.	onderzoeker	
Cardoso J.	assistent	m.i.v. 25-09
Duyf F.C. van dr.	senior onderzoeker	
Evans C. dr.	postdoc	m.i.v. 01-12
Gerringa A.L. dr.	postdoc	
Goeij J.M. de	OIO	
Hegeman J.	senior onderzoekmedewerker	
Klunder M.B.	OIO	m.i.v. 01-11
Kramer G.D.	senior laboratoriummedewerker	tot 09-04
Laan P.	onderzoekmedewerker	
Maier C. dr.	postdoc	
Martinez Martinez J. dr.	postdoc	
Middag R.	OIO	m.i.v. 16-10
Noordeloos A.A.M. Ing.	onderzoekmedewerker	
Noort G.J. van	onderzoekmedewerker	
Oosterhuis S.S.	onderzoekmedewerker	
Parada V.S.	OIO	tot 01-12
Peperzak L. dr.	projectmedewerker	
Reinthalder T. dr.	postdoc	

Robertson C.M.	laboratoriummedewerker	tot 16-06
Ruardij P. drs.	onderzoeker	
Sintes E. dr.	postdoc	
Smit A.T.	onderzoekmedewerker	tot 09-10
Snoek J.	onderzoekmedewerker	
Thuroczy C.E.	OIO	m.i.v. 15-11
Timmermans K.R. dr.	senior onderzoeker	
Varela Rozados M.M. dr.	postdoc	m.i.v. 01-03
Veldhuis M.J.W. dr.	senior onderzoeker	
Witte H.J.	senior onderzoekmedewerker	
Zemmelink H.J. dr.	postdoc	m.i.v. 01-01

AFDELING MARIENE ECOLOGIE & EVOLUTIE

Meer J. van der dr.	hoofd	sabbatical m.i.v. 01-08
Veer H.W. van der dr. ir.	wnd hoofd	m.i.v. 01-08
Andresen H.	OIO	
Bak R.P.M. prof. dr.	senior onderzoeker	
Berghuis E.M.	senior onderzoekmedewerker	
Bergman M.J.N. Ir.	onderzoeker	
Bol-den Heijer A.C.	senior laboratoriummedewerker	
Brugge M.C.	diervorzorger	
Camphuijsen C.J.	projectonderzoeker	
Compton T.	OIO RuG	tot 16-04
Daan R. dr.	onderzoeker	
Dapper R.	automatiseringsdeskundige	50%
Dekinga A. drs. ing.	senior onderzoekmedewerker	
Dekker R. drs.	onderzoeker	
Drent J. dr.	postdoc	m.i.v. 19-07
Duineveld G.C. drs.	onderzoeker	
Geest M. van der	OIO	m.i.v. 01-10
Gils J.A. van dr.	postdoc	m.i.v. 01-12
Hoek J. van der	laboratoriummedewerker	m.i.v. 11-12
Hof P.M.J. van 't	OIO	m.i.v. 14-08
Honkoop P.J.C. dr.	postdoc	
Hout P.J. van den	OIO	
Iperen J. van	onderzoekmedewerker	
Koutrik A. van ing.	laboratoriummedewerker	

Kraan C.	OIO	
Lavaleye M.S.S. drs.	projectonderzoeker	tot 20-12
Luttikhuisen P.C. dr.	onderzoeker	m.i.v. 01-09
Mulder M.	onderzoekmedewerker	
Nieuwland G.	senior onderzoekmedewerker	
Nugues M.M. dr.	postdoc	m.i.v. 01-05
Philippart C.J.M. dr.ir.	onderzoeker	
Piersma T. prof. dr.	senior onderzoeker	
Reneerkens J.W.H.	OIO	tot 01-03
Smallegange I.M.	OIO	tot 01-04
Spaans B. drs.	senior onderzoekmedewerker	
Troost T.A. dr.	postdoc	m.i.v. 01-03
Vahl W.K.	onderzoeker	m.i.v. 01-04 tot 01-10
Vézina, F. dr.	postdoc	m.i.v. 01-07
Waasdorp C.M.	senior laboratoriummedewerker	
Witbaard R. dr.	onderzoekmedewerker	m.i.v. 10-04
Witte J.IJ.	onderzoekmedewerker	

HULPAFDELINGEN

FACILITY MANAGEMENT

Kralingen P. van ing.	hoofd
Berbée-Bossen J.	telefoniste/receptioniste
Boks-Visser H.	telefoniste/receptioniste
Bonne E.	medewerker (detachering)
Daalder R.M.	medewerker
Dapper-Maas M.A.	telefoniste/receptioniste
Groot S.P.	medewerker
Heerschap J.H.	medewerker
Hillebrand-Kikkert A.	telefoniste/receptioniste
Lakeman R.	medewerker
Markesteyn A.M.	secretaresse
Sleutel A.	medewerker
Trap B.	medewerker
Witte R.J.C.	medewerker

INFORMATIE EN PRESENTATIE CENTRUM

Pool W.G. dr.	hoofd	
Aggenbach R.P.D.	medewerker	
Barten-Krijgsman N.	grafisch medewerker	
Derksen J.D.J.	systeem/netwerkbeheerder	
Gerssen A.	medewerker	tot 01-08
Malschaert H. ing.	systeem/netwerkbeheerder	
Manshanden G.M.	medewerker	

Bibliotheek

Grippeling R.S.M.	hoofd
Bruining-de Porto M.E.	medewerker

Redactie Journal of Sea Research

Philippart C.J.M. dr.ir.	hoofredacteur
Bak-Gade B.	assistent redacteur

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MARINE TECHNOLOGY

Smit M.G. ir.	hoofd
Porto H.H. de	project engineer MTM

Marine Technology Instrumentation

Boekel H.J.	hoofd	
Bakker R.	instrumentmaker	
Heerwaarden J. van	instrumentmaker	
Keijzer E.J.H.	instrumentmaker	
Schrama M.	instrumentmaker	m.i.v. 10-07

Marine Technology Electronics

Koster B. ing.	hoofd	
Asjes A.J.	electronicus	
Buijsman D.J.	electronicus	
Cluderay J.M.N.	electronicus	m.i.v.19-06
Franken H. ing.	senior electronicus	
Groenewegen R.L. ing.	senior electronicus	
Laan M.	senior electronicus	

Marine Technology Mechanical

Schilling J.	hoofd	
Bakker M.C.	zeetechnicus electrotechniek	
Blom J.J.	zeetechnicus	
Boom L.	zeetechnicus	
Gieles S.J.M.	komvisser/chauffeur	
Grisnich P.W.	chauffeur/medewerker logistiek	
Polman W.	zeetechnicus	
Witte Y.	zeetechnicus	tot 31-12
Wuis L.M.	zeetechnicus	

Vaartuigen en logistiek

Buisman T.C.J.	hoofd	
Adriaans E.J.	havenmeester/schipper	
Alkema P.R.	medewerker	
Betsema G.L.J.	scheepstechnicus	
Dresken J.T.	scheepskok	tot 01-07
Duyn M.D. van	stuurman	tot 01-08
Ellen J.C.	gezagvoerder	
Heide R. van der	scheepstechnicus	
Jongejan W.P.	medewerker	
Jourdan M.T.	administratief medewerkster	
Kikkert K.C.	hoofdwerktuigkundige	
Kleine M.D.M. de	2e werktuigkundige	
List H.M.	2e werktuigkundige	
Maas J.J.M.	scheepstechnicus	
Mik G.	scheepskok	
Puijman E.A.	stuurman	
Seepma J.	hoofdwerktuigkundige	
Slikke R. van der	scheepstechnicus	
Star C.J. van der	schipper	
Stevens C.T.	scheepstechnicus	
Vermeulen G.P.	scheepstechnicus	
Vis P.C.A. van der	machinist/motordrijver	
Vries H. de	scheepstechnicus/kok	

GASTMEDEWERKERS

Beukema J.J. dr.

Bik M.H. drs.

Cadée G.C. dr.

Frade P. Rodrigues

Goeij P.J. de dr.

Hallers-Tjabbes C.C. ten dr.

Jager, C. de prof. dr.

Vooy's C.G.N. de dr.

Wolf P. de dr.

ARBEIDSVOORWAARDEN

Nieuwe CAO voor onderzoekinstellingen

Op 1 oktober 2006 expireerde de zesde CAO voor de onderzoekinstellingen. De onderhandelingen die in het verslagjaar zijn gevoerd over de nieuwe CAO hebben begin 2007 geleid tot overeenstemming tussen de werknemersorganisaties en de Werkgeversvereniging Onderzoekinstellingen. De nieuwe CAO met als ingangsdatum 1 oktober 2006, loopt tot 1 januari 2008 en geldt voor ongeveer drieduizend werknemers.

De salarissen worden per 1 februari 2007 verhoogd met 2 procent, aangevuld met 0,15 procent vanwege het vervallen van buitengewoon verlof bij verhuizen, huwelijk en samenwonen.

Per 1 januari 2007 wordt de nominale eindejaarsuitkering van € 380, die als tegemoetkoming gold voor de zorgverzekeringspremie, omgezet in een structurele verhoging van de procentuele eindejaarsuitkering van 4,1% naar 5,4%.

In december 2006 werd uit het zogenaamde pensioenakkoord een levensloopbijdrage uitgekeerd van 0,8%. Deze zal eveneens in december 2007 aan de werknemer worden uitbetaald. Per 1 januari 2008 wordt deze bijdrage omgezet in een structurele pensioengevende levensloopbijdrage van 0,7%, die dan wordt toegevoegd aan de eindejaarsuitkering. Deze uitkering zal per genoemde datum derhalve neerkomen op 6,1%.

In het kader van employability zijn er afspraken gemaakt die er op gericht zijn OIO's te ondersteunen bij hun loopbaanoriëntatie, medewerkers boven de 45 jaar te stimuleren actief aan het arbeidsproces te blijven deelnemen door ze de mogelijkheid te bieden leeftijdsdagen in te zetten voor activiteiten waardoor zij nieuwe kennis en ervaring opdoen plus dat medewerkers vanaf 59 jaar de mogelijkheid wordt geboden middels een nieuwe seniorenregeling langer actief aan het arbeidsproces deel te nemen.

Er wordt een regeling levensloop opgenomen die ondermeer voorziet in de voorwaarden voor deelname en de consequenties voor arbeidsvoorwaarden, pensioen en sociale zekerheid.

De bovenwettelijke regeling werkloosheid personeel onderzoekinstellingen is aangepast met ondermeer een bonusregeling voor werknemers die vanuit een WW-uitkeringssituatie een reguliere baan aanvaarden, mits het recht op de WW-uitkering daadwerkelijk eindigt.

Per 1 januari 2007 ontvangt bij opname van ouderschapsverlof de werknemer over de uren ouderschapsverlof 75% van zijn bezoldiging, waarbij de aan de levensloopregeling gekoppelde fiscale ouderschapsverlofkering is inbegrepen.

Arbeidsvoorwaarden op maat

In 2005 was er sprake van een lichte daling van het gebruik van AVOM doelen. Deze daling is in 2006 echter omgeslagen in een forse stijging, vooral ten aanzien van de verkoop van verlofuren en de aankoop van fietsen. Met het oog op het terugdringen van het verlofstuwmeer zijn medewerkers gestimuleerd om van deze arbeidsvoorwaardenregeling gebruik te maken.

Verkoop verlofuren	70 medewerkers
Koop verlofuren	5 medewerkers
Fietsen	33 medewerkers
Studieregeling	1 medewerker
Vakbondscontributie	14 medewerkers

Opleiding cursus en training

In 2006 is veel aandacht besteed aan en is ruimschoots gebruik gemaakt van de faciliteiten voor opleidingen, cursussen en trainingen.

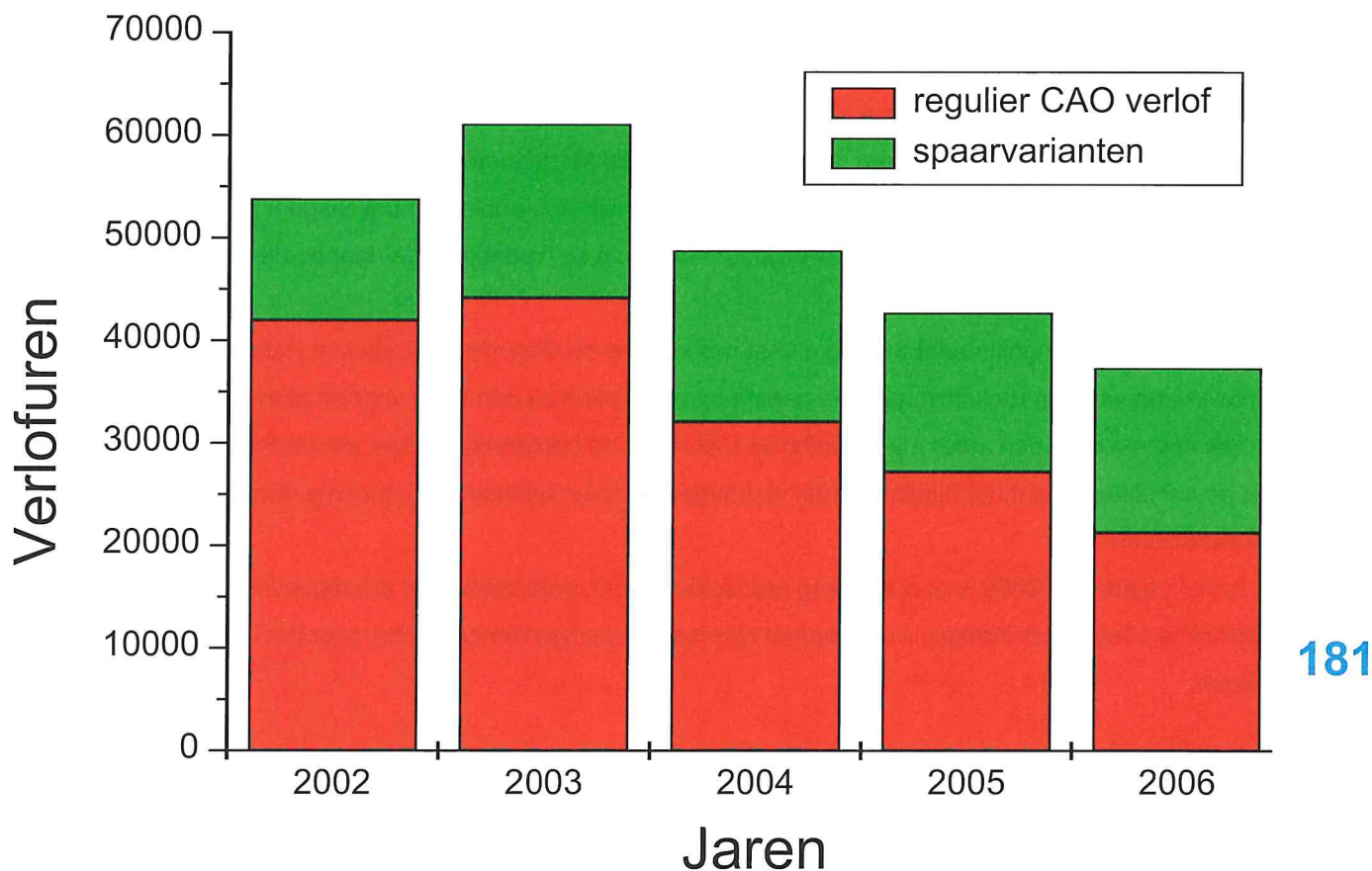
Er zijn 7 in-company cursussen of trainingen georganiseerd, te weten:

- Projectmatig werken; 1-daagse training met 12 deelnemers van de diverse wetenschappelijke afdelingen. Tijdens de training zijn de basisprincipes van projectmanagement besproken en is er een praktische NIOZ-casus besproken. Een reactie van één van de deelnemers na afloop was: 'we hebben echt wezenlijke zaken bij de kop gehad'. In 2007 zal er een vervolg worden gegeven aan deze training.
- Werken aan persoonlijk perspectief; 2-daagse training met 8 deelnemers uit de groep onderzoekers in opleiding. Tijdens de training is aandacht besteed aan de loopbaanontwikkeling van onderzoekers in opleiding en is gekeken naar ambities en competenties. Een reactie van één van de deelnemers na afloop was: 'het is nuttig om oio's dit soort cursussen in de toekomst te blijven aanbieden'.
- Ondernemingsraad cursus; 2 daagse cursus met 7 deelnemers uit de ondernemingsraad. De cursus was gericht op (herhaling van) de theorie Wet op de Ondernemingsraden en diverse ondernemingsraadzaken die voor de OR binnen het NIOZ relevant zijn.
- ARB-cursus; 2 daagse cursus met 10 deelnemers van de afdelingen MEE, BIO en MBT. Deze cursus was gericht op fylo genetische analyses.
- NIL-instructie lasmedewerkers; 1 dagdeel instructie aan de lasmedewerkers van de afdeling Marine Technology.
- Multibeam echosounder; de cursus was gericht op het gebruik van de multibeam echosounder aan boord van de Pelagia. 10 gebruikers hebben deelgenomen aan de cursus data-aquisitie en 6 gebruikers hebben deelgenomen aan de cursus post-processing.
- Cursus Finite Element Method Application (FEMAP); 4 daagse cursus met 3 deelnemers van de afdeling Marine Technology. FEMAP is een methode om met behulp van speciale computer programma's sterkteberekeningen uit te voeren aan (complexe) objecten.

Naast de in-company cursussen en trainingen hebben in 2006 18 personen op individuele basis 26 (externe) opleidingen, cursussen of trainingen gevolgd. Deze staan los van wetenschappelijke bijeenkomsten/seminars,

zijn functiegericht en aan de werkplek gerelateerd. 3 van deze trainingen bestonden uit een korte of langlopende managementleergang.

Verlofstuwmeer



Evenals in de voorgaande twee jaren heeft de daling van het verlofstuwmeer zich in 2006 voortgezet. Hoewel deze daling niet spectaculair is, moet rekening gehouden worden met het feit dat jaarlijks op 1 januari aan de medewerker een volume CAO-verlof wordt toegekend van circa 45 dagen wat neerkomt op 9 werkweken.

Additioneel kan er nog sprake zijn van compensatieverlof in het kader van deelname aan zeegaande expedities.

Ten opzichte van 2005 is het verlofstuwmeer in 2006 desondanks afgenomen met 12.5%.

De "spaarvarianten" hebben betrekking op sabbatical leave, recreatief verlof en prépensioen. Voor deze laatste variant kan niet meer gespaard worden en deze variant heeft in het overzicht uitsluitend betrekking op in het verleden verworven spaartegoed.

Individueel Klachtrecht

Koninklijk NIOZ beschikt over een regeling Individueel Klachtrecht. Deze regeling biedt werknemers de mogelijkheid om klachten, over een gedraging door of vanwege de werkgever bespreekbaar te maken en te doen onderzoeken. In 2006 zijn er bij de Klachtadviescommissie geen klachten ingediend.

Aanbevelingen Commissie Toekomst Pelagia

Naar aanleiding van het advies van de Commissie positie Koninklijk NIOZ in het Toekomstig Zeeonderzoek ("commissie Hermans") dat in 2004 aan NWO is uitgebracht en het in 2004 uitgebrachte Peer Review rapport heeft het bestuur aan de toenmaals ingestelde Commissie Toekomst Pelagia de opdracht gegeven onderzoek te doen naar de wijze waarop, samengevat, de bedrijfsvoering van de "rederij NIOZ" in al haar facetten geoptimaliseerd kan worden.

De Commissie Toekomst Pelagia heeft deze opdracht uitgevoerd en mede ondersteund door een analyse van het bij het onderzoek betrokken bedrijf Blue Star Ship Management (onderdeel van A.P. Möller Maersk) aan het bestuur een rapport uitgebracht met daarin opgenomen een aantal aanbevelingen. De belangrijkste aanbeveling die door het bestuur in 2006 is overgenomen, is om de "rederijfunctie" binnen de NIOZ-organisatie te blijven uitvoeren.

Een andere belangrijke aanbeveling uit het rapport van de Commissie Toekomst Pelagia kwam neer op het ontwikkelen van een toekomststrategie gericht op aansluiting bij een CAO voor de zeevaart.

Het streven naar een meer marktconforme CAO voor de bemanningsleden van de Pelagia was gebaseerd op de constatering dat het huidige aantal vaardagen per jaar substantieel minder is dan gebruikelijk in scheepvaartsectoren.

In het najaar van 2006 is een aanvang gemaakt met het onderzoek naar de aanbevelingen van de Commissie Toekomst Pelagia. In de maand oktober zijn de bemanningsleden over het bovenstaande geïnformeerd.

"Quick Scan" Ondersteunende Afdelingen

In vervolg op het onderzoek dat zich heeft gericht op de bedrijfsvoering van de "rederij NIOZ" (zie hierboven) is in 2006 besloten om eveneens de bedrijfsvoering van de ondersteunende afdelingen onder de loep te nemen.

De beoordeling richtte zich op drie aspecten:

- beoordeling van de situatie,
- voorstellen voor verbetering, en
- opties voor besparing,

en wel met betrekking tot:

- 1 de kwaliteit van de dienstverlening
- 2 de aangeboden diensten en ontwikkeling ervan
- 3 de werkwijze: werkprocessen, communicatie, prioritering
- 4 de middelen: personele opbouw, voorzieningen/infrastructuur

De uitkomst van dit onderzoek kwam er op neer dat de ondersteunende diensten goed werk leveren en zich dienstbaar naar de wetenschap opstellen. Op enkele kleine verbeterpunten na, werden er geen tekortkomingen

geconstateerd en tevens werd geconcludeerd dat er geen sprake was van een formatieve overcapaciteit. Bij een enkele afdeling werd gesteld dat er mogelijk eerder een situatie van ondercapaciteit bestond.

Arbo- en Milieujaarverslag 2006

Inleiding

In dit verslag wordt gerapporteerd over de belangrijkste activiteiten op het terrein van arbo en milieu, die in 2006 hebben plaatsgevonden.

Beleid

In het begin van 2006 is de risicoinventarisatie "Technische afdelingen" van eind 2005 omgezet in een plan van aanpak. De hierin genoemde aandachtspunten zullen door de betrokken afdelingen worden aangepast of worden verholpen. De voortgang van het plan van aanpak wordt mede bewaakt door de Arbo- en Milieucommissie.

Voor het komende jaar wordt er o.a. verder gewerkt aan de implementatie van de nieuwe arbowet waaronder begrepen de zogenaamde arbocatalogus, het omgaan met gevaarlijke stoffen volgens REACH en GHS en de beoordeling van de explosierichtlijn ATEX 137.

Arbo- en Milieucommissie

De Arbo- en Milieucommissie heeft een adviserende en signalerende taak naar de directie en ondernemingsraad op het gebied van veiligheid en milieu. De commissie is breed van samenstelling, vanuit verschillende geledingen.

De commissie heeft in het afgelopen jaar onder meer de voortgang van de renovatie van de laboratoria bewaakt. Er is een procedure ingevoerd voor het transport naar en gebruik van chemicaliën aan boord van de schepen.

Op initiatief van de WVOI is er een gezamenlijke arbo-overleggroep ingesteld van de instituten die onder de NWO-koepel ressorteren. Hierbij waren de arbofunctionarissen van KB, FOM, CWI, NWO en NIOZ vertegenwoordigd. Doel is om tweemaal per jaar bijeen te komen en overleg te voeren over arbozaken die spelen op de instituten.

Ongevallen

In het afgelopen jaar zijn er een paar (kleine) ongevallen gebeurd. In de meeste gevallen is het personeel doorverwezen naar een huisarts. Er zijn een drietal ongevallen gemeld. Deze betroffen gekneusde ribben, afklemmen van vinger en een snijwond als gevolg van gebroken glaswerk. In een vierde geval betrof het een ongeval zonder letsel. Dit betrof een lekkage van een chemische stof (organische peroxyde). Deze lekkage is door een aantal leden van de bedrijfsbrandweer adequaat verholpen.

Veiligheids- en milieuzaken

In verband met de vergunning voor het lozen van afvalwater heeft het laboratorium van Tauw Milieu in Deventer ieder kwartaal het geloosde afvalwater geanalyseerd. De gegevens zijn uiterlijk één maand na beëindiging van ieder kwartaal toegezonden aan Rijkswaterstaat Directie Noord Holland met afschrift aan het RIZA in Lelystad. Het NIOZ heeft het afgelopen jaar 45.931 m3 afvalwater geloosd.

Via de afvalcontainer chemische stoffen is het nodige klein chemisch afval afgevoerd. De belangrijkste af te voeren componenten waren oplosmiddelen, giftige chemicaliën, laboratoriumafval en batterijen. Ook werd in totaal 11,6 ton aan verlopen olie afgevoerd. Daarnaast is er via de huisvuilcontainer 43,8 ton aan vuil ingenomen en afgevoerd.

In het afgelopen jaar is er een saneringsronde geweest van kwikhoudende apparaten of delen hiervan. Het betrof hoofdzakelijk thermometers en thermostaten die kwik bevatten.

In totaal is er ingezameld: 40 stuks contactthermostaten, 72 stuks thermometers, 7 stuks kwikschakelaars en één flesje kwik van 1,5 kg.

Bedrijfsgezondheidszorg

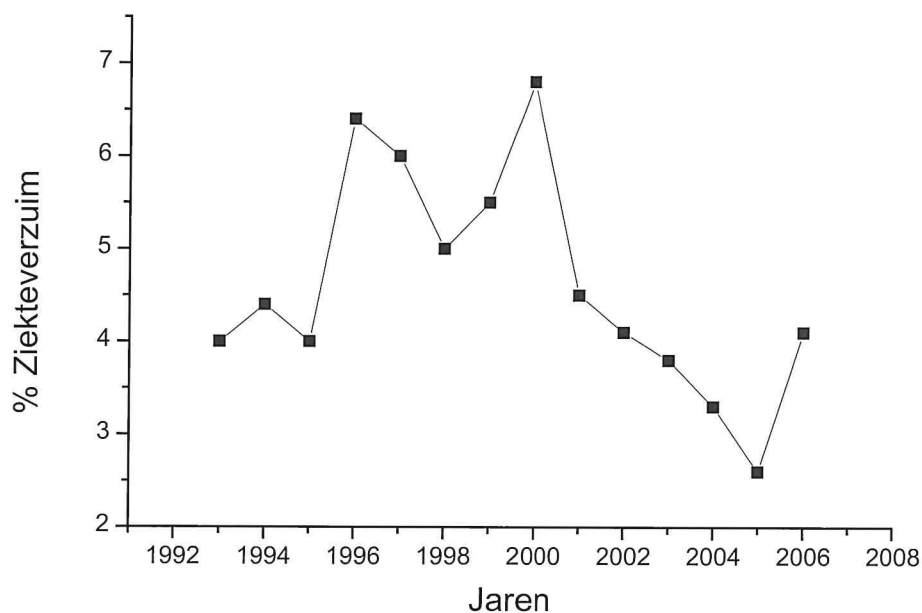
De opvarenden van de schepen en de leden van de bedrijfsbrandweer zijn dit jaar weer periodiek gekeurd en geschikt bevonden. Ook zijn er niet reguliere keuringen gedaan voor personeel dat voer op buitenlandse schepen of keuringen voor duikers.

Ziekteverzuim

Vanaf het jaar 2000 is het ziekteverzuim drastisch gedaald. In 2006 is het ziekteverzuim echter met 1,5% ten opzichte van 2005 toegenomen tot 4,1%. Deze toename werd voornamelijk veroorzaakt door enkele langdurige ziektegevallen, vooral in de categorie van het niet wetenschappelijk personeel.

Ziektepercentages

	wp	man	vrouw	nwp	man	vrouw	totaal
1993	2.0	1.5	3.9	5.1	4.6	6.9	4.0
1994	2.4	1.5	5.5	5.4	5.6	4.7	4.4
1995	1.5	1.3	2.2	5.2	5.0	5.8	4.0
1996	2.0	1.7	4.5	8.4	7.2	12.1	6.4
1997	4.3	4.3	4.3	6.8	6.1	9.8	6.0
1998	4.5	4.0	12.8	5.3	3.5	13.4	5.0
1999	5.5	5.4	5.8	5.5	5.5	5.1	5.5
2000	5.6	5.8	4.9	8.6	6.9	15.6	6.8
2001	3.7	4.0	2.5	5.7	4.1	12.9	4.5
2002	3.5	3.5	3.4	5.0	3.1	13.9	4.1
2003	1.5	1.3	2.3	6.8	6.7	7.4	3.8
2004	2.5	1.8	4.6	4.3	4.2	4.9	3.3
2005	1.6	2.1	0.6	3.1	2.5	5.3	2.6
2006	2.1	1.8	2.7	5.4	5.0	7.1	4.1



BHV organisatie

De bedrijfsbrandweer bestaat momenteel uit 12 manschappen. De formatie houdt rekening met 13 manschappen, vandaar dat er nog een vacature open staat. Voor de taak EHBO zijn er 12 leden beschikbaar.

Om de inzetbaarheid van de leden van de bedrijfsbrandweer en de EHBO te garanderen zijn er de afgelopen jaar diverse trainingen en cursussen gevolgd. Zo heeft de bedrijfsbrandweer een flash-over training gevolgd. De nadruk van deze training lag op, naast de warmtetraining, het tijdig herkennen van de gevaren van een zeer snelle brandontwikkeling.



VERSLAG VAN DE ONDERNEMINGSRAAD

Samenstelling van de OR

De samenstelling van de OR was in 2006 ongewijzigd ten opzichte van het jaar ervoor: Klaas Timmermans (voorzitter), Kees Veth (secretaris), Swier Oosterhuis (plv. voorzitter), Maarten Mulder (plv. secretaris), Ruud Witte, Klaas Kikkert en Piet van den Hout. Eén positie voor een vertegenwoordiger uit de categorie "Technische diensten, ondersteunende diensten en stafeenheden" bleef vacant.

Formeel en informeel overleg

De OR en directie hebben zes maal in een formeel overleg vergaderd, en wel op 26 januari, 16 maart, 18 mei, 13 juli, 21 september en 17 november. Bij twee van die gelegenheden werd ook, en afzonderlijk, met het NIOZ-bestuur gesproken. De notulen van de formele overleg vergaderingen zijn gepubliceerd op de intranet-site van de or. Verder is diverse malen (in principe om de twee weken) informeel overleg met de directie gevoerd.

Welke onderwerpen kwamen aan de orde?

De belangrijkste onderwerpen waarmee de OR dit jaar te maken kreeg waren: verlenging van het zorgcontract met arbo-dienst 'Maetis', voordracht van nieuwe leden in de klachtencommissie, verbetering van communicatie binnen het instituut (onder meer door het instellen van een forum op het intranet), de toekomst en de strategische positie van het NIOZ na het laatste peer-review, de "quick scan" die heeft plaatsgevonden binnen de ondersteunende diensten en de rapportage over de toekomst van de Pelagia. Verder vormde de problematische financiële positie van het NIOZ voortdurend een punt van aandacht. Hierover is enige malen overleg gevoerd met de controller van het instituut. Besparingen lijken niet meer haalbaar gezien de minimale personele bezetting en financiële middelen waarmee gewerkt wordt. De OR heeft in dit verband gevraagd naar een overzicht van de kosten die gemaakt zijn in verband met de aanstelling van de interimdirectie en de zoekprocedure naar een nieuwe directeur. Deze kosten, die deels gemaakt zijn in opdracht van NWO, blijken hoog te zijn. Tijdens een achterbanbijeenkomst op 23 mei was de lange zoektocht naar een nieuwe directeur een van de belangrijkste onderwerpen van gesprek. Het personeel sprak de duidelijke wens uit dat zo snel mogelijk een nieuwe, éénhoofdige directie aangesteld zou worden. Om dit nadrukkelijk onder de aandacht te brengen heeft de OR deze wens in een brief overgebracht aan zowel NIOZ- als NWO-bestuur.

Op 27 april werd ten behoeve van informatie-uitwisseling een bijeenkomst belegd met andere Texelse ondernemingsraden (TESO, Stichting Texels Museum, RSG en Gemeente Texel). De bijeenkomst vond op het NIOZ plaats.

Afgeronde zaken

Ondanks matige ervaringen in het verleden heeft de OR onder voorwaarden ingestemd met een nieuw zorgcontract met arbodienst Maetis. Verder werd aan het NIOZ-bestuur positief geadviseerd met betrekking tot de verlenging van de aanstelling van Bert Geerken als zakelijk directeur tot 1 januari 2007, de benoeming van

Herman Ridderinkhof als tijdelijk directeur en die van Carlo Heip als algemeen directeur. In het laatste geval werd het advies gegeven nadat opheldering was verkregen over diens deeltijd-aanstelling, de duur van het contract en de voorgenomen aanstelling van een adjunct-directeur.

Het volledige overzicht van instemmings- en adviesaanvragen, en andere behandelde onderwerpen, is te vinden op de intranetpagina van de or.

DE PERSONEELSVERENIGING

Bezetting

Het afgelopen jaar heeft Johan Dresken vanwege het verlaten van het NIOZ ook het bestuur van de PV verlaten. De overige PV-bestuursleden zijn aangebleven.

Kinder-Pannenkoekenfeest

Alle kinderen van NIOZ-medewerkers waren uitgenodigd om dit feest bij te wonen. Bij binnenkomst kregen de circa 25 kinderen allemaal een kaartje waarop ze spelletjes konden laten aftekenen. Deze spelletjes bestonden o.a. uit blikgooien, spoorzoeken, kegelen en een elektrische spiraal. Voor tussendoor was een springkussen aanwezig waar veel gebruik van werd gemaakt. Nadat iedereen een ijsje had gekregen, konden na afloop van alle spelletjes overheerlijke pannenkoeken worden gegeten. Na het inleveren van een volle kaart kregen de kinderen als cadeautje een opblaasbare frisbee mee naar huis. Al met al een geslaagde middag die voor herhaling vatbaar is.

Branding-raften

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Het weer was ons goed gezind met ongeveer windkracht 5 en een flinke branding met brekers van vier meter hoog (zo leek het echt!). Dit was bijzonder goed gepland, omdat voor het eerst sinds weken er weer golven verschenen. Nadat we ons in een wetsuit met helm gehesen hadden, sleepten we de raft (rubberboot) naar het water. Vervolgens moesten we met een flinke sprong in de boot belanden en dan als een gek door de branding heen peddelen om dan terug over de golven te surfen. Enkelen belandden echter op de kop in de raft waarbij ze anderen via een klap met een peddel in dezelfde houding mepten. Nadat uiteindelijk iedereen geïnstalleerd was en klaar om te peddelen, zaten we al bijna weer op het strand en dan begon het hele verhaal weer van voren af aan. Drie keer haalden we de eerste rij golven om dan trots achterom te kijken en vervolgens om te slaan. Dit leverde enige hilarische momenten op.

PV-uitje

Als PV-uitje zijn we dit jaar met een volle bus naar Amsterdam vertrokken. Bij de Beurs van Berlage kreeg iedereen een fiets en kon je tijdens de fietstocht even stoppen om op bezoek te gaan bij het Tropenmuseum, Rijksmuseum, de Hortus, van Goghmuseum en de Heineken bierbrouwerij. Er was grote animo om Artis te bezoeken en daar zijn dan ook een aantal mensen heen gegaan. Aan het eind van de middag zijn we met de pont het IJ overgestoken om naar de Pollux te gaan, het oude opleidingsschip van de zeevaartschool. Hier had Johan Dresken samen met zijn neef een horecagelegenheid geopend waar we een heerlijk Italiaans buffet hebben genuttigd.

Sinterklaas

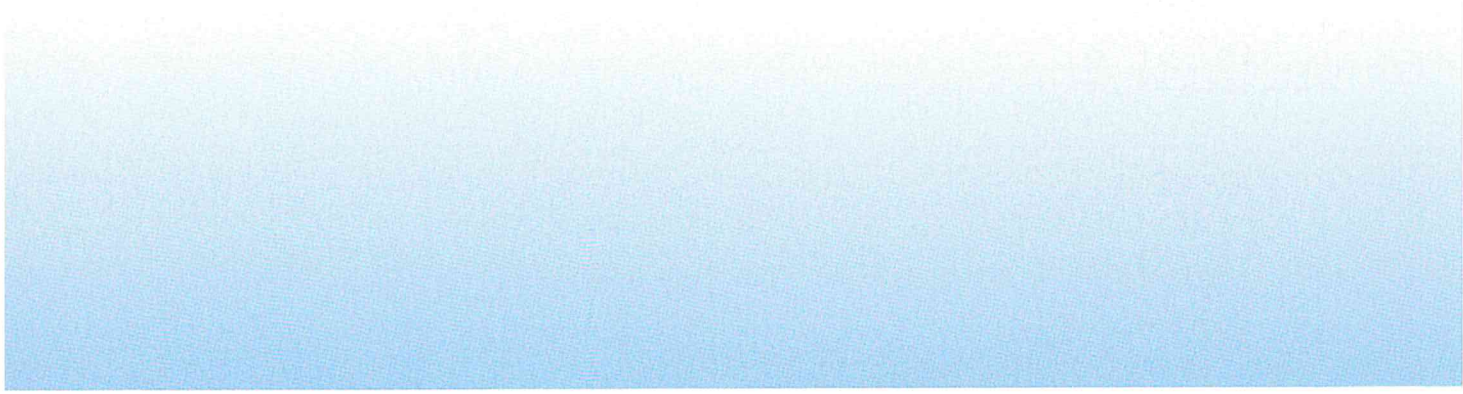
Het werd weer eens tijd om de mensen die nog niet bekend zijn met oeroude Hollandse tradities hiermee kennis te laten maken en om oude bekenden weer eens bij Sinterklaas te vragen. Sinterklaas en zijn pieten hadden gelukkig tijd om het NIOZ te bezoeken en een aantal mensen werd uitgenodigd bij de Sint. Hij had echter wat problemen met zijn trek en trees systeem, waardoor wat logistieke problemen optraden met de cadeaus. Gelukkig was er een microfoon om het allemaal wat te verduidelijken.



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Kerstborrel

De Kerstborrel had dit jaar niet een echt thema, maar er werden wel oude dia's en voorwerpen uit een ver verleden gebruikt bij de aankleding. Het was erg leuk om die oude foto's voorbij te zien komen en herinneringen op te halen. Dit jaar was er gelukkig weer beschikking over voldoende vis. Maar ook de barbecue stond weer aan en de tafels stonden vol met salades. De Kerstborrel was een geslaagd einde van een geslaagd jaar.



FINANCIEEL JAARVERSLAG



Balans per 31 december 2006 (in € x1,000)

Activa	2006	2005
Vaste activa		
Immateriële vaste activa	35	62
Materiële vaste activa	31,523	32,229
	31,558	32,291
Vlottende activa		
Voorraden	87	92
Vorderingen en overlopende activa	2,071	1,749
Liquide middelen	6,610	11,123
	8,768	12,964
	40,327	45,255

Staat van Baten en Lasten	2006	2005
NWO Basissubsidie	10,626	10,505
LOICZ	0	269
Investeringsubsidie	2,352	1,798
Eenmalige toekenningen	500	1,100
Projecten	4,949	4,986
	18,427	18,658
Inkomsten buiten norm. bedrijfsv.	599	557
Financiële baten	211	243
	810	800
Totale baten	19,237	19,458
Personeelskosten	10,896	11,017
Materiële kosten	5,191	5,674
Afschrijvingen	3,149	3,200
Rente	78	81
	19,314	19,972
Dotatie + vrijval voorzieningen	519	-923
Overlopende projectverplichtingen	-322	330
	197	-593
Totale lasten	19,511	19,379
Result. voor resultaatsbestemming	-274	79
Resultaatsbestemming	1,652	2,175
Result. na resultaatsbestemming	1,378	2,254

Passiva	2006	2005
Eigen vermogen		
Stichtingskapitaal	0	0
Algemene reserve	-7,086	-7,887
Bestemde reserve	3,525	3,884
Bestemde fondsen	31,789	32,506
	28,228	28,503
Voorzieningen	1,829	2,022
Langlopende schulden	2,420	2,553
Kortlopende schulden	7,850	12,176
	12,099	16,751
	40,327	45,255

Kasstroomoverzicht	2006	2005
Beginsaldo liquide middelen	11,123	11,206
Bedrijfsresultaat	-274	80
Aanpassingen voor:		
Afschrijvingen	3,149	3,200
Voorzieningen	-193	-1,490
	2,956	1,710
Toename/afname vorderingen	-322	974
Toename/afname voorraden	4	-25
Toename/afname kortl. schulden	-4,327	3,578
Mutatie werkkapitaal	-4,645	4,527
Tot. mutatie uit bedrijfsoperaties	-1,963	6,317
Investerings immateriële vaste act.	-3	0
Investerings materiële vaste activa	-3,029	-2,561
Desinvesteringen matr. vaste activa	615	430
	-2,417	-2,131
Aflossing leningen	-134	-956
Afname langlopende schulden	0	-3,314
	-134	-4,270
Mutatie liquide middelen	-4,514	-84
Eindsaldo liquide middelen	6,610	11,123

Toelichting op de jaarrekening

Waarderingsgrondslagen van activa en passiva

De immateriële vaste activa worden gewaardeerd tegen verkrijgingsprijs verminderd met de cumulatieve afschrijvingen. De materiële vaste activa worden gewaardeerd tegen verkrijgingsprijs dan wel vervaardigingsprijs onder aftrek van de toegepaste afschrijvingen. De afschrijving geschiedt lineair met de volgende percentages:

Terreinen	0.0%
Gebouwen en haven	3.0%
Vaartuigen	7.5%
Apparatuur en installaties	10.0%
Transportmiddelen	20.0%
Automatiseringapparatuur	25.0%
Inventaris	10.0%

De voorraden worden opgenomen tegen aanschafprijs. Indien noodzakelijk wordt een voorziening incourantheid opgenomen.

Opname van debiteuren en overige vorderingen vindt zonodig plaats onder aftrek van een voorziening wegens oninbaarheid.

Grondslagen voor de bepaling van het resultaat

Baten en lasten worden toegerekend aan het jaar waarop zij betrekking hebben. Verliezen worden in aanmerking genomen in het jaar waarin deze voorzienbaar zijn.

Kasstroomoverzicht

Het kasstroomoverzicht is opgesteld overeenkomstig de indirecte methode.

Toelichting op de balans

Immateriële vaste activa

	Waarde per 31-12-2006	Investerings	Desinvesteringen	Waarde per 31-12-2005
Software				
Aanschafwaarde	118	2		116
Afschrijvingen	83	29		54
Boekwaarde	35	-27		62

Materiële vaste activa

	Waarde per 31-12-2006	Investerings	Desinvesteringen	Waarde per 31-12-2005
Terreinen				
Aanschafwaarde	1,357			1,357
Afschrijvingen	0			0
Boekwaarde	1,357			1,357
Gebouwen				
Aanschafwaarde	34,208	567		33,641
Afschrijvingen	17,488	982		16,506
Boekwaarde	16,720	-415		17,135
Haven				
Aanschafwaarde	4,021	45		3,976
Afschrijvingen	2,262	95		2,167
Boekwaarde	1,759	-50		1,809
Apparatuur en installaties				
Aanschafwaarde	29,705	1,991	115	27,829
Afschrijvingen	20,180	1,616	113	18,677
Boekwaarde	9,525	375	2	9,152

Materiële vaste activa (vervolg)

	Waarde per 31-12-2006	Investerings	Desinvesteringen	Waarde per 31-12-2005
Inventaris				
Aanschafwaarde	913	83		830
Afschrijvingen	584	43		541
Boekwaarde	330	40		289
Automatiseringapparatuur				
Aanschafwaarde	2,405	83	16	2,338
Afschrijvingen	2,252	94	15	2,173
Boekwaarde	153	-11	1	165
Transportmiddelen				
Aanschafwaarde	863	15	5	853
Afschrijvingen	815	40	5	780
Boekwaarde	48	-25		73
Vaartuigen				
Aanschafwaarde	15,939	177	545	16,307
Afschrijvingen	14,309	251		14,058
Boekwaarde	1,630	-74	545	2,249
Totaal				
Aanschafwaarde	89,411	2,961	681	87,131
Afschrijvingen	57,890	3,121	133	54,902
Boekwaarde	31,523	-160	548	32,229

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Flottende activa

De vorderingen zijn opgenomen voor de nominale bedragen onder aftrek van benodigde voorzieningen. Ze vervallen binnen 1 jaar.

	2006	2005
Debiteuren	370	327
Rekening courant NWO	1,235	979
Overige vorderingen	466	443
	<u>2,071</u>	<u>1,749</u>

Onder de post overige vorderingen is K€ 300 opgenomen betreffende RV Nereis.

Eigen Vermogen

Saldo per 1 januari 2006		28,503
Bij: dotaties	103	
Bij: resultaat boekjaar	<u>1,378</u>	
		1,481
Af: mutaties	-1,653	
Af: vrijval	<u>-103</u>	
		-1,756
Saldo per 31 december 2006		<u>28,228</u>

Voorzieningen

Wachtgeldregeling:

Saldo per 1 januari 2006		627
Bij: dotatie	341	
Af: onttrekking	<u>-226</u>	115
Saldo per 31 december 2006		<u>742</u>

De dotatie bedroeg K€276 t.l.v. de basis en K€65 t.l.v. externe projecten

NIOZ-regeling:

Saldo per 1 januari 2006		1,176
Bij: dotatie	0	
Af: onttrekking	<u>-308</u>	-308
Saldo per 31 december 2006		<u>868</u>

Zeevaartregeling:

Saldo per 1 januari 2006		219
Bij: dotatie	0	
Af: onttrekking	<u>0</u>	0
Saldo per 31 december 2006		<u>219</u>

De fiscus heeft met ingang van augustus 2005 de toepassing van de zeevaartregeling ter discussie gesteld. Eventueel toegepaste vermindering van de loonbelasting dienst wellicht te worden terugbetaald. Definitieve uitspraak wordt in 2007 verwacht.

Langlopende schulden

	2006	2005
Lening nieuwbouw E-10		
Saldo 1 januari	1,856	1,945
Aflossing	-92	-89
Saldo 31 december	1,764	1,856
Lening Nieuwbouw MTC		
Saldo 1 januari	697	738
Aflossing	-41	-41
Saldo 31 december	656	697
	<u>2,420</u>	<u>2,553</u>

De lening in het kader van de sanering financiën is in 2006 in zijn geheel afgelost (zie kortlopende schulden).

Kortlopende schulden

Crediteuren	96	276
Betalingen onderweg	386	342
Loonbelasting	430	444
Omzetbelasting	3	0
Uitvoeringsorgaan	3	0
Pensioenpremie	139	155
Rekening courant Unesco	135	0
Te betalen overlopende kosten	313	112
Barter exchange OFEG	124	49
Aflossingsverpl. leningen NWO	134	4,270
Nog te betalen vakantie uitkering	344	338
Verlofdagen	992	1,087
Overlopende projectverplichtingen	<u>4,751</u>	<u>5,103</u>
	<u>7,850</u>	<u>12,176</u>

De rekening courant Unesco heeft betrekking op vooruit ontvangen bedragen inzake RV Logachev. In voorgaande jaren werden ontvangsten en betalingen geboekt via de projecten. Vanaf 2006 geschiedt dit via een rekening courant boeking zodat kosten en opbrengsten buiten de NIOZ (project)boekhouding worden gehouden.

Niet uit de balans blijken de verplichtingen

Renovatie gebouw E-00 en F-00	428
Vernieuwen van de meetsteiger	185
Multibeam echosounder RV Pelagia	158
Vervangen van de koel- en vriescellen	58
Aanschaf meubilair	26
Nieuwe machines + afzuiging (timmer) werkplaats	16
Bankgarantie inzake entrepot	<u>4</u>
	<u>875</u>

Toelichting op de staat van Baten en Lasten**Baten**

Investeringsubsidie:

In 2006 is investeringsubsidie ontvangen t.g.v. de multibeam echosounder.

Specificatie overige projectsubsidies:

	2006	2005
NWO projecten	2,006	1,793
Vaarvergoeding NWO	865	767
EU	892	440
Overige projecten	<u>1,186</u>	<u>1,986</u>
	<u>4,949</u>	<u>4,986</u>

Daling opbrengst overige projecten veroorzaakt door baten RV Logachev niet langer via projecten te boeken.

Lasten

Personele kosten:	2006	2005
Bruto schaalsalaris	6,957	6,868
Overige bruto componenten	1,341	1,218
Sociale lasten	1,606	2,024
Overige personeelskosten	482	499
Direct toerekenbare personeelskosten	<u>510</u>	<u>408</u>
	<u>10,896</u>	<u>11,017</u>
Bruto schaalsalaris:		
t.l.v. basissubsidie	5,256	5,484
t.l.v. externe projecten	<u>1,701</u>	<u>1,384</u>
	<u>6,957</u>	<u>6,868</u>
Medewerkers in fte:		
t.l.v. basissubsidie	149.1	148.7
t.l.v. externe projecten	<u>49.6</u>	<u>45.3</u>
	<u>198.7</u>	<u>194.0</u>

De stijging direct toerekenbare personeelskosten is het gevolg van de stijging kosten inhuur bemanning. De vacatures ontstaan door vertrek vaste bemanning worden voorlopig op deze wijze ingevuld.

	2006	2005
Materiële kosten:	1,400	1,242
Algemene- en reiskosten	666	602
Huisvestingskosten	1,230	1,072
Scheepskosten	838	817
Aanschaffingen	300	426
Bibliotheek	661	1,079
Diensten derden	<u>96</u>	<u>436</u>
Overige kosten	<u>5,191</u>	<u>5,674</u>

Stijging scheepskosten is het gevolg van de dokbeurt.

Daling diensten derden heeft zijn oorzaak in de nieuwe boekingsgang inzake RV Logachev.

Overlopende projectverplichtingen.

Hierin opgenomen K€ 300 inzake RV Nereis.

