CAMPAIGN REPORT BMM-Measuring service Ostend 2005/18

11.07.2005 till 15.07.2005

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Program identification	ENDIS RISK – SISCO

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1. Scienctist team

ENDIS-RISKS team:

E. Monteyne
M. Neyts
A. Ghekiere
H. Noppe
G. Coulier
B. Beuselinck
N. Fockedey
G. Desmet
D. Peelaers
A. Goffin

SISCO team:

J. Petit
V. Carbonnel
L. Rebreanu
A. Taillez

TV – team (1000 zonnen en garnalen)

H. Van Welden
J. De Neve
S. Van Roy

Other

G.Smagghe

2. Objectives of the campaign

2.1 ENDIS-RISKS – Roose

The goal of the project is to get better insight into the distribution and the possible effects of hormone disrupting substances in the Scheldt Estuary. The components to be analysed are mentioned on the OSPAR list of priority substances or are mentioned as hormone disrupting components on the OSPAR list of candidate substances. Also the short and long term effects of these components will be evaluated in the laboratory and in the field. For the priority substances the fysico-chemical distribution (speciation between the different compartments: sediment, water, suspended particulate matter), their concentrations in biota (mysids and gobies) and geographical spreading will be measured. Possible toxicological effects will also be investigated on an ecological important group of endemic organisms (mysids). For this purpose acute as well as chronical effects are studied on individual and population level and compared to historical data.

2.2 SISCO – Chou

The general goal of the project "SISCO" is to get better insights into the bio-chemical cycle of Si and its antropogenic disturbance in the Scheldt Estuary. The bio-chemical cycle of dissolved Si in aquatic ecosystems is important to structure biological societies. The excess of N and P relative to Si, carried from rivers to the coastal zone, has a dramatic effect on the food webs in the coastal seas.

The origin and sinks of Si in the Scheldt estuary will be defined. Important processes controlling the bio-chemical behaviour of Si in the water column will be measured. The early diagenesis of Si will be evaluated in order to determine the flux of Si (retained) in the sediment as well as the internal recycling of Si in the sediments. At last the Si flux of the Scheldt to the southern bay of the North Sea will be quantified by using a coupled hydro-dynamic bio-geochemical model in which the input of the most important supplying rivers, the fraction retained in the estuary, as well as the fraction reaching the coastal zone are determined. This will permit the evaluation of the impact of Si on eutrophication of the coastal zone via the alteration in the composition of the species of phyto-plankton.

2.3 BMM-Laumont

In the framework of the permission granted to C-Power (C-Power NV is a Belgian company which stands for the development and implementation of a farshore wind farm on the Thornton Bank, 27 to 30 km in the North Sea) for the construction of a windfarm in the EEZ , a monitoring plan is foreseen for 6 years starting in the autumn of 2004

3. Operations

Monday 11 July

11h00 : Zeebrugge – departure

13h00 : Recovery ADCP, tripode (refer to report M Fettweis)

Station S01 Vlissingen

17h20 : Start centrifuge
17h55 : CTD scan
17h57 : Water sampling (Nisking / Go Flo)
18h06 : Sediment sampling (Van Veen)
18h50 : Sediment sampling (Boxcorer)
19h07 : Fish tracks (Hyperbentic sledge) start
19h25 : Fish tracks (Hyperbentic sledge) 2 start
20h00 : Fish tracks (Hyperbentic sledge) 3 start
20h40 : CTD scan
20h41 : Stop centrifuge

Station 710

22h30 : Niskin
22h34 : Reineck
22h39 : Reineck

Station 780

23h25 : Niskin
23h30 : Reineck
23h37 : Reineck

Tuesday 12 July

Station 130

07h40 : Niskin
07h45 : Reineck
07h50 : Reineck

Station 230

08h20 : Niskin
08h50 : Boxcore
05h57 : Centrifuge start

Station 330

09h44 : Niskin
09h47 : Niskin
09h58 : VanVeen

De Gootte Bank

WG1

10h21 : Niskin
10h23 : Centrifuge stop
10h33 : Hyperbenthic sledge start
10h40 : Hyperbenthic sledge stop

Thornthon Bank

WT9

11h32 : Niskin
11h40 : Hyperbenthic sledge start
11h55 : Hyperbenthic sledge stop

WT8

12h23 : Niskin
12h29 : Hyperbenthic sledge start
12h44 : Hyperbenthic sledge stop

WT7

13h11 : Niskin
13h16 : Hyperbenthic sledge start
13h31 : Hyperbenthic sledge stop

Station S12 Bath

18h41 : Start centrifuge
18h55 : CTD scan
19h01 : Water sampling (Nisking / Go Flo)
19h06 : Sediment sampling (Van Veen)
19h17 : Fish tracks (Hyperbentic sledge)
19h30 : Fish tracks (Hyperbentic sledge) 2
19h51 : Fish tracks (Hyperbentic sledge) 3
20h15 : Fish tracks (Hyperbentic sledge) 4
20h25 : Fish tracks (Hyperbentic sledge) 5
20h49 : CTD scan
20h52 : Stop centrifuge

Wednesday 13 July

Temse

08h51 : Start centrifuge
09h01 : CTD scan
09h03 : Water sampling (Nisking / Go Flo)
09h04 : Fish track passive (Hyperbentic sledge)
09h12 : Sediment sampling (Van Veen)
09h35 : Sediment sampling (Boxcorer)
09h36 : CTD scan
09h50 : Stop centrifuge

Station S15 Doel

12h06 : Start centrifuge
12h20 : CTD scan
12h21 : Water sampling (Nisking / Go Flo)
12h33 : Sediment sampling (Van Veen)
12h44 : Sediment sampling (Boxcorer)
13h05 : Fish track passive (Hyperbentic sledge)
13h26 : Fish track passive (Hyperbentic sledge)
13h40 : CTD scan
14h03 : Stop centrifuge

T3

14h27 : Niskin + Reineck

Thursday 14 July

Station S22 Antwerpen

08h16 : Centrifuge start
08h32 : CTD scan
08h40 : Water sampling (Nisking / Go Flo)
08h46 : Sediment sampling (Van Veen)
08h54 : Fish tracks (Hyperbentic sledge)
09h15 : Fish tracks (Hyperbentic sledge) 2
09h40 : Fish tracks (Hyperbentic sledge) 3
10h53 : Sediment sampling (Boxcorer)
10h53 : CTD scan

Staton S09 SISCO

12h35 : Niskin + Reineck

Station S07 Hansweert

13h24 : Start centrifuge
13h39 : CTD scan
13h40 : Water sampling (Nisking / Go Flo)
13h54 : Sediment sampling (Reineck)
14h08 : Sediment sampling (Van Veen)
14h49 : Fish tracks (Hyperbentic sledge)
15h14 : Fish tracks (Hyperbentic sledge) 2
15h54 : Fish tracks (Hyperbentic sledge) 3
16h20 : CTD scan
16h31 : Stop centrifuge

Station S04 SISCO

17h27 : Niskin
17h40 : Reineck

Friday 15 July

Station S09 Saefthinge

07h20 : Centrifuge start
08h00 : CTD scan
08h03 : Water sampling (Nisking / Go Flo)
08h15 : Sediment sampling (Reineck)
08h24 : Sediment sampling (Van Veen)
08h38 : Fish tracks (Beam trawl)
09h00 : Fish track (Hyperbentic sledge)
09h00 : Fish track e (Hyperbentic sledge) 2
09h00 : Fish track e (Hyperbentic sledge) 2
09h34 : CTD
09h42 : Centrifuge stop

4. Remarks regarding measurement instruments and the campaign in general

In general the campaign went very smoothly. No special remarks concerning measurement instruments are to be made.

5. Executed sampling programme ENDIS-RISKS and SISCO

Scheldt River

STATION	POSITIE		ODAS	SCTD	Water sampling	Sediment	Suspended particulate matter (SPM)	Fish tracks
	N.B.	O.L.						
S01	51 25.00	3 34.20	X	X	X	X	X	X
S07	51 26.20	4 00.00	X	X	X	X	X	X
S09	51 22.20	4 04.70	X	X	X	X	X	X
S12	51 21.90	4 13.50	X	X	X	X	X	X
S15	51 18.80	4 16.40	X	X	X	X	X	X
S22	51 13.13	4 23.50	X	X	X	X	X	X

ODAS = automatic registration of :
navigation parameters en bathymetry
meteo parameters (inclusive solar radiation)
salinity en temperature (thermosalinographe Seabird SBE21)
fluorescence (Turner Design fluorimeter model 10AU)
temperature (Rosemount temperatuurssensor)

CTD = Conductiviteit (Saliniteit), Temperatuur, Diepte gekoppeld met Densiteit, Turbiditeit met OBS-sensor, LiCor Quantameter (PAR).

Belgian Continental Shelf

STATION	POSITIE		ODAS	CTD	Water sampling	Sediment	Suspended particulate matter (SPM)	Fish tracks
	N.B.	O.L.						
710	51 26.45	3 08.32	X	X	X	X		
780	51 28.27	3 03.48	X	X	X	X		
130	51 16.25	2 54.30	X	X	X	X		
230	51 18.50	2 51.00	X	X	X	X		
330	51 26.00	2 48.50	X	X	X	X		

ODAS = automatische registratie van :
navigatie parameters en bathymetrie
meteoparameters (inclusief solarradiation)
saliniteit en temperatuur (thermosalinograaf Seabird SBE21)
fluorescentie (Turner Design fluorimeter model 10AU)
temperatuur (Rosemount temperatuurssensor)

CTD = Conductiviteit (Saliniteit), Temperatuur, Diepte gekoppeld met Densiteit, Turbiditeit met OBS-sensor, LiCor Quantameter (PAR).

6. Detailed overview sampling programme ENDIS-RISKS and SISCO

Scheldt River

STATION	WATER SAMPLING				SEDIMENT		SPM	FISH TRACKS	
	WATER NISKIN (5 l)		WATER GO FLO (10 l)	WATER NISKIN (10 l)	Van Veen	Boxcorer / Reineck	Centrifuge	Beam trawl	Hyperbentic sledge
	SPM	DOC POC	Endocrine Disruptors	Radiotracer Incubation					
S01	X	X	X	X	X	X	X	X	X
S07	X	X	X	X	X	X	X	X	X
S09	X	X	X	X	X	X	X	X	X
S12	X	X	X	X	X	X	X	X	X
S15									
S22	X	X	X	X	X	X	X	X	

Belgian Continental Shelf

STATION	WATER SAMPLING				SEDIMENT		SPM	FISH TRACKS	
	WATER NISKIN (5 l)		WATER GO FLO (10 l)	WATER NISKIN (10 l)	Van Veen	Reineck / Boxcorer	Centrifuge	Beam trawl	Hyperbentic sledge
	SPM	DOC POC	Endocrine Disruptors	Radiotracer Incubation					
710				X		X			
780				X		X			
130				X		X			
230				X		X			
330				X		X			

7. METEO PARAMETERS - ODAS

Tabel : Wind Speed, Wind direction, Air temperature, Water depth, Barometric Pressure and salinity at the different sampling stations.
(B : No data, S : Suspected data)

Station	Date	Time (gmt)	Wind sp. (m/s)	Wind dir. (dg)	Air temp. (°C)	Water depth (m)	Water temp. (°C)	Salinity (PSU)
S01								
Centrifuge start	11.07.05	15h17	12.3	357.2	22.6	-19.15	19.2	30.1
Water sampling	11.07.05	15h50	10.1	358.1	23.6	-23.56	19.3	29.6
Sediment	11.07.05	16h03	9.5	2.6	23.5	-23.51	19.4	29.7
Hyper start	11.07.05	17h05	8.7	351.8	22.8	-23.08	19.3	29.8
Hyper stop	11.07.05	17h16	10.1	3.0	22.5	-25.71	19.3	29.8
Centrifuge + CTD stop	11.07.05	18h35	6.6	353.9	21.9	-23.06	19.3	29.7
S12								
Centrifuge start	12.07.05	16h42	8.6	326.2	26.7	-13.30	21.5	11.5
Water sampling	12.07.05	16h51	8.0	327.7	25.3	-11.5	21.5	11.2
Sediment	12.07.05	17h04	8.1	327.3	25.0	-11.49	21.5	11.5
Sledge start	12.07.05	17h14	8.4	327.1	25.0	-11.50	21.5	11.7
Sledge stop	12.07.05	17h24	7.3	326.1	24.9	-11.89	21.5	11.8
Sledge start 2	12.07.05	17h28	6.8	325.7	24.8	-11.89	21.5	11.9
Sledge stop 2	12.07.05	17h45	7.6	332.4	24.8	-11.00	21.5	12.2
Sledge start 3	12.07.05	17h45	8.7	331.5	24.9	-11.23	21.5	12.2
Sledge stop 3	12.07.05	18h12	5.0	323.6	24.6	-13.99	21.3	13.0
Sledge start 4	12.07.05	18h13	5.5	324.8	24.6	-13.99	21.3	13.0
Sledge stop 4	12.07.05	18h24	6.0	320.0	24.6	-13.69	21.3	13.1
Sledge start 5	12.07.05	18h34	6.6	331.7	24.4	-13.41	21.2	13.4
Sledge stop 5	12.07.05	18h46	4.5	324.7	25.1	-12.41	21.2	13.3
Centrifuge stop	12.07.05	18h49	4.6	320.7	24.7	-12.91	21.4	12.7
Temse								
Centrifuge start	13.07.05	6h48	1.2	265.8	21.5	-12.6	22.3	3.9
CTD start	13.07.05	6h57	2.8	312.4	21.4	-12.9	20.6	0.6
Water sampling	13.07.05	6h57	2.1	63.6	21.4	-12.41	20.6	0.6
Sledge start	13.07.05	7h01	2.2	327.7	21.3	-13.5	20.6	0.6
Sediment	13.07.05	7h07	1.9	318.3	21.4	-14.01	20.6	0.6
Centrifuge stop	13.07.05	7h47	1.7	332.1	22.2	-12.19	20.7	0.8

Tabel (continued): Wind Speed, Wind direction, Air temperature, Water depth, Barometric Pressure and salinity at the different sampling stations.
(B : No data, S : Suspected data)

Station	Date	Time (gmt)	Wind sp. (m/s)	Wind dir. (dg)	Air temp. (°C)	Water depth (m)	Water temp. (°C)	Salinity (PSU)
S15 Doel								
Centrifuge start	13.07.05	10h03	4.7	337.0	26.1	-11.52	21.9	8.6
Water sampling	13.07.05	10h17	4.4	331.3	27.1	-11.42	22.0	8.3
CTD start	13.07.05	10h17	4.0	352.2	26.7	-11.48	21.9	8.3
Sediment	13.07.05	10h30	4.6	330.9	25.0	-15.30	22.0	8.0
Hyper start	13.07.05	11h02	4.6	329.1	25.9	-14.9	22.0	7.9
Hyper stop	13.07.05	11h14	4.6	317.5	24.9	-15.00	22.0	8.0
Hyper start 2	13.07.05	11h23	5.2	300.5	25.0	-13.30	22.0	7.9
Hyper stop 2	13.07.05	11h32	4.8	295.4	25.3	-13.19	22.1	7.8
Cenrifuge stop	13.07.05	12h01	5.0	324.6	25.2	-12.61	21.9	7.0
S22								
Water sampling	14.07.05	6h27	1.2	26.5	22.5	-12.61	21.6	3.6
Sediment	14.07.05	6h42	1.0	20.4	22.7	-13.7	21.7	4.1
Hyper start	14.07.05	6h52	0.7	43.8	23.0	-13.7	21.7	4.4
Hyper stop	14.07.05	7h04	1.3	9.9	23.2	-13.59	21.8	4.7
Hyper start2	14.07.05	7h13	0.8	234.3	23.8	-13.7	21.8	4.9
Hyper stop2	14.07.05	7h26	0.7	262.8	23.9	-13.70	21.9	5.1
Hyper start3	14.07.05	7h37	1.7	355.1	24.5	-14.31	21.9	5.4
Hyper stop3	14.07.05	7h56	1.0	360.0	24.2	-13.79	21.9	5.8
CTD stop	14.07.05	8h25	1.0	74.1	25.0	-14.8	22.0	6.0
Centrifuge stop	14.07.05	8h46	1.2	352.8	25.6	-20.5	22.0	5.6

Tabel (continued): Wind Speed, Wind direction, Air temperature, Water depth, Barometric Pressure and salinity at the different sampling stations.
(B : No data, S : Suspected data)

Station	Date	Time (gmt)	Wind sp. (m/s)	Wind dir. (dg)	Air temp. (°C)	Water depth (m)	Water temp. (°C)	Salinity (PSU)
S07								
Centrifuge start	14.07.05	11h22	1.4	276.5	26.1	-15.58	21.0	18.4
CTD start	14.07.05	11h35	0.6	210.2	26.7	-8.67	20.9	19.1
Water sampling	14.07.05	11h40	0.7	172.0	27.1	-8.41	21.0	19.0
Van Veen	14.07.05	12h06	0.9	112.4	28.5	-7.8	21.0	18.7
Hyper start	14.07.05	12h46	2.1	108.8	27.8	-7.8	21.1	18.3
Hyper stop	14.07.05	12h57	1.5	113.6	27.8	-12.72	21.1	17.7
Hyper start2	14.07.05	13h11	1.4	123.3	28.2	-7.31	21.2	18.2
Hyper stop2	14.07.05	13h28	0.7	271.9	29.2	-11.52	21.2	17.7
Hyper start3	14.07.05	13h51	0.7	18.1	28.4	-8.29	21.2	18.0
Hyper stop3	14.07.05	14h09	0.8	266.5	29.7	-12.21	21.2	17.7
Centrifuge stop	14.07.05	14h27	0.3	307.3	29.5	-23.22	21.12	17.6
S09 Saefthinge								
Water sampling	15.07.05	5h36	4.4	231.8	23.5	-16.61	21.4	16.2
CTD start	15.07.05	5h37	6.3	235.4	23.4	-16.90	21.5	16.1
Centrifuge start	15.07.05	5h40	4.5	274.0	23.5	-16.30	21.4	16.1
Van Veen	15.07.05	5h55	5.2	240.0	23.6	-16.80	21.4	16.5
Hyper start2	15.07.05	6h43	6.0	224.6	24.0	-17.1	21.2	18.2
Hyper stop2	15.07.05	6h58	5.4	231.6	24.1	-17.29	21.2	18.2
Hyper start3	15.07.05	7h12	6.3	234.6	24.4	-17.68	21.2	18.5
Hyper stop3	15.07.05	7h22	5.8	239.2	24.6	-17.71	21.2	18.5
CTD stop	15.07.05	7h27	5.9	249.4	24.7	-17.02	21.1	18.6
Centrifuge stop	15.07.05	7h37	5.4	261.4	25.1	-23.8	21.2	18.0

8. SCTD-PARAMETERS SEABIRD SBE 19 (Seacat)

Tabel : Sampling Depth, Sea Temperature, Salinity, Turbidity, Oxygen and Density are measured In situ with the Seabird SCTD-model SBE19 (Seacat) (B: no data)

Sample depth

Station	Depth (m)	Temperature (°C)	Salinity (ppt)	Oxygen (ml/L)	Oxygen Sat (ml/L)	Turbidity (FTU)
S01 Start	3.88	8.74	30.61	7.84	6.69	31.43
S01 Stop	4.33	8.71	31.39	7.73	6.65	14.27
S04 Start	4.31	8.53	27.23	7.87	6.86	12.56
S04 Stop	4.79	8.52	27.11	7.87	6.87	9.67
S07 Start	6.00	8.41	20.64	8.04	7.17	11.34
S07 Stop	5.40	8.38	21.98	8.04	7.12	12.40
S09 Start	3.07	8.10	20.41	8.14	7.24	7.86
S09 Stop	3.53	7.28	19.2	8.05	7.28	12.34
S12 Start	4.33	9.28	10.93	6.48	7.49	25.8
S12 Stop	4.25	9.30	9.96	6.05	7.53	10.25
S15 Start	2.38	9.29	11.38	6.52	7.46	21.88
S15 Stop	4.31	9.18	12.54	6.83	7.42	28.71
S22 Start	3.37	8.57	4.56	2.89	7.93	33.21
S22 Stop	2.79	8.06	2.61	2.35	8.13	39.84
Temse start	3.25	7.67	0.61	2.07	8.31	39.87
Temse stop	2.80	7.69	0.54	1.13	8.31	43.35

Bottom

Station	Depth (m)	Temperature (°C)	Salinity (ppt)	Oxygen (ml/L)	Oxygen Sat (ml/L)	Turbidity (FTU)
S01 Start	17.38	8.7	30.63	7.80	6.69	37.89
S01 Stop	17.95	8.74	31.39	7.73	6.65	15.59
S04 Start	17.32	8.56	27.84	7.65	6.83	18.88
S04 Stop	18.20	8.54	27.52	7.82	6.85	28.36
S07 Start	8.75	8.41	20.77	8.02	7.17	19.82
S07 Stop	8.48	8.38	22.07	8.02	7.12	22.18
S09 Start	10.80	8.15	20.66	8.16	7.22	16.99
S09 Stop	18.86	8.19	19.93	8.02	7.25	18.86
S12 Start	11.50	9.16	12.17	6.60	7.44	53.08
S12 Stop	13.02	9.29	10.54	6.06	7.50	12.30
S15 Start	6.15	9.27	11.73	6.58	7.45	37.75
S15 Stop	11.03	7.42	12.59	6.84	7.42	46.24
S22 Start	10.31	8.58	4.58	3.01	7.93	26.70
S22 Stop	7.53	7.89	2.63	2.96	8.16	76.31
Temse start	7.18	7.55	0.87	2.20	8.32	42.66
Temse stop	7.63	7.70	0.54	2.05	8.31	50.17

9. ROSCOP-DATA

ENDIS-RISKS

No.	Data Type	Description
8 stations	H09 H10 P01 P02 P03 P04 P05 P90	
8 stations	G04 P02 P03 P04 P05 P90	
8 stations	B18 B14 P13	

ANNEX A: Instrumentation and Data-acquisition

A.1. Used instrumentation.

A.1.1. Navigational instrumentation.

During this cruise, the data from the following navigational instruments connected to the ship born computer system were logged by the Oceanographic Data Acquisition System "ODASII":

- THALES NAVIGATION AQUARIUS-02 LRK DGPS positioning system with an accuracy of 2 to 10 cm using IALA beacons for the differential correction.
- MAGNAVOX 200MX DGPS positioning system with an accuracy of ca. 5 m using IALA beacons for the differential correction.
- ANSHUTZ STD20 Gyro Compass.
- RAYTHEON DSN450 Doppler speed log and bathymetric depth.
- ATLAS DESO 22 Scientific Echosounder.
  The Atlas Deso 22 is equipped with 2 transducers (33 kHz and 210 kHz).
- TSS 320B Heave Compensator.
  The data of the Atlas Deso 22 echosounder are corrected for the heave by the TSS 320B.
- FURUNO Echosounder FCV381.
  The Furuno is also equipped with 2 transducers (28 kHz and 88 kHz).

A.1.2. Oceanografical instrumentation.

The sea surface temperature was measured continuously with the remote temperature sensor of the Sea-Bird SBE21 thermosalinograph as well as with a Sea-Bird SBE38 temperature sensor, both installed at the inlet of the non-toxic seawater circuit situated at the bow of the vessel.

The Sea-Bird SBE21 thermosalinograph, installed in the wet lab, is also connected to the non-toxic seawater circuit. The salinity was measured continuously using a personal computer with a dedicated software package from Sea-Bird. The processed data were continuously (every 6 sec.) transmitted to the HP1000/A400 data acquisition computer. The specifications of this thermosalinograph are found in table 1.

Parameter	Units	Range	Accuracy
Temperature	°C	-5 - +35	0.01 °C /6 months
Conductivity	S/m	0 – 7	0.001 S/m/month

Tabel 1. Sea-Bird SBE21 thermosalinograph specifications.

Salinity and density are calculated from conductivity, temperature and depth, in accordance to the 1978 Practical Salinity Scale from the IEEE Journal of Oceanic Engineering, January 1980.

A Turner Designs 10-AU-005 fluorimeter, also connected to the non toxic seawater circuit, was used to measure chlorophyll concentrations during the full campaign. The data were also transmitted to the HP1000/A400 data acquisition computer.

A Sea-Bird SBE19 'SeaCat' CTD profiler measures different parameters where under depth, temperature, conductivity, turbidity, oxygen content and lightintensity. The CTD-system is connected to the hydrologic winch and hydrologic CTD-measurements coincide with the water sampling. The specifications of the sensors of the SeaCat are found in tabel 2.

Parameter	Units	Range	Accuracy
Depth	m	0 - 600	
Temperature	°C	-5 - +35	0,02 °C/ 6 maand
Conductivity	S/m	0 – 7	0,001 S/m/maand
Backscatterance (OBS)	FTU	0 – 2000	
Dissolved Oxygen	ml/L	0 – 15	0,02 ml/L
Irradiance	µEinstein s^{-1} m^{-2}	0,02 - 2000	

Tabel 2. Sea-Bird SBE19 'SeaCat' specifications.

A.1.3. Meteorological instrumentation.

Following parameters were measured by the Friedrichs meteorological station:

- wind speed
- wind direction
- air temperature
- air pressure
- solar radiation

Table 3 gives a summary of the specifications of the meteo sensors.

Parameter	Units	Range	Accuracy
Wind speed	m/s	0 – 41	0.2
Wind direction	degrees	0 – 360	2
Air pressure	mbar	950 – 1050	0.3
Air temperature	°C	-35 - +45	0.2
Solar radiation	watt/m^2	0 – 1000	10

Tabel 3. Specifications of the meteo sensors.

The meteo sensors are calibrated at least once a year.

A.2. Data Acquisition System.

A.2.1. ODASII data acquisition and processing system.

A Hewlett Packard HP1000 Model A400 real-time minicomputer system with 26 RS-232 interfaces and a Hewlett Packard HP3852A data acquisition system (for analogous signals) were used to acquire meteorological, hydrological and navigational data at a 10 seconds interval.

The HP1000/A400 minicomputer is implemented as a black box. All input devices are connected through RS232 type interfaces to this real-time computer. The data acquisition software collects the sensor data and delivers this raw data to the data processing software implemented on a HP9000/748i-100 UNIX workstation. This on-line data processing software converts the raw data from the different input devices into physical units and stores the data in an Informix relational database.

The data presentation software is based on a Client Server model. The oceanographic data in the Informix database on the UNIX workstation are obtained on personal computer through a local area network (thin Ethernet LAN). These personal computer presentation units are installed in the labs, in the computer room and on the bridge and are accessible by all scientists on board for the production of real-time listings, graphs and track plots.

A.5.2. Sea-Bird CTD system.

The acquisition of the data from the Sea-Bird CTD systems (SBE09, SBE19 en SBE21) is allowed by using PCs using the Sea-Bird software. The software allows the necessary configuration and data acquisition. The sea-bird CTD software allows you to make real-time data-plots and to make markings when water bottle samples are taken so that the CTD and related parameters are known at the exact sampling depth.

ANNEX B: Trackplot Campaign 2005/18