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Report of the Working Group on Oceanic Hydrography

Hamburg 26-27 May 1986

The working group met at the Institut für Meereskunde, University of Hamburg on May 26 and 27 1986.

The following members were present:- G. Becker, J. Blindheim, E. Buch, J. Crease, R.R. Dickson, D.J. Ellett, E. Fahrbach, W.J. Gould (Chairman), K.-P. Koltermann, S.-A. Malmberg, J. Meincke, D. Rierma (representing G. Prangma), M. Stein, A. Svannson. The meeting was also attended by H. Dooley (ICES Hydrographer), T. McAndrew and H. von Bennekom.

Apologies for absence were received from A. Clarke, N. Hojerslev, K. Aagaard, O. Saelen and B. Hansen.

The draft agenda Annex A was adopted but it was agreed that the items would not necessarily be taken in the order proposed.

H. Dooley acted as rapporteur for the meeting.

J. Meincke welcomed the working group to the Institut für Meereskunde and described the facilities available and the timetable for the meeting.

The chairman said that he was concerned that even though the working group was flourishing there were a considerable number of members who took no part in its activities. Partly this was due to the working group having its main meetings independent of the Statutory Meetings and hence involving members wishing to attend both meetings in additional travel costs.

Dickson suggested that all members should be asked to say what topics they

would like to see discussed. Malmberg commented that he would like to see more specific geographical areas and topics discussed and that this would make travel funds easier to obtain. The chairman agreed to contact all members to ascertain their particular areas of interest and concern.

It was agreed that the meeting should move to a presentation and discussion of experimental results and plans for future work. This would naturally include plans for work in the Southern Norwegian Sea under the NANSEN project.

Summaries of the presentations are as follows:-

Fahrbach described long-term mooring work in the N. Atlantic related to the crossing of the mid-Atlantic ridge by the N. Atlantic current near the sub-polar front. The measurements are related to the French-German TOPOGULF project. A single 5 year-long current record at 600m showed almost zero mean despite being close to such a major current system. A mooring close to the Charlie-Gibbs Fracture Zone (50km to the north) showed persistent eastward flow over one year. The data demonstrate the difficulty in interpreting current records as short as one year. Some of the current records had been curtailed due to Aanderaa battery problems in 1985.

Meincke gave a more general description of the Institut fur Meereskunde Hamburg work. He said that each of the moorings showed sheared barotropic events with typically 10-30 days period but with no coherence between events on adjacent moorings. With the recovery of the mid-Atlantic ridge array in 1985 the programme of measurements was completed.

Dickson presented data collected in the course of a multi-year programme aimed at the study of models of dispersion in the N. Atlantic. A major component of this programme is the deployment of long-range SOFAR

neutrally buoyant floats within a current meter array on the Iberia abyssal plain. The current meters showed a horizontally incoherent pattern but with significant vertical coherence about the depth of the floats. The preliminary float tracks (approx 400 days long) show similar incoherent spatial patterns. Other projects include an analysis of plutonium ratios resulting from a combination of fallout, waste and burnup of the SNAP satellite in 1964 which contributed about one third of the oceanic plutonium inventory. Studies will also be made of the tritium concentrations in and around the NE Atlantic low level dump site in order to determine whether there is any evidence of leakage from the site. Work continues on studies of the injection of eddy kinetic energy into the ocean from atmospheric forcing. The interannual variability of the eddy energy as well as the low frequency variability can be seen in the 6 year long current record from NEADS site 6 (at the southern end of the Rockall Trough). This now shows an approximately 3 year periodicity of westward flow alternating with weaker southwestward movement.

In terms of new work, feasibility studies were being made of a deep ocean tracer release of sulphur hexafluoride (SF_6) as a means of studying directly dispersion in the deep ocean. This work is being done in cooperation with A. Watson of MBA Plymouth. The other major work will be the start of a current meter array experiment to measure the deep outflow of Norwegian Sea water southwest of the Denmark Strait. Two trial moorings will be deployed in 1986 to assess the technical difficulties of making measurements in this area. The plan for the main experiment calls for a 5 year array of 8 moorings.

Buch then reviewed work on the relationship between climatic change and fisheries in the W. Greenland area. He showed a 100 year time series

of temperature anomalies at Godhab which illustrated the recent cold spell. The cod catches in W. Greenland waters seemed related to temperatures with decreases during cold periods until catches fell to almost zero in the early 1980s. Another approach had been to study the year to year changes in the T-S characteristics of the Irminger Sea water. 1976 and 1984 have very anomalous T-S values.

The circulation of the Irminger Sea and its changes appear to have marked effects on the recruitment of O-group cod. How does the recruitment relate to both changes in both the circulation and to local temperature changes?

Blindheim commented that there were similar effects in the Barents Sea. The chairman said that these kinds of problems highlighted the difficulty in relating complex physical changes to biological effects and wondered what kind of physical observations were most appropriate to the study of fisheries problems.

Malmberg reported that he had two moorings on the east side of the Denmark Strait in an effort, in conjunction with hydrographic observations, to measure the volume of Irminger water passing to the north and west of Iceland. This was in addition to the Icelandic contribution to the Greenland Sea project which involved current meter and hydrobiological surveys connected with the capelin and cod fisheries. Plans for next year include grids of hydrographic observations in the Irminger Sea.

Blindheim described both routine survey work of the Institute for Marine Research (seasonal hydrobiological surveys in the Norwegian Sea together with surveys of blue whiting and capelin). In relation to the NANSEN project he described work to be carried out north of the Faroes jointly with the Faroese in June 1986. This was aimed at measuring the

flux of N. Atlantic or Modified N.A. water passing between the Faroes and the Icelandic-Faroes front. The work would be coordinated with simultaneous measurements by IOS UK and the NATO Saclant Center at La Spezia.

Could then gave a brief overview of the La Spezia GINSEA project, a multi-year exercise using many observational techniques to study the inflow of N.A. water to the southern Norwegian Sea. The project is unclassified and the data would eventually be available to the scientific community. He continued to describe IOS plans for work in the Iceland Faroes region. These at present centre around the dynamics of the Iceland Faroes front, variability in the Faroe Shetland Channel and monitoring of the Faroe Bank channel outflow of Norwegian Sea water using acoustic travel time measurements. Work was continuing on the analysis of the CONSLEX current meter measurements and on the year-long current records from the W. Shetland slope.

The meeting continued with a general review of contributions planned for the NANSEN project. These included in addition to those mentioned above comprehensive plans for CTD, current meter and tracer studies by the Netherlands in the S. Norwegian Sea and work around Faroe Bank by SMBA (Ellett) aiming to look at the circulation and mixing on and around the bank and over the Wyville-Thomson Ridge. Becker and Koltermann described planned work in the Iceland-Faroe ridge area, in the Iceland Basin of the N. Atlantic and running northwards from Spitzbergen in August 1987. Meincke reviewed a comprehensive series of observations in the Norwegian and Greenland Seas which would make a major contribution to the Arctic Ocean Science Board Greenland Sea project.

Each contributor summarised their likely NANSEN contribution on a

chart and the chairman agreed to circulate a synthesis of the planned activities to all participants. Many cruises are planned for the summer of 1987 and will provide a good initial data set for the NANSEN project.

The meeting went on to consider the role that ICES might play in the World Ocean Circulation Experiment (WOCE). Crease provided a general overview of the scope and aims of WOCE. There are two major goals

- (1) The development of models useful for the prediction of climate and the collection of the data needed to test them. This requires an understanding of
 - (a) the large scale fluxes of heat and water, their divergences and annual and interannual variability,
 - (b) the dynamical balance of the global ocean circulation and its response to changing surface fluxes,
 - (c) ocean variability on scales of months to years and megametres to global scales and
 - (d) the rates of formation, ventilation and circulation of water masses which influence climate on scales of 10 to 100 years.
- (2) To determine how representative the WOCE data sets are of the long term behaviour of the ocean and to find methods to determine long term changes in ocean circulation. This will involve the identification of oceanic parameters whose observation is essential for continuing measurements of the ocean climate on decadal time scales and the development of cost-effective techniques for the development of climate observing systems.

Within these goals are three Core Projects

Core 1 Concerned with obtaining a Global Description of the ocean

Core 2 The Southern Ocean

Core 3 The study of the Gyre Dynamics of one ocean basin.

It is clear that many of the WOCE objectives, as they relate to the North Atlantic, are of prime interest to ICES and could lead to a better understanding not just of the physics of the ocean but of the relationship of long term physical changes to biological indicators. Specific questions to which the ICES community might contribute answers for the northern N. Atlantic are:-

What is the mass transport across the northern boundaries of the N. Atlantic? (This would be needed as a boundary condition for N. Atlantic models.) Are the transports steady? What are the horizontal correlation scales in the ocean interior? Is the temperature field more variable than the density field?

One key element of WOCE planning is the use of altimetric data and data on surface ocean fluxes and wind stress from satellites. The altimeter data will be cross checked with high quality sea level data from a global network of tide gauges. Sea level is one of the most readily available and uniform parameters from which to assess long term changes in the ocean and it is of great importance that as many high quality stations as possible should be installed and maintained at open ocean island sites. Several of these lie within the ICES geographical area and members were asked to use what influence they had to improve the tide gauge network and to ensure that existing gauges on island sites were maintained at a high standard.

The use of chemical tracers in the deep ocean has also been recognised as throwing light on the long term patterns of ocean circulation and it was noted that many of the laboratories represented on the Oceanic Hydrography working group had the required levels of expertise to make such measurements.

Another field in which ICES might make a contribution could be in the establishment of reference stations (similar to the Panulirus station near Bermuda) at which hydrographic, chemical and perhaps biological measurements would be repeated at regular intervals over a long period of time in order to establish baselines against which anomalous conditions could be recognised. The expertise and cooperation of ICES member nations could be used to choose the most suitable sites and to maintain these stations.

It was also recognised that within the ICES Service Hydrographique was to be found a wealth of experience in the quality control and archiving of multi-year sets of oceanic observations and that this expertise and in particular that concerned with data quality assurance should be made available to those planning the WOCE experiment.

This then concluded the first day's discussion.

The meeting continued with a discussion of the work of the Service Hydrographique. In order to aid the discussion the Hydrographer had prepared a set of information notes. He explained that these notes had already been presented to the working groups on Marine Data Management and Shelf Seas Hydrography and that he would highlight only those matters of concern to the Oceanic Hydrography Working Group.

These were:-

- (a) The archiving of the Soviet weather ship data and sections programme.

Examples of overview products were presented to demonstrate the usefulness of chart presentations to facilitate access to relevant parts of the data bank. MDM had agreed that this was a useful way to proceed in order to publicise the data holdings. In discussion it was

noted that the only data being acquired was that from Soviet cruises starting and finishing in Odessa and was thus principally from the N. Atlantic south of the OWS Charlie position. Whilst very useful in itself the working group urged the Hydrographer to try to acquire the data from Soviet ships working out of Murmansk as these data sets would include sections across the Norwegian Sea and Faroe-Shetland channel. The Hydrographer undertook to take the necessary steps but only after all outstanding requests presently with the World Data Centre had been processed.

- (b) The establishment of a project centre at the Service Hydrographique to service the Baltic Patchiness Experiment (PEX). The group recognised that this development provided firm foundations for the future, especially for an involvement in relevant elements of WOCE. As a lead up to this it was considered that the Service Hydrographique should become the project centre for the NANSEN project. This would involve a much heavier commitment than in the past with regard to CTD and current meter data. The Hydrographer explained that the ICES secretariat is gradually becoming better equipped with regard to computer hardware and software and such a development would therefore be quite feasible. Its ability to receive and handle data, both standard homogeneous data sets, and nonstandard heterogeneous data sets would be greatly improved by recent developments. These were the result of the acquisition of GF3 software (GF3-PROC) and also the acceptance by the working group on Marine Data Management of a "blueprint" for reporting formats, details of which are given in the report of that working group. Accordingly the working group proposed resolution 1.

- (c) A draft version of the 1986 edition of the working group's Inventory of Activities in the N. Atlantic ICES area. This had been considerably altered since the 1985 edition, over 60 responses to the last questionnaire having been received. Some further updating was made by the working group members in readiness for the Hydrographer to prepare a final version as soon as possible. It was agreed that the present timetable for preparation and issue of the inventory was cost-effective and efficient and therefore the Hydrographer should continue to proceed along these lines.
- (d) Data acquisition to the regional data bank. There was lively, if rather negative, discussion of this item which included problems related to the ROSCOP form. It was clear that generalised data and information flow as envisaged in the IODE system was in some difficulty. The reasons for this are complex and hard to understand. Many scientists are now acquiring exchange data sets through personal contacts and bilateral arrangements and the Hydrographer admitted that most of his successes have been by this means. The group agreed that this situation should not persist due to its lack of control of data quality and the potential duplication of effort. It was therefore important for the Service Hydrographique to develop a good capability in "services" as this will help to demonstrate to the oceanographic community the value of a regional data centre.
- (e) Salinometer intercomparison. The results of this exercise were presented by the Hydrographer with background information provided by Becker and Dickson. Initially it had been planned as an FRG national exercise but Dickson had encouraged it to become international. Within 3 months of its announcement there had been approximately 40

requests for samples for analysis. Each laboratory had been sent 4 samples (approx 8.5, 23.5, 35.0 and 35.5 on the practical salinity scale) and despite some breakages and lost samples most laboratories made satisfactory determinations of the samples near 35 but that there were some salinometers which gave wildly erroneous results at all salinities (presumably the operators were not aware of the problem until this exercise was carried out.) A significant number of clearly erroneous values were returned by laboratories which produced other high quality results and therefore it is suspected that a few "bad" samples were circulated. It was agreed that the results gave both encouragement at the degree of interest in the exercise but also disquiet at the poor performance of some instruments. It is planned to publish the results in Deep-Sea Research. There was some discussion of possible ways to repeat the exercise in order to investigate the performance of the better laboratories and it was agreed that this could be achieved only by involving the type of sample quality control exercised by the Standard Seawater Service.

In concluding this discussion Dickson reported on an exercise to investigate the effects on salinity values of prolonged storage. To do this laboratories had sent to the MAFF Lowestoft laboratory examples of their salinity sample bottles which were then filled with water of constant salinity which will be refilled and analysed after various lengths of time.

The meeting continued with a general discussion of the problems of ensuring uniform and high data quality. The chairman remarked that considerable insight had been gained into the problems of maintaining quality control of hydrographic data both through the exercises reported

here and through the papers presented at the 1985 statutory meeting. The concentration of work next summer in the S. Norwegian Sea would present further opportunities for intercomparisons.

The further progress on comparing CTD data quality would be greatly helped by the submission of data to data centres where intercomparisons could be carried out. Koltermann asked about the usefulness of a DSRT thermometer intercomparison exercise but it was considered that to a great degree these instruments were now used only as a secondary check on CTD values.

Dickson and Crease commented that much of the CTD data from the 1970's were of doubtful quality and that their archiving may not be worthwhile.

It was agreed that the working group would continue to pursue improvements in oceanographic data.

Dickson reviewed the arrangements for the 1986 statutory meeting and in itemising the papers submitted commented on the new rules for citation of papers and the plans to publish abstract volumes. There was no great enthusiasm in the working group for this plan since it was felt that at present the abstracts gave rather little information on the papers' subject matter. It was felt that longer and more informative abstracts should be encouraged. The chairman reported that he had learned from Allyn Clarke that 10 papers had been submitted to the Deep Water Project Symposium.

Dickson also mentioned the coming JOA meeting in 1988 (probably in Mexico City) and the role that ICES could play in it. It was felt that ICES might sponsor discussions of the Norwegian Sea circulation and exchanges with the N. Atlantic, a topic which would by then be receiving considerable observational effort. Other possible topics were data quality and instrument intercomparisons and IREP problems. It was felt that all of

these matters would be appropriate and that the JOA meeting would be a good opportunity to publicise ICES in the wider oceanographic community.

The meeting then moved to a discussion of the venue and main topics for the next working group meeting. It was agreed to hold it at KNMI de Bilt Netherlands on 23/24 April 1987. The main topics would be

- (a) The coordination of observational plans for work in the southern Norwegian Sea in the summer of 1987.
- (b) Current meter data quality.

In conclusion the chairman thanked Crease for addressing the meeting on the subject of WOCE and Meincke and the Institut fur Meereskunde for acting as hosts.

The meeting ended at 1300.

Recommendations

- (1) The Oceanic Hydrography working group recommends that the ICES Service Hydrographique acts as a project data centre for the NANSEN project (aimed at studying and quantifying the exchange of water between the N. Atlantic and Norwegian Sea).
- (2) The ICES Oceanic Hydrography working group recognising the importance of high quality sea level data requests that ICES member nations attempt to bring such measurements as are being made in their countries up to the level of precision required for use in the WOCE experiment.
- (3) That the next meeting of the Oceanic Hydrographic working group be held at KNMI de Bilt Netherlands on April 23/24 1987 and that the main discussion will focus on
 - (a) the coordination of plans for the NANSEN project in the summer of 1987, and
 - (b) a consideration of the quality of current meter data.

ANNEX A

ICES OCEANIC HYDROGRAPHY W.G.

HAMBURG, MAY 28-29 1986

Draft Agenda

1. Local arrangements and introduction.
2. Additions and changes to agenda.
3. Appointment of rapporteur.
4. Membership review.
5. ICES and WOCE
Discussion of role of ICES WOCE (J. Crease).
 (a) Experimental contributions.
 (b) Role of Service Hydrographique in WOCE.
6. Review of proposed national contributions to NANSEN.
7. Review of quality standards for hydrographic data.
Results of salinometer intercomparison, suggestions for further tests.
8. Review of national programmes.
Presentation of new results.
9. Update of inventory entries.
Timetable for future inventory publication.
10. Progress and future work of Service Hydrographique (H. Dooley).
11. Statutory meeting '86. Rules for citation.
Review of papers submitted
12. Possible ICES role in next (1988) JOA.
13. Any other business.
14. Venue and topic for next working group meeting.