PROVESS

Processes of Vertical Exchange in Shelf Seas

MAST III Project No. 96 1032

Northern North Sea Experiment

Cruise Report

RV DANA Togt1198

PROVESS N-2

October 1998

TOGTRAPPORT

Skib	DANA

Togt nr.	1198	Periode	October	År	1998	Område	North Sea

Afsejlet fra	Hirtshals	Dato	14-10-98	Hjemkomst til	Hirtshals	Dato	26-10-98

Havneanløb (incl. dato)

Togtleder	Andre W. Visser	Ass.togtleder	Thomas Kiørboe	Projekt nr.	3016

Øvrige deltagere

Enric Saiz	Mikkel Jørgensen	Adolf Stipps
Hiroaki Saito	Robin MacCandliss	Karsten Bolding
Lars Christensen	Malcolm Hearn	Peter Martin
		Hartmut Prandke

Togtets hovedformål

To collect turbulence – microstructure concurrently with bulk water column parameters (temperature, salinity, currents) and the distribution of phyto- and zooplankton. Futhermore, to investiagte the trophic interaction of plankton as a function of environmental parameters.

Togtets gennemførelse (vejr, uheld m.m.)

Work went very much to plan, with only a few stoppages due to weather conditions. This effected activities from the aft deck more than from the hydrodeck. The cruise was one day shorter than planned due to sever weather.

Udført arbejde (tekst)

CTD/ water column stations
Zooplankton pump
WP2 nets
Under water video
Suspended sediments
Microstructure and turbulence profiles

Oparbejdet materiale (arkiveret hos)

Type	Institut	Person
Turbulence	SAI	Stipps
Suspended Sediment	UWB	MacCandliss
CTD/water column	DFU	Visser
Phyto-Zoo plankton/ video	DFU	Kiørboe

Resultater skal benyttes til: (evt. titel på rapport/paper samt tidspunkt for trykning)

Data reports will be prepared and distributed to project partners within the next 12 months.

Evt. bilag (kryds)

Togtprogram:	X	Togtrapport(tekst)	X	Stationsliste:	X	Rutekort:		Teknisk rapport:	

Underskrift: Andre W Visser

Dato: 16/11/98

Danmarks Fiskeriundersøgelser

RV DANA Togt1198

PROVESS N-2

1. Introduction.

This cruise was conducted as part of PROVESS: Processes of Vertical Exchange in Shelf Seas, an EU funded project under the MAST III programme. This project is conducted with the collaboration of 14 institutes from 8 European countries.

The purpose of PROVESS is to advance scientific understanding of the role that turbulence plays as an environmental factor in shelf seas. Turbulence, for instance, is believed to be an important factor in the feeding success of larval fish and thus for recruitment. Present understanding of this environmental importance stems mainly from observations of bulk property, theory and laboratory studies. PROVESS is specifically designed to field test these hypotheses using state of the art instrument and models, and international expertise.

Further and more detailed information on PROVESS, project elements, participants, timetable and deliverables can be found on the World Wide Web page http://www.pol.ac.uk/provess.

2. Objectives.

The scientific objectives of the cruise were:

- The aim of the turbulence measurements during the DANA cruise was to collect sufficient data for the calibration of the envisaged PROVESS 1D K-ε model and to investigate the influence of the turbulence level (microscale shear and dissipation rate) on zooplankton distribution and feeding success.
- new components of the microstructure measuring system developed under the umbrella of MAST III MITEC project were to be tested under open sea conditions.

to measure the microstructure and turbulent dissipation rate for varying tidal (spring-neap) and wind conditions at a typical northern North Sea site.

to concurrently measure bulk water column properties (temperature, salinity, nutrients, chlorophyll, dissolved oxygen, suspended sediments, currents).

to measure the vertical distribution and variation of phyto- and zooplankton with a view to testing specific hypotheses.

to investigate the trophic interaction of zooplankton and secondary production.

3. Scientific Party.

Cruise Leader:	André W. Visser	DFU
Ass. Cruise Leader:	Thomas Kiørboe	DFU
Technician:	Tommy Nielsen	DFU
	Enric Saiz	ICM
	Lars Christensen	DFU
	Mikkel Jørgensen	DFU
	Hiroaki Saito	DFU
	Robin McCandliss	UWB
	Malcolm Hearn	UWB
	Adolf Stipps	SAI
	Karsten Bolding	SAI
	Peter Martin	UR
	Hartmut Prandke	ISW

4. Cruise Programme.

RV Dana left the port of Hirtshals in northern Jutland at 1600 on the afternoon of Wednesday October 14 and sailed through heavy seas to the primary sampling site at 59° 20′ N, 1° E. Incidence of sea sickness was high during these first days. Sampling commenced at 900 CET on the morning of Friday 16 October and continued with a few interruptions due to weather until Saturday 24 October at 1930 CET. RV Dana was joined on 21 Oct at 13:00 GMT by the RV Pelagia, and on 24 Oct at 02:00 by the RV Challenger.

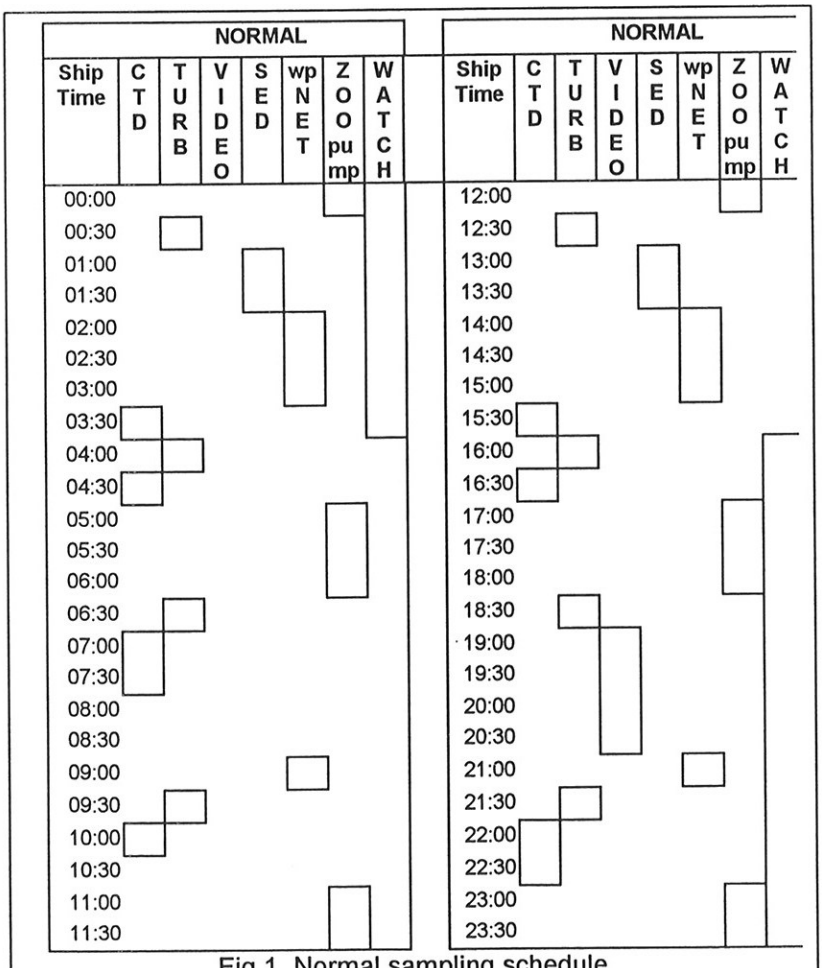


Fig 1. Normal sampling schedule

We are very grateful to the galley crew for striving to fulfil requests for vegetarian meals. A vegetarian cook book was specially purchased as an inspirational guide, and which quite adventurous dishes were served.

The deployment of instruments was organised on a 6 hourly cycle. A nominal "normal" schedule is included in Fig 1. Wire time was at a premium and this schedule went through several revisions

as weather conditions changed, the crew became more efficient at deployment, and the demanding pace started to take its toll on equipment.

The early termination of the measurement programme was due to sever weather warnings, and the tendency of mariners to make more dire interpretations as the trip home approaches.

5. Instruments deployed.

5.1 Turbulence probe

For turbulence measurements, the MST (Micro Structure - Turbulence) profiler has been used. The profiler is equipped with standard CTD sensors, a microstructure temperature sensor and two microstructure shear sensors: a PNS 93 shear probe (older shear sensor) and a new developed PNS 98 shear probe. Internal vibrations of the profiler housing which can interfere with the shear measurements are recorded using an internal vibration sensor.

The profiler was used in the free falling mode. Its sinking velocity was adjusted to about 0.8 m/s. The cable was deployed with high speed into the water in order to avoid cable tension. For that purpose, a new developed winch system was used. This technology enabled measurements from the moving ship (speed approx. 1 knot). Initially, the MST profiler was deployed from mid-ship with the ship drifting with the wind. However, due to the heavy sea-state, it was found to be less problematic to deploy the profiler from the aft, with the ship slowly steaming forward into the wind (swell) at 1 knot.

During the duration of the cruise approx. every three hours a burst of normally 5 casts with the MST profiler was performed. Several breaks occurred because of the rather rough weather conditions. Two periods of intense turbulence measurements (5 casts every two hours for about 24 hours) have been made at the beginning, Oct 16-17, and at the end, Oct 22-23, of the cruise. These periods corresponded to neap and spring tide respectively. The later period of intense turbulence measurements was also parallel to turbulence measurements at r/v Pelagia with the FLY system and will be used for inter-comparison of the MST and FLY microstructure profiler.

Altogether 300 microstructure profiles were taken during the cruise.

5.2 CTD & Water samples

A Seabird 9-11 CTD and water bottle rosette was deployed 4 to 6 times per day. In addition, the CTD was equipped with

- fluorometer ,
- transmissometer (Sea Tech 20 cm path length),
- oxygen sensor,
- irradiance meter.

Sea water samples that were taken include:

- Salt: 4 times a day at the surface and bottom for salinity analysis and conductivity calibration.
- Oxygen: 2 times a day from surface and bottom.
- Chlorophyll: 2 times a day from 5, 15, 30 and 60 m.
- Nitrate/Nitrite: 2 times a day from 5, 10, 15, 20, 30, 40, 60 and 80 m.
- Phosphate: 2 times a day from 5, 10, 15, 20, 30, 40, 60 and 80 m.
- Phytoplankton: 4 times a day from 15 and 30 m.
- Suspended sediment: 4 times a day from the surface, bottom, and/or from the thermocline (transmittence maximum).

The Sea Tech transmissometer was on loan from UWB, and was successfully spliced into Dana's Sea Soft data logging system. Note: it was logged under 'userpoly 1' and the Wet Star fluorometer which is usually logged under that heading was logged under 'userpoly 2'.

Initially, there were 11 Nisken bottles attached to the Rosette. However, one shattered (no apparent reason), and several of the others failed to close completely on occasion. Therefore, because of the large volume of water that had to be collected, the CTD was sometimes deployed twice in rapid succession. Note that each CTD dip was allocated a unique station number.

5.3 Bug Watcher underwater micro video

The under water video camera, Bug Watcher, was deployed 2 to 6 times per day. Two standard magnifications were used, low magnification (LM) at ca. 10x and high magnification (HM) at ca. 40 x .These correspond to a scanned volume per video frame of about 25 ml and 0.2 ml respectively, and frames were recorded at 50 s^{-1}. Observations were generally made at 8 depths: 5, 10, 20, 30, 40, 50, 60 and 80 meters. 3 minutes of observations were recorded at each depth, always at LM, and sometimes at HM also.

From 22 Oct onwards, the Bug Watcher was deployed more frequently at about 4 hourly intervals. This was to compensate for the fewer plankton pump samples that could be taken.

In total, some 5.5×10^6 images were recorded.

The Bug Watcher was equipped with a Seacat CTD, data from which was logged for each deployment. One curiosity of this system was that the CTD clock ran at about half speed. Synchronisation readings were taken at each depth for each deployment.

5.4 Plankton Pump

An *in situ* plankton pump, pumping at a rate of about 1.2 m^3 per minute through a 30 μm mesh was deployed 2 to 4 times a day. Pumping depths were 5, 10, 20, 30, 40, 50, 60 and 80 m. The nets were carefully washed down, and the contents of the cod ends filtered through a 40 μm mesh. Samples were then preserved in 4% borax buffered formaline for future analysis.

Of all the equipment used during the cruise, this caused the greatest problems. During the first ¾ of the cruise the pump was operating at only ca. 1/6 of its nominal capacity due to a failure in the power cable. This was first noticed when the cable eventually broke down on October 21. The cable was then fixed, and the pump operated normally subsequently. In addition, the nets frequently ripped and had to be repaired. The scientific team developed admirable needle point skills, but unfortunately not fast enough to keep up with the failure rate. After Oct 22, the plankton net was deployed only 2 per day and at 5 depths: 10, 20, 30, 40 and 50. More frequent Bug Watcher profiles were initialled to compensate.

5.5 Plankton Nets

A 60 cm diameter 200 μm mesh plankton net was towed during 4 periods a day from 40 m depth to the surface. Each period comprised 1 to 6 hauls. Zooplankton samples from these plankton net hauls were subsequently preserved or used in the following:

- Chaetognath gut content: Every 12 hours, samples were collected and preserved in 4% borax buffered formaline. In order to collect sufficient numbers, this required 4-6 plankton net hauls each 12 hours.
- Copepod gut fluorescence: At 6 hour intervals, samples were filtered onto 200 μm nylex screen filters, rinsed with filtered sea water, placed in 49-mm petri dishes and frozen with freeze spray. Samples were subsequently stored at -80°C for future analysis.
- Copepod egg production: see below.

5.6 Sediment settling tubes

Quasi *in situ* settling (QUISSET) tubes built at University of Wales, Bangor, were deployed over the side of the ship twice daily. A single tube is lowered in the horizontal position to the required depth and triggered, obtaining a horizontal 'slice' of water. The tube is then brought back on board and turned so that it stands vertically, allowing particles to settle downwards through the tube. Sub-samples are removed from the bottom of the tube after 5, 10, 20, 40, 80, 160, 320, 420 and 600 minutes have elapsed. The sub-samples are filtered through pre-weighed polycarbonate membrane filters for gravitimetric determination of suspended matter mass concentration. When analysed, these will allow the settling velocity distribution of the sample particle population to be calculated.

A total of 30 samples was obtained during the cruise period. Initially, samples were obtained 12 hourly from surface (~5m) and near-bed (~100m), but towards the end of the cruise it was decided to attempt to also sample the particle population within the pycnocline, at 60 m, where a persistent maximum in transmission was observed on profiles from the CTD-mounted beam transmissometer. Two successful sample suites (surface, 60m, bed) of this kind were obtained.

5.7 Hull mounted ADCP

An RDI, 600 kHz Acoustic Doppler Current Profiler (ADCP), mounted on the hull of Dana, recorded continuously throughout the cruise. The ADCP was configured to 8 m depth bins, and 10 minute ensemble averaging.

6. Water column and biology

6.1 Chlorophyll and other pigments:

About 4 litres of sea water were filtered through GF/C filters under 0.2 bar vacuum filter. These were extracted in the dark in 5ml, 90% acetone. The time lapsed between extraction and subsequent analysis was in no cases longer than 3 days. The spectral properties of the samples were measured against a 90% acetone blank using a Perkin-Elmer 554 UV-VIS spectrophotometer at wave lenghts 750, 665, 664, 647, 630, 510, and 480 nm. These same wavelengths were then measured again after the addition of HCl.

6.2 Phytoplankton

400 ml samples of seawater were preserved with lugols solution (final concentration id sample 4%). These samples were then stored in the dark until further analysis.

6.3 Dissolved Oxygen

Numbered, glass-stoppered bottles of known volume were rinsed and then carefully filled from the Nisken bottles. These were always the first water samples to be taken from the Nisken bottles, and the sample bottles were filled from the bottom up using a silicon tube attached to the spigot. The sample bottles were flushed in this way to ensure no air bubbles remained in the sample. The contents were then fixed with the addition of 0.7 ml each of reagents 1 and 2 (essentially solutions of Mn^{++} and I^{-} respectively) in the usual way. 1 ml of 9.1 M sulphuric acid was then added, and the sample stored in a dark place until further analysis.

The oxygen content of the samples was determined via a Winkler titration as per the method described in Grasshoff, (1976), Methods of Seawater Analysis. This is a visual titration with sodium thiosulphate where detection of the end point is aided with the addition of a starch solution.

6.4 Nutrients

Samples for Nitrate, Nitrite, and total Phosphate were taken twice a day from 8 different depths. Nitrate/Nitrite samples were place in new 25 ml plastic bottles to which a drop of chloroform was added. Samples were then frozen for subsequent analysis. 25 ml samples for total Phosphate were measured precisely, and placed in brown glass medicine bottles. These samples were stored in the dark until further analysis.

6.5 Suspended sediments

92 samples of water were obtained from the CTD for determination of suspended matter mass concentration at different levels in the water column. The water samples (at least 5 litres) were filtered through pre-weighed GF/C filters and frozen until return to Bangor. The directly measured particle mass concentration will be regressed against transmissometer beam attenuation enabling particle concentration to be predicted throughout the water column where beam attenuation measurements exist.

6.6 Egg Production

Egg production of 3 copepod species (*Canalus finmarchicus, Metridia lucens, Centropages typicus*) was measured daily throughout the cruise. We used standard 24-h bottle incubation technique, with bottles mounted on a slowly rotating wheel in a constant temperature laboratory. Incubation temperature was throughout 11 ^{0}C. We incubated 1 *Canalus finmarchicus* per 1-L bottle, and 1-2 individuals of the other two species per 0.5-L bottle, with 5-10 replicate bottles per species.

7. Meteorology

The weather during the period of the cruise was punctuated by the frequent passage of low depressions sweeping off the North Atlantic. Wind speeds seldom dropped below 10 m/s and were often in excess of 15 m/s (Fig. 2). When winds exceeded 20 m/s, activities, particularly from the aft deck, had to be suspended.

8. Preliminary Results

8.1 Thermocline development

Throughout the cruise, there was a distinct thermocline between 50 and 60 m depths (cf. Fig 3). This thermocline separated a well mixed surface layer (T=10 – 11°C) from a well mixed bottom layer (T = 7.5°C).

One feature that of note, is the gradual sharpening and deepening of the thermocline over the first 5 days, and a subsequent thickening and shallowing over the following 5 days. That is, Δz, the vertical separation of the 10°C and 8°C isotherms, decreases from about 15 m on 16 Oct, to 5 m on 20-21 Oct, and then increases again. Further, the depth of the 9°C isotherm deepened from 45 m on Oct 16, to 60 m on Oct 20, and then shallowed again to 45 m on Oct 24.

While the wind regime was generally of strong winds throughout the period, tidal mixing varied considerably with neap tides at Oct 15, and spring tides on Oct 22. We interpret the above variation of thermocline thickness and depth as being associated with its erosion from the bottom by tidally induced mixing.

8.2 Fluorescence and Chlorophyll

Fluorescence (Fig. 4) and chlorophyll showed a distinct two layer vertical distribution throughout the cruise. There was no evidence of a subsurface chlorophyll maximum. The fluorescence and chlorophyll remained relatively constant in the surface and bottom layers throughout the cruise. Note that the fluorescence reported in Fig 3 is uncalibrated. However, preliminary results from spectrophotometeric analysis indicates that surface chlorophyll-a concentrations were between 0.6 and 0.8 μg/l, whereas concentrations in the deep layer were always less than 0.1 μg/l.

8.3 Transmittance and particle distribution

The particle distribution can be partitioned into surface, thermocline and bottom layers. This can be seen in Fig 5. The bottom layer displays the greatest decrease in beam transmission indicating the highest concentration of suspended particulate matter (SPM), with a near bed maximum suggesting resuspension of material. Within the thermocline there is a distinct minimum in particle concentration. Above the thermocline SPM increases but not to the same extent as in the near bed layer. The fact that the surface beam transmission profile mirrors the fluorescence profile indicates that the SPM within this layer is predominately biological.

8.4 Bug Watcher

This was the first deployment of the Bug Watcher. High quality pictures were obtained with both magnifications, and individual zooplankters could easily be identified to species and, hence, quantified. We even obtained a spectacular picture of mating copepods, an event which has never before been observed in nature. It may be possible to infer particle abundances and size distributions from video images (for particles > ca. 50 µm). A qualitative analysis confirmed the observations of the transmissionmeter. The occurrence of large marine snow particles was surprisingly low, probably owing to the generally low concentrations of biological particles (e.g. phytoplankton) in the water column. Snow particles stemming from discarded larvacean houses were observed in the upper water column, while some 'streamers' were observed in the bottom layer.

8.5 Microstructure – turbulence probe

We were able to obtain preliminary results of the turbulent dissipation rate (Fig 6) and the microstructure temperature (Fig 7). These were obtained without rigourous statistical treatment, and we include them for illustrative purposes. We note the high values of dissipation in the surface layer, and note that these qualitatively follow the wind speed (Fig 2). That is, there appears to be a correlation between the high-low-high variation on Oct 19, 20 and 21st exhibited in both wind speed and dissipation. This same correlation is not exhibited in the earlier part of the record, probably due to the sudden change stratification before and after Oct 18 as seen in Fig 7.

Figures

Appendices

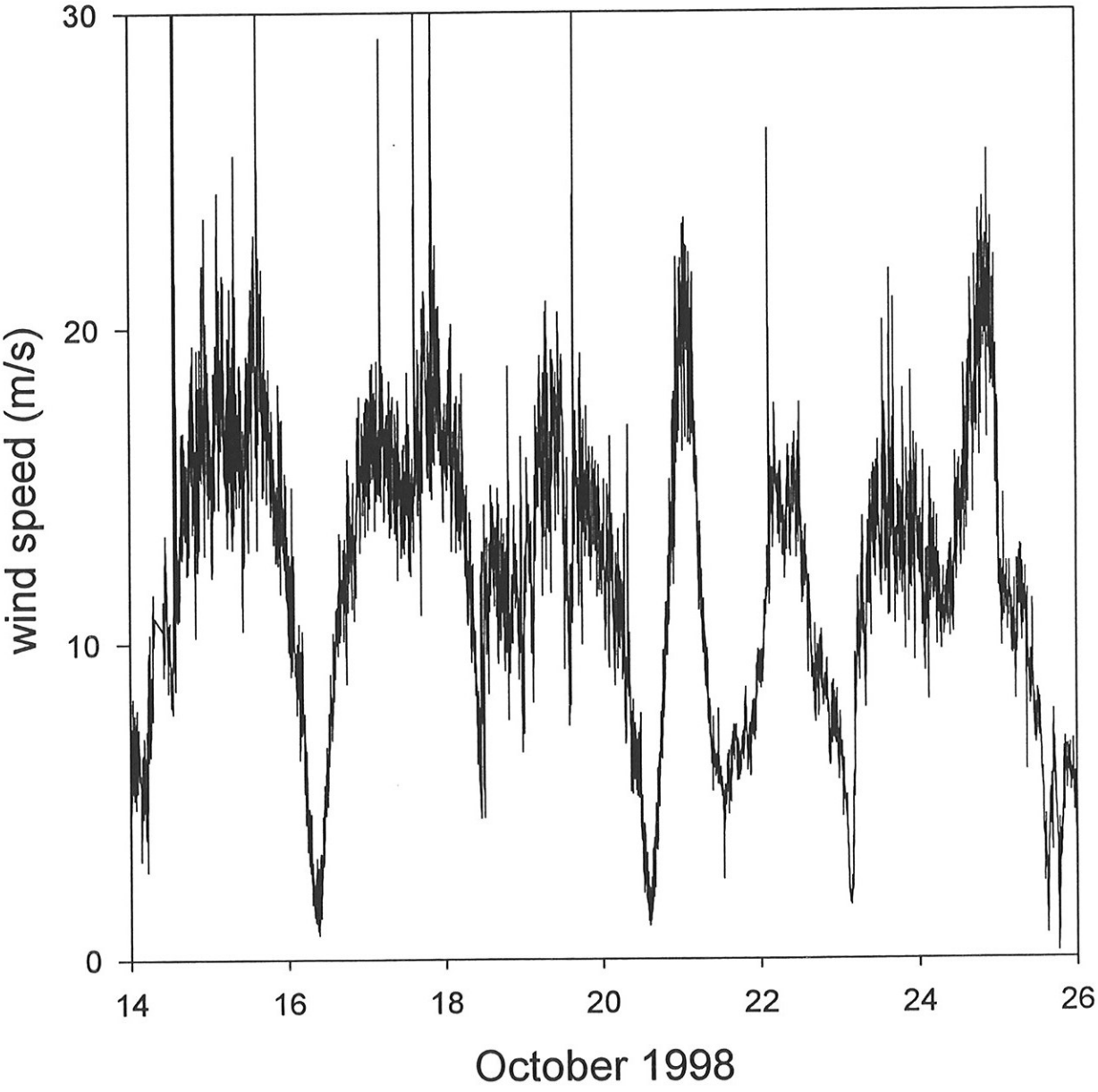


Fig 2.

Wind speed during Dana PROVESS cruise (togt1198)

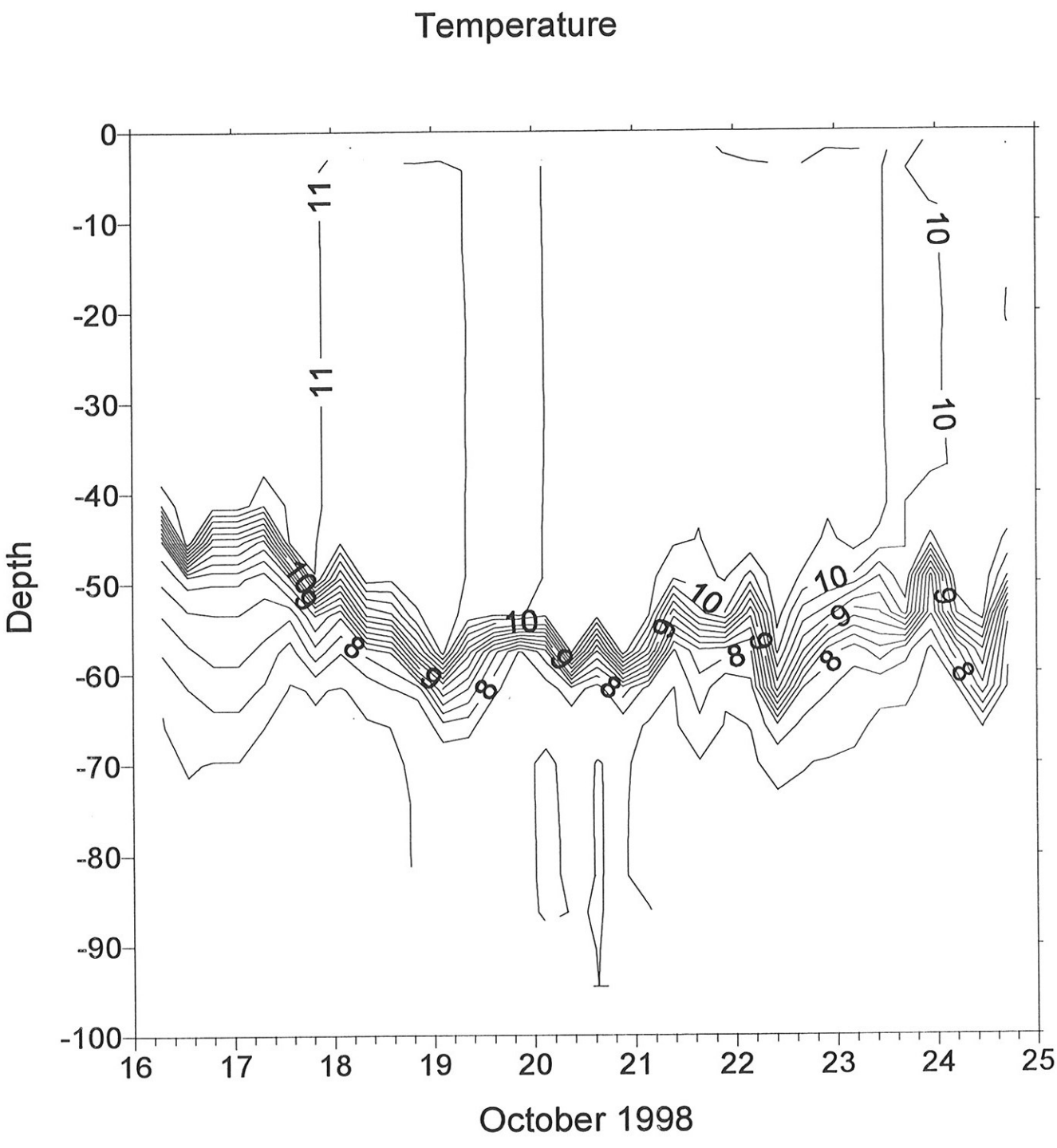


Fig. 3

Vertical distribution of temperature during the Dana leg of the PROVESS field campaign.

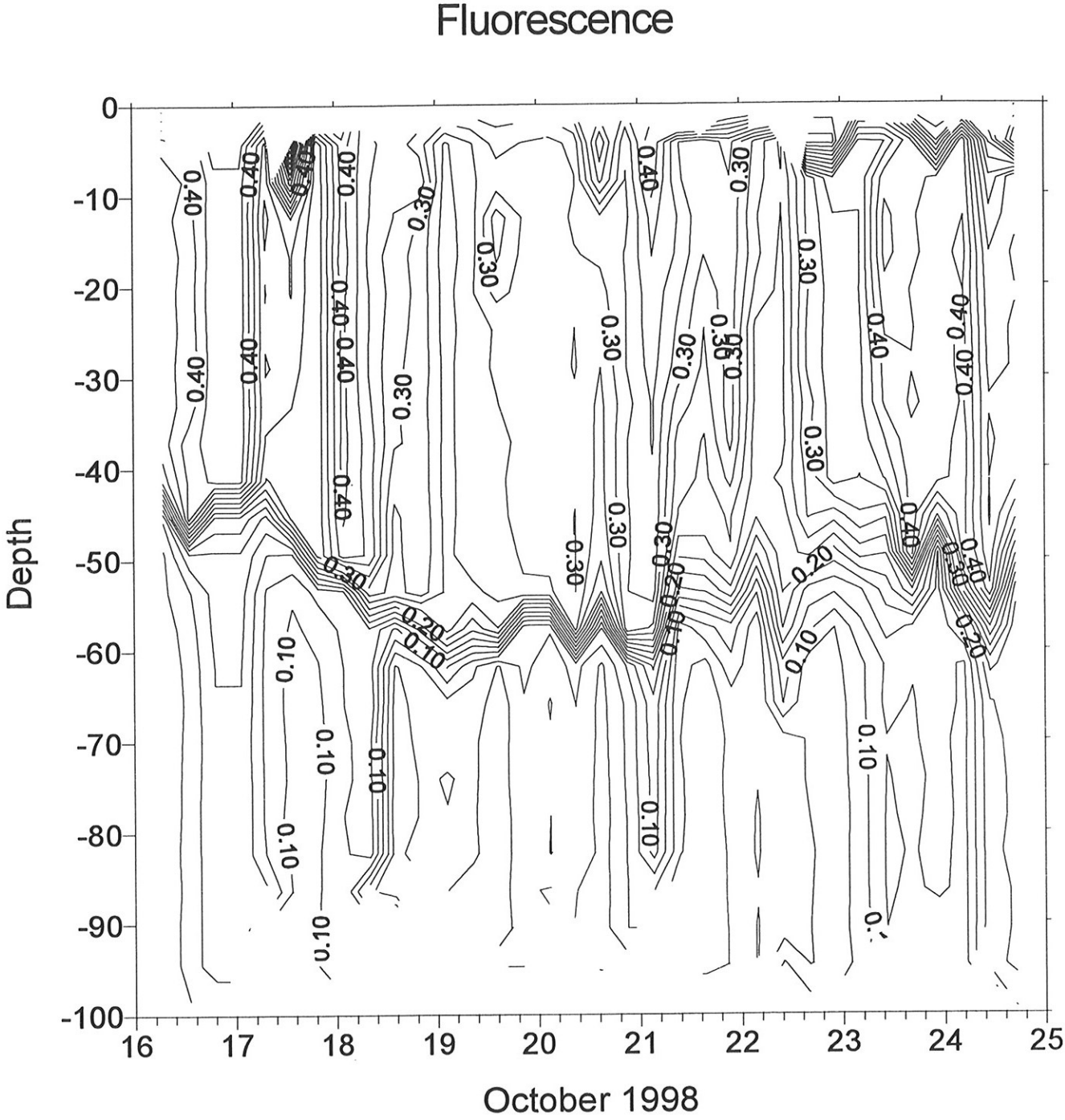


Fig. 4

Vertical distribution of fluorescence during the Dana leg of the PROVESS field campaign. Note that the values reported here are uncalibrated.

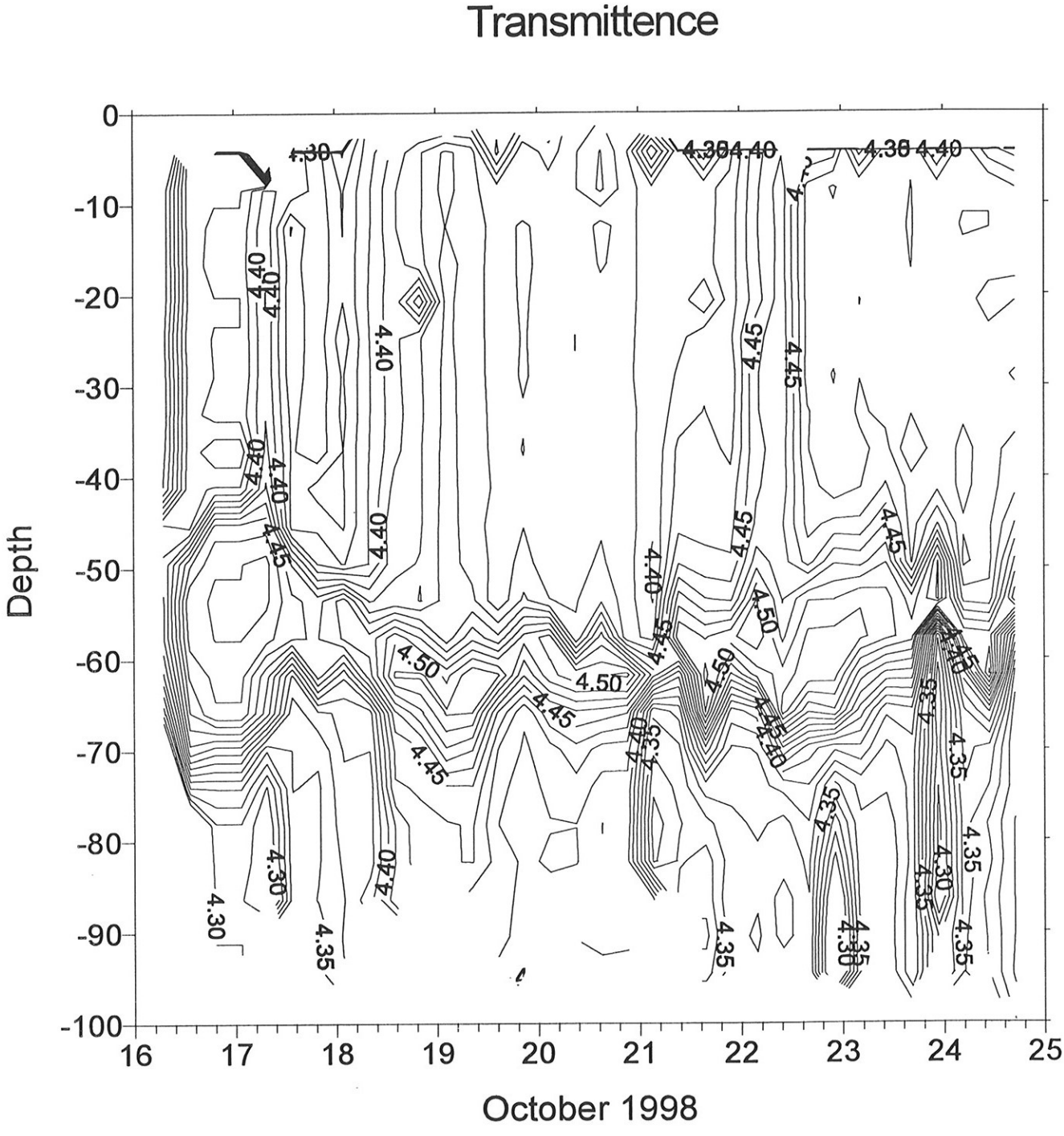
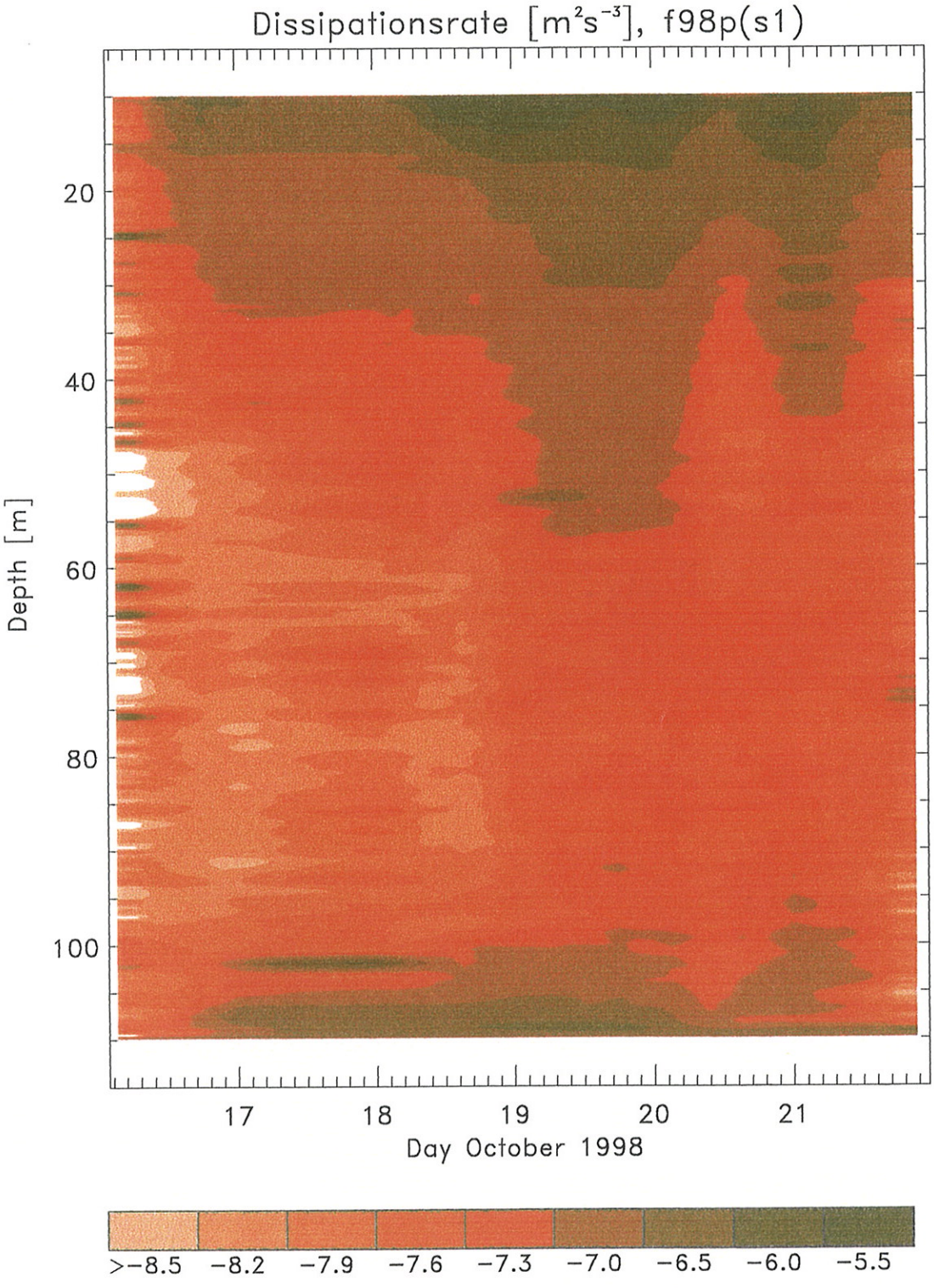


Fig. 5

Vertical distribution of transmittance during the Dana leg of the PROVESS field campaign. Note that the values reported here are uncalibrated. High values indicate relatively clear water.


Dissipationsrate [m²s⁻³], f98p(s1)
20
40
60
80
100
Depth [m]
17
18
19
20
21
Day October 1998
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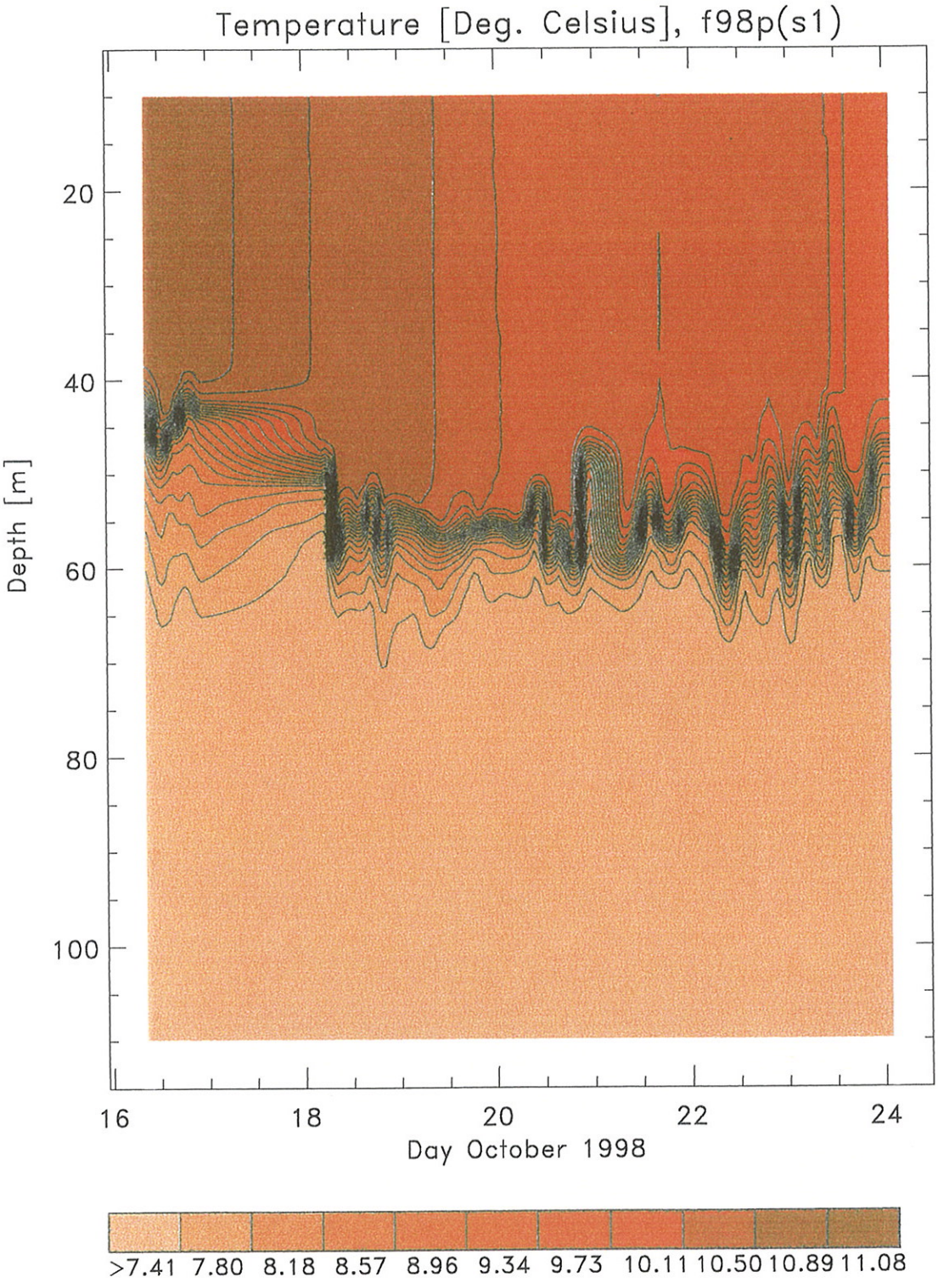
−8.2
−7.9
−7.6
−7.3
−7.0
−6.5
−6.0
−5.5


Temperature [Deg. Celsius], f98p(s1)
Depth [m]
20
40
60
80
100
16
18
20
22
24
Day October 1998
>7.41
7.80
8.18
8.57
8.96
9.34
9.73
10.11
10.50
10.89
11.08

				start			finish					
togt	stn	date	op	time (UTC)	latitude	longitude	time (UTC)	latitude	longitude	instru-ment	wind	comment
11/98	1	981016	OP	701	59.20.02N	001.00.24E	721	59.19.91N	001.00.69E	CTD	NV 8 MS	
11/98	2	981016	OP	751	59.19.62N	001.01.22E	830	59.19.13N	001.01.72E	TURBU	NV 8 MS	
11/98	3	981016	OP	849	59.18.85N	001.01.90E	905	59.18.65N	001.02.02E	SEA	NV 8 MS	
11/98	4	981016	OP	907	59.18.61N	001.02.04E	932	59.18.46N	001.02.06E	WP2	NV 8 MS	
11/98	5	981016	MA	1037	59.17.85N	001.02.09E	1054	59.17.65N	001.01.73E	TURBU	NV 8 MS	NOT APPROVED DUE TO METOD AND WEATHER
11/98	6	981016	MA	1114	59.17.45N	001.01.47E	1131	59.17.41N	001.01.18E	SEDI	ENE 5	APPROVED
11/98	7	981016	MA	1208	59.17.40N	001.00.38E	1239	59.17.85N	000.59.60E	TURBU		WITH 1 KNOT DEPLOY FROM AFT DECK: APPROVED
11/98	8	981016	MA	1316	59.17.83N	000.58.89E	1442	59.17.50N	000.57.46E	ZOO	E 9 MS	APPROVED
11/98	9	981016	MA	1449	59.17.45N	000.57.70E	1517	59.17.23N	000.58.08E	TURBU	E 9 MS	APPROVED
11/98	10	981016	MA	1521	59.17.20N	000.58.08E	1547	59.17.07N	000.57.74E	SEA	E 11MS	APPROVED
11/98	11	981016	OP	1631	59.18.80N	001.01.31E	1659	59.18.60N	001.01.45E	WP2	E 12 MS	
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11/98	15	981016	OP	1942	59.18.54N	001.01.68E	1956	59.18.35N	001.01.81E	ZOO	E 17 MS	
11/98	16	981016	OP	2107	59.17.27N	001.01.65E	2133	59.17.15N	001.02.16E	TURBU	E 17 MS	
11/98	17	981016	MG	2142	59.17.00N	001.02.17E	2232	59.16.26N	001.02.07E	WP2	E 18 MS	
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11/98	24	981017	MA	1412	59.20.27N	001.04.17E	1425	59.20.38N	001.04.15E	SEA	NNE 16 S	APPROVED
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11/98	31	981018	MA	11	59.21.56N	001.02.56E	40	59.21.56N	001.03.01E	WP2		APPROVED
11/98	32	981018	MA	44	59.21.57N	001.03.03E	57	59.21.64N	001.03.18E	SEA		APPROVED

				start			finish					
togt	stn	date	op	time (UTC)	latitude	longitude	time (UTC)	latitude	longitude	instru-ment	wind	comment
11/98	33	981018	OP	321	59.24.31N	001.00.77E	508	59.25.70N	001.00.74E	ZOO	NW 15 MS	
11/98	34	981018	OP	549	59.20.87N	001.02.07E	626	59.21.21N	001.01.09E	TURBU	NW 15MS	
11/98	35	981018	OP	632	59.21.24N	001.01.04E	653	59.21.36N	001.01.25E	CTD	NW 15MS	
11/98	36	981018	OP	702	59.21.45N	001.01.37E	717	59.21.58N	001.01.54E	SEDI	NW 15MS	
11/98	37	981018	OP	719	59.21.59N	001.01.56E	726	59.21.61N	001.01.74E	WP2	NW 15MS	
11/98	38	981018	OP	736	59.21.68N	001.01.64E	758	59.21.62N	001.01.37E	TURBU	NW 15MS	
11/98	39	981018	OP	835	59.20.23N	001.03.57E	943	59.19.91N	001.04.07E	ZOO	NW 12MS	
11/98	40	981018	MA	1037	59.20.64N	001.03.04E	1101	59.20.23N	001.02.41E	TURBU	W 7 MS	APPROVED
11/98	41	981018	MA	1216	59.21.22N	001.02.10E	1254	59.21.59N	001.01.71E	WP2	WSW 10 S	APPROVED
11/98	42	981018	MA	1331	59.22.14N	001.01.65E	1340	59.22.22N	001.01.49E	SEA	WSW 10 S	APPROVED
11/98	43	981018	MA	1356	59.22.10N	001.01.32E	1420	59.21.80N	001.01.29E	TURBU	SW 12 MS	APPROVED
11/98	44	981018	MA	1427	59.21.80N	001.01.15E	1440	59.21.97N	001.01.07E	SEA	SW 15 MS	APPROVED
11/98	45	981018	OP	1445	59.22.06N	001.01.02E	1619	59.23.76N	001.00.31E	ZOO	SW 15 MS	
11/98	46	981018	OP	1650	59.20.87N	001.02.47E	1713	59.20.68N	001.02.69E	TURBU	SW 15 MS	
11/98	47	981018	OP	1725	59.20.65N	001.02.81E	1809	59.20.81N	001.03.03E	VIDEO	SW 12MS	
11/98	48	981018	OP	1903	59.21.01N	001.02.00E	1909	59.21.09N	001.02.12E	WP2	SW 12MS	
11/98	49	981018	OP	1913	59.21.13N	001.02.10E	1939	59.21.11N	001.01.65E	TURBU	W 13MS	
11/98	50	981018	OP	2002	59.20.59N	001.04.08E	2017	59.20.74N	001.04.33E	CTD	W 13MS	
11/98	51	981018	OP	2024	59.20.74N	001.04.31E	2148	59.20.68N	001.04.67E	ZOO	W 13MS	
11/98	52	981018	MA	2234	59.20.25N	001.03.44E	2257	59.19.81N	001.03.22E	TURBU	W 13MS	APPROVED
11/98	53	981018	MA	2303	59.19.78N	001.03.20E	2318	59.19.81N	001.03.26E	SEDI	W 13MS	APPROVED
11/98	54	981019	MA	7	59.19.04N	001.02.00E	41	59.19.20N	001.02.25E	WP2	W 10 MS	APPROVED
11/98	55	981019	MA	135	59.18.59N	001.01.34E	144	59.18.71N	001.01.33E	SEA	W 15 MS	APPROVED
11/98	56	981019	MA	151	59.18.70N	001.01.22E	206	59.18.45N	001.01.25E	TURBU	W 15 MS	CANCELLED DUE TO PROBE ERROR
11/98	57	981019	MA	215	59.18.34N	001.00.94E	221	59.18.25N	001.00.80E	TURBU	W 15 MS	CANCELLED DUE TO PROBE ERROR
11/98	58	981019	MA	228	59.18.23N	001.00.80E	241	59.18.38N	001.00.80E	SEA	W 15 MS	APPROVED
11/98	59	981019	OP	302	59.18.64N	001.00.84E	425	59.20.02N	001.01.37E	ZOO	W 15 MS	
11/98	60	981019	OP	440	59.20.51N	001.03.45E	506	59.20.31N	001.03.25E	TURBU	W 15 MS	
11/98	61	981019	OP	531	59.20.86N	001.04.17E	544	59.20.96N	001.04.14E	SEA	W 20 MS	
11/98	62	981019	PT	700	59.21.71N	001.01.51E	712	59.21.68N	001.01.49E	WP2	W 20 MS	
11/98	63	981019	PT	714	59.21.68N	001.01.51E	821	59.21.40N	001.02.58E	TURBU	W 20 MS	NOTE: FINAL POSITION ENTERED TOO LATE
11/98	64	981019	OP	829	59.21.58N	001.03.32E	942	59.22.10N	001.03.88E	ZOO	W 20 MS	

				start			finish					
togt	stn	date	op	time (UTC)	latitude	longitude	time (UTC)	latitude	longitude	instru-ment	wind	comment
11/98	65	981019	MA	1023	59.21.69N	001.02.93E	1039	59.21.31N	001.02.67E	TURBU	W 20 MS	CANCELLED DUE TO PROBE FAILURE
11/98	66	981019	MA	1055	59.21.30N	001.02.93E	1105	59.21.30N	001.03.04E	SEDI	W 20 MS	APPROVED
11/98	67	981019	MA	1201	59.21.66N	001.02.38E	1238	59.21.71N	001.02.84E	WP2	W 20 MS	APPROVED
11/98	68	981019	MA	1333	59.21.81N	001.01.13E	1342	59.21.82N	001.01.26E	SEA	W 14 MS	APPROVED
11/98	69	981019	MA	1405	59.21.84N	001.01.27E	1415	59.21.86N	001.01.48E	SEA	NW 11 MS	APPROVED
11/98	70	981019	MA	1451	59.22.03N	001.01.58E	1555	59.22.21N	001.02.50E	ZOO	NNW 16MS	APPROVED
11/98	71	981019	OP	1642	59.22.51N	001.00.66E	1711	59.22.83N	000.59.67E	TURBU	NNW 16MS	
11/98	72	981019	OP	1717	59.22.82N	000.59.55E	1759	59.23.36N	000.59.65E	VIDEO	NNW 16MS	
11/98	73	981019	OP	1902	59.19.50N	001.03.95E	1918	59.19.58N	001.04.36E	WP2	NW 18MS	
11/98	74	981019	OP	1930	59.19.66N	001.04.11E	1951	59.19.88N	001.03.61E	TURBU	NW 18MS	
11/98	75	981019	OP	1955	59.19.92N	001.03.58E	2013	59.20.00N	001.03.76E	SEA	NW 18MS	
11/98	76	981019	OP	2032	59.20.20N	001.03.94E	2142	59.20.21N	001.04.84E	ZOO	NW 18MS	
11/98	77	981019	MA	2231	59.20.72N	001.04.14E	2256	59.20.46N	001.03.62E	TURBU	NW 15 MS	APPROVED
11/98	78	981019	MA	2259	59.20.41N	001.03.61E	2310	59.20.39N	001.03.77E	SEDI	NW 15 MS	APPROVED
11/98	79	981020	MA	1	59.20.92N	001.02.97E	39	59.20.78N	001.03.88E	WP2	NNW 13MS	APPROVED
11/98	80	981020	MA	133	59.21.45N	001.03.08E	143	59.21.42N	001.03.36E	SEA	NNW 13MS	APPROVED
11/98	81	981020	MA	151	59.21.48N	001.03.28E	213	59.21.50N	001.02.52E	TURBU	NNW 13MS	APPROVED
11/98	82	981020	MA	229	59.21.52N	001.02.54E	240	59.21.56N	001.02.77E	SEA	NNW 12MS	APPROVED
11/98	83	981020	OP	300	59.21.61N	001.02.95E	423	59.22.04N	001.04.66E	ZOO	NNW 12MS	
11/98	84	981020	OP	435	59.22.24N	001.04.40E	451	59.22.42N	001.03.92E	TURBU	NNW 12MS	
11/98	85	981020	OP	531	59.20.44N	001.03.21E	543	59.20.56N	001.03.43E	SEA	NNW 12MS	
11/98	86	981020	PT	700	59.22.29N	001.01.19E	707	59.22.27N	001.01.27E	WP2	NV 9 MS	
11/98	87	981020	PT	730	59.22.44N	001.01.76E	757	59.22.72N	001.01.87E	TURBU	NV 9 MS	
11/98	88	981020	OP	830	59.21.52N	001.03.93E	937	59.21.65N	001.05.16E	ZOO	NV 9 MS	
11/98	89	981020	MA	1022	59.21.59N	001.05.50E	1046	59.21.68N	001.05.27E	TURBU	NV 9 MS	APPROVED
11/98	90	981020	MA	1050	59.21.70N	001.05.22E	1101	59.21.65N	001.05.40E	SEDI	NNW 8MS	APPROVED
11/98	91	981020	MA	1157	59.21.46N	001.04.02E	1247	59.21.09N	001.04.56E	WP2	NNW 8MS	APPROVED
11/98	92	981020	MA	1336	59.21.14N	001.04.78E	1345	59.21.06N	001.04.84E	SEA	NW 5	APPROVED
11/98	93	981020	MA	1355	59.21.03N	001.04.88E	1420	59.21.31N	001.04.66E	TURBU	NW 5	APPROVED
11/98	94	981020	MA	1423	59.21.31N	001.04.66E	1431	59.21.34N	001.04.65E	SEA	NW 5	APPROVED
11/98	95	981020	OP	1501	59.21.24N	001.04.67E	1638	59.21.14N	001.05.13E	ZOO	NW 5	
11/98	96	981020	OP	1647	59.21.15N	001.05.22E	1712	59.20.99N	001.06.21E	TURBU	NW 5	
11/98	97	981020	OP	1717	59.20.97N	001.06.28E	1755	59.20.96N	001.06.37E	VIDEO	S 7 MS	NW SWELL

				start			finish					
togt	stn	date	op	time (UTC)	latitude	longitude	time (UTC)	latitude	longitude	instru-ment	wind	comment
11/98	98	981020	OP	1902	59.19.54N	001.04.24E	1909	59.19.55N	001.04.28E	WP2	SSE 10MS	
11/98	99	981020	OP	1930	59.19.46N	001.04.66E	1953	59.19.32N	001.05.37E	TURBU	SSE 10MS	
11/98	100	981020	OP	2000	59.19.38N	001.05.42E	2014	59.19.43N	001.05.31E	SEA	SSE 13MS	
11/98	101	981020	OP	2017	59.19.40N	001.05.33E	2123	59.19.34N	001.05.83E	ZOO	SSE 13MS	
11/98	102	981020	MA	2225	59.19.80N	001.04.83E	2258	59.19.42N	001.06.61E	TURBU	SE 17 MS	APPROVED
11/98	103	981020	MA	2304	59.19.42N	001.06.73E	2317	59.19.29N	001.06.69E	SEDI	SE 17 MS	APPROVED
11/98	104	981021	MA	6	59.18.95N	001.05.64E	39	59.18.70N	001.04.74E	WP2	SW 20 MS	APPROVED
11/98	105	981021	OP	511	59.19.99N	001.03.70E	524	59.20.12N	001.03.91E	SEA	SSE 17MS	
11/98	106	981021	OP	659	59.18.74N	001.04.80E	704	59.18.78N	001.04.81E	WP2	S 11 MS	
11/98	107	981021	OP	711	59.18.75N	001.04.90E	743	59.18.36N	001.05.89E	TURBU	S 11 MS	
11/98	108	981021	OP	829	59.20.37N	001.02.76E	935	59.20.00N	001.02.81E	ZOO	S 8 MS	
11/98	109	981021	MA	1022	59.18.55N	001.03.52E	1051	59.17.72N	001.03.84E	TURBU	S 8 MS	APPROVED
11/98	110	981021	MA	1054	59.17.69N	001.03.84E	1103	59.17.57N	001.03.71E	SEDI	S 8 MS	APPROVED
11/98	111	981021	MA	1202	59.20.24N	001.03.00E	1242	59.19.95N	001.02.35E	WP2	S 8 MS	APPROVED
11/98	112	981021	MA	1333	59.21.40N	001.02.24E	1346	59.21.42N	001.02.00E	SEA	S 8 MS	APPROVED
11/98	113	981021		1353	59.21.27N	001.01.94E	1422	59.20.69N	001.01.78E	TURBU	S 8 MS	APPROVED
11/98	114	981021	MA	1440	59.21.95N	001.03.68E	1450	59.22.00N	001.03.46E	SEA	S 8 MS	APPROVED
11/98	115	981021	OP	1501	59.22.04N	001.03.22E	1610	59.22.64N	001.02.17E	ZOO	S 8 MS	
11/98	116	981021	OP	1631	59.22.44N	001.01.63E	1653	59.22.38N	001.01.40E	TURBU	S 8 MS	
11/98	117	981021	OP	1710	59.22.51N	001.01.14E	1732	59.22.79N	001.01.09E	VIDEO	S 8 MS	STATION STARTED CA. 1900
11/98	118	981021	OP	1859	59.20.59N	001.03.41E	1905	59.20.63N	001.03.38E	WP2	SSW 7 MS	
11/98	119	981021	OP	1926	59.20.33N	001.03.53E	1950	59.19.98N	001.03.98E	TURBU	SSW 7 MS	
11/98	120	981021	OP	2000	59.20.02N	001.04.16E	2013	59.20.05N	001.04.17E	SEA	SSW 7 MS	
11/98	121	981021	MA	2226	59.18.77N	001.04.00E	2251	59.18.13N	001.04.44E	TURBU	S 8MS	APPROVED
11/98	122	981021	MA	2255	59.18.05N	001.04.50E	2304	59.17.98N	001.04.38E	SEDI	S 10MS	APPROVED
11/98	123	981022	MA	3	59.17.22N	001.03.83E	31	59.17.02N	001.03.35E	WP2	S 10 MS	APPROVED
11/98	124	981022	MA	128	59.16.80N	001.01.80E	138	59.16.74N	001.01.56E	SEA	S 12 MS	APPROVED
11/98	125	981022	MA	142	59.16.67N	001.01.49E	218	59.15.86N	001.01.72E	TURBU	S 12 MS	APPROVED
11/98	126	981022	MA	219	59.15.85N	001.01.72E	230	59.15.83N	001.01.40E	SEA	S 12 MS	APPROVED
11/98	127	981022	OP	310	59.18.77N	001.02.68E	502	59.18.79N	000.59.05E	ZOO	S 14 MS	
11/98	128	981022	OP	515	59.18.73N	000.59.15E	530	59.18.67N	000.59.41E	TURBU	S 14 MS	
11/98	129	981022	OP	558	59.18.19N	000.59.84E	624	59.17.96N	001.00.44E	TURBU	S 14 MS	
11/98	130	981022	OP	628	59.17.97N	001.00.48E	635	59.18.12N	001.00.43E	WP2	S16 MS	
11/98	131	981022	PT	701	59.17.40N	000.59.12E	714	59.17.65N	000.59.09E	SEA	S16 MS	

				start			finish					
togt	stn	date	op	time (UTC)	latitude	longitude	time (UTC)	latitude	longitude	instru-ment	wind	comment
11/98	132	981022	OP	800	59.17.76N	000.58.55E	826	59.17.56N	000.59.30E	TURBU	S16 MS	
11/98	133	981022	OP	829	59.17.54N	000.59.42E	943	59.17.74N	001.00.19E	ZOO	S16 MS	
11/98	134	981022	MA	959	59.17.51N	001.00.30E	1033	59.16.78N	001.01.28E	TURBU	S16 MS	APPROVED
11/98	135	981022	MA	1036	59.16.77N	001.01.28E	1053	59.16.83N	001.01.30E	SEDI	S16 MS	APPROVED
11/98	136	981022	MA	1159	59.15.95N	001.01.79E	1227	59.15.18N	001.02.47E	TURBU	S16 MS	APPROVED
11/98	137	981022	MA	1257	59.17.53N	001.02.68E	1333	59.17.42N	001.02.19E	WP2	SW 13MS	APPROVED
11/98	138	981022	MA	1335	59.17.42N	001.02.16E	1356	59.17.38N	001.01.84E	SEA	SW 13MS	APPROVED
11/98	139	981022	MA	1401	59.17.31N	001.01.83E	1427	59.16.76N	001.01.58E	TURBU	SW 13MS	APPROVED
11/98	140	981022	MA	1432	59.16.72N	001.01.47E	1550	59.17.12N	001.00.03E	VIDEO	SW 10 MS	APPROVED
11/98	141	981022	OP	1557	59.17.02N	001.00.03E	1623	59.16.63N	000.59.99E	TURBU	SW 10 MS	
11/98	142	981022	OP	1628	59.16.63N	001.00.00E	1640	59.16.68N	000.59.79E	SEA	SW 10 MS	
11/98	143	981022	OP	1659	59.16.83N	000.59.51E	1738	59.17.33N	000.58.81E	VIDEO	SW 10 MS	
11/98	144	981022	OP	1759	59.18.74N	000.57.00E	1825	59.18.45N	000.56.99E	TURBU	SW 10 MS	
11/98	145	981022	OP	1902	59.18.54N	000.56.15E	1906	59.18.61N	000.56.14E	WP2	SW 10 MS	
11/98	146	981022	OP	1923	59.18.83N	000.56.02E	1936	59.18.99N	000.55.90E	SEA	SW 10 MS	
11/98	147	981022	OP	1956	59.18.78N	000.55.94E	2021	59.18.68N	000.56.16E	TURBU	S 10 MS	
11/98	148	981022	OP	2033	59.18.76N	000.56.11E	2154	59.19.29N	000.56.01E	VIDEO	S 10 MS	
11/98	149	981022	MA	2201	59.19.18N	000.56.03E	2227	59.18.81N	000.56.80E	TURBU	S 10 MS	APPROVED
11/98	150	981022	MA	2248	59.18.76N	000.56.90E	2302	59.18.77N	000.56.95E	SEDI	SSW 10MS	APPROVED
11/98	151	981022	MA	2356	59.17.97N	000.57.25E	20	59.17.53N	000.57.82E	TURBU	SSW 8 MS	APPROVED
11/98	152	981023	MA	24	59.17.46N	000.57.89E	34	59.17.42N	000.57.93E	WP2	SSW 8 MS	GOGKENDT
11/98	153	981023	MA	130	59.17.81N	001.00.00E	139	59.17.76N	001.00.02E	SEA	SSW 8 MS	APPROVED
11/98	154	981023	MA	157	59.17.44N	001.00.13E	221	59.16.92N	001.00.42E	TURBU	SSW 5 MS	APPROVED
11/98	155	981023	MA	234	59.16.80N	001.00.43E	354	59.16.71N	000.59.90E	VIDEO	W 4 MS	APPROVED
11/98	156	981023	P□	401	59.16.65N	000.59.64E	424	59.16.33N	000.58.84E	TURBU	W 4 MS	
11/98	157	981023	OP	428	59.16.30N	000.58.78E	439	59.16.36N	000.58.68E	SEA	W 4 MS	
11/98	158	981023	OP	600	59.18.72N	001.02.75E	623	59.18.84N	001.01.98E	TURBU	NW 13MS	
11/98	159	981023	OP	644	59.18.00N	001.04.55E	645	59.18.00N	001.04.57E	WP2	NW 13MS	START TIME CA. 0840
11/98	160	981023	OP	703	59.18.18N	001.04.78E	718	59.18.33N	001.04.87E	SEA	NW 13MS	
11/98	161	981023	PT	800	59.18.69N	001.04.96E	823	59.18.84N	001.04.29E	TURBU	NW 13MS	
11/98	162	981023	OP	826	59.18.87N	001.04.30E	940	59.19.70N	001.04.86E	VIDEO	NW 13MS	
11/98	163	981023	MA	1028	59.20.15N	001.04.29E	1053	59.19.96N	001.03.80E	TURBU	NW 15MS	APPROVED
11/98	164	981023	MA	1057	59.19.96N	001.03.79E	1109	59.20.02N	001.03.99E	SEA	NW 15MS	APPROVED
11/98	165	981023	MA	1112	59.20.04N	001.03.99E	1143	59.20.26N	001.04.68E	SEDI	NW 15MS	APPROVED

				start			finish					
togt	stn	date	op	time (UTC)	latitude	longitude	time (UTC)	latitude	longitude	instru-ment	wind	comment
11/98	166	981023	MA	1203	59.20.43N	001.05.12E	1250	59.20.67N	001.06.41E	ZOO	NW 15MS	APPROVED
11/98	167	981023	MA	1251	59.20.67N	001.06.43E	1327	59.20.83N	001.07.34E	WP2	W 18 MS	APPROVED
11/98	168	981023	MA	1329	59.20.83N	001.07.39E	1338	59.20.88N	001.07.59E	SEA	W 18 MS	APPROVED
11/98	169	981023	MA	1359	59.20.58N	001.04.35E	1431	59.19.78N	001.04.06E	TURBU	W 18 MS	APPROVED
11/98	170	981023	OP	1441	59.19.69N	001.04.09E	1600	59.20.01N	001.04.87E	VIDEO	W 18 MS	
11/98	171	981023	OP	1631	59.21.52N	001.03.22E	1657	59.20.98N	001.02.82E	TURBU	W 18 MS	
11/98	172	981023	OP	1701	59.20.91N	001.02.74E	1715	59.20.92N	001.02.81E	SEA	W 18 MS	
11/98	173	981023	OP	1731	59.21.01N	001.02.67E	1848	59.21.57N	001.02.50E	VIDEO	W 18 MS	
11/98	174	981023	OP	1905	59.21.71N	001.02.33E	1914	59.21.76N	001.02.24E	WP2	W 17MS	
11/98	175	981023	OP	1931	59.21.85N	001.01.49E	1953	59.21.70N	001.00.92E	TURBU	W 17MS	
11/98	176	981023	OP	2000	59.21.73N	001.00.70E	2015	59.21.86N	001.00.69E	SEA	W 17MS	
11/98	177	981023	MA	2106	59.22.52N	000.59.41E	2221	59.22.52N	000.59.49E	VIDEO	VSV 15MS	APPROVED
11/98	178	981023	MA	2230	59.22.42N	000.59.37E	2255	59.22.02N	000.59.28E	TURBU	VSV 15MS	APPROVED
11/98	179	981023	MA	2303	59.21.95N	000.59.22E	2310	59.22.06N	000.59.30E	SEA	VSV 15MS	APPROVED
11/98	180	981023	MA	2317	59.22.06N	000.59.32E	2338	59.22.18N	000.59.36E	SEDI	VSV 15MS	APPROVED
11/98	181	981024	MA	3	59.22.16N	000.59.18E	37	59.22.10N	000.59.30E	ZOO	W 15 MS	APPROVED
11/98	182	981024	MA	48	59.22.07N	000.59.33E	114	59.21.98N	000.59.46E	WP2	W 15 MS	APPROVED
11/98	183	981024	MA	130	59.21.99N	000.59.42E	141	59.22.00N	000.59.42E	SEA	W 15 MS	APPROVED
11/98	184	981024	MA	156	59.21.72N	000.59.23E	223	59.21.13N	000.59.33E	TURBU	W 15 MS	APPROVED
11/98	185	981024	OP	245	59.21.54N	001.02.69E	412	59.21.36N	001.02.42E	VIDEO	SW 12 MS	
11/98	186	981024	OP	442	59.20.07N	001.03.76E	506	59.19.56N	001.04.23E	TURBU	SW 12 MS	
11/98	187	981024	OP	508	59.19.54N	001.04.30E	520	59.19.51N	001.04.49E	SEA	SW 12 MS	
11/98	188	981024	OP	548	59.19.37N	001.04.60E	707	59.19.76N	001.04.38E	VIDEO	SV 12 MS	
11/98	189	981024	OP	711	59.19.78N	001.04.33E	714	59.19.80N	001.04.30E	WP2	SV 12 MS	
11/98	190	981024	PT	729	59.19.37N	001.04.17E	755	59.18.98N	001.04.62E	TURBU	SV 12 MS	
11/98	191	981024	PT	831	59.18.46N	001.04.61E	842	59.18.53N	001.04.45E	SEA	SV 12 MS	
11/98	192	981024	MA	900	59.18.65N	001.04.18E	1030	59.18.96N	001.03.64E	VIDEO	S 12 MS	APPROVED
11/98	193	981024	MA	1033	59.18.96N	001.03.66E	1059	59.18.58N	001.04.40E	TURBU	S 12 MS	APPROVED
11/98	194	981024	MA	1104	59.18.58N	001.04.52E	1114	59.18.55N	001.04.51E	SEA	S 12 MS	APPROVED
11/98	195	981024	MA	1118	59.18.54N	001.04.52E	1138	59.18.48N	001.04.72E	SEDI	S 14 MS	APPROVED
11/98	196	981024	MA	1203	59.18.32N	001.04.86E	1248	59.18.12N	001.04.72E	ZOO	SSW 15MS	APPROVED
11/98	197	981024	MA	1307	59.18.06N	001.04.64E	1320	59.18.02N	001.04.76E	WP2	SSW 15MS	APPROVED
11/98	198	981024	MA	1330	59.17.93N	001.04.85E	1340	59.17.89N	001.04.86E	SEA	SSW 15MS	APPROVED
11/98	199	981024	MA	1359	59.17.73N	001.05.43E	1427	59.17.89N	001.06.63E	TURBU	SSW 15MS	APPROVED

				start			finish					
togt	stn	date	op	time (UTC)	latitude	longitude	time (UTC)	latitude	longitude	instru-ment	wind	comment
11/98	200	981024	OP	1454	59.17.95N	001.03.04E	1616	59.17.67N	001.02.95E	VIDEO	SW 18 MS	
11/98	201	981024	OP	1631	59.17.59N	001.02.93E	1659	59.17.52N	001.04.14E	TURBU	SE 23MS	
11/98	202	981024	OP	1702	59.17.51N	001.04.22E	1715	59.17.47N	001.04.15E	SEA	SE 23MS	
11/98	203	981025	MA	1102	58.18.24N	004.57.29E	1128	58.18.12N	004.56.72E	SEA		TURBULENCE PROBE CONNECTED TO CTD: APPROVED
11/98	204	981025	MA	1136	58.18.09N	004.56.61E	1204	58.18.03N	004.56.35E	ZOO		APPROVED
		SEA		Sailing time to reposition ship								
		TURBU		Micro structure turbulence probe								
		ZOO		Zooplankton pump								
		VIDEO		Bug Watcher under water video								
		CTD		CTD								
		SEDI		Sediment tube deployment								
		WP 2		Zooplankton nets								

PROVESS 1998									
Station	Point	Cast	Day	Time [UTC]	LAT	LAT	LON	LON	LOT
D1	NNS	1	16-10-98	08:09	59	19.67	1	1.1	105
D1		2	16-10-98	08:14	59	19.38	1	1.51	
D1		3	16-10-98	08:21	59	19.08	1	1.91	
D1		4	16-10-98	08:27	59	18.78	1	2.31	
D1		5	16-10-98	12:16	59	17.51	1	0.23	
D1		6	16-10-98	12:22	59	17.56	1	0.1	
D1		7	16-10-98	12:26	59	17.62	0	59.97	
D1		8	16-10-98	12:31	59	17.69	0	59.85	
D1		9	16-10-98	12:36	59	17.76	0	59.71	
D1		10	16-10-98	14:56	59	17.42	0	57.74	
D1		11	16-10-98	15:00	59	17.39	0	57.75	
D1		12	16-10-98	15:06	59	17.35	0	57.87	
D1		13	16-10-98	15:11	59	17.31	0	57.88	
D1		14	16-10-98	15:16	59	17.27	0	58	
D1		15	16-10-98	17:13	59	18.62	1	1.76	
D1		16	16-10-98	17:18	59	18.64	1	1.96	
D1		17	16-10-98	17:22	59	18.66	1	2.13	
D1		18	16-10-98	17:27	59	18.68	1	2.31	
D1		19	16-10-98	17:31	59	18.69	1	2.46	
D1		20	16-10-98	19:14	59	18.54	1	1.01	
D1		21	16-10-98	19:20	59	18.55	1	1.1	
D1		22	16-10-98	19:24	59	18.58	1	1.2	
D1		23	16-10-98	19:29	59	18.59	1	1.39	
D1		24	16-10-98	19:33	59	18.6	1	1.44	
D1		25	16-10-98	21:10	59	17.26	1	1.69	
D1		26	16-10-98	21:14	59	17.24	1	1.79	
D1		27	16-10-98	21:19	59	17.22	1	1.95	
D1		28	16-10-98	21:25	59	17.18	1	2.06	
D1		29	16-10-98	21:29	59	17.14	1	2.15	
D1		30	18-10-98	06:05	59	21.03	1	1.76	
D1		31	18-10-98	06:08	59	21.09	1	1.57	
D1		32	18-10-98	06:12	59	21.15	1	1.39	
D1		33	18-10-98	06:16	59	21.21	1	1.21	
D1		34	18-10-98	06:22	59	21.28	1	1.03	
D1		35	18-10-98	07:40	59	21.67	1	1.73	
D1		36	18-10-98	07:44	59	21.67	1	1.63	
D1		37	18-10-98	07:48	59	21.66	1	1.53	105
D1		38	18-10-98	07:52	59	21.66	1	1.48	
D1		39	18-10-98	07:56	59	21.65	1	1.44	105
D1		40	18-10-98	10:43	59	20.63	1	3	
D1		41	18-10-98	10:48	59	20.56	1	2.79	
D1		42	18-10-98	10:52	59	20.48	1	2.69	
D1		43	18-10-98	10:56	59	20.4	1	2.6	
D1		44	18-10-98	11:00	59	20.33	1	2.53	
D1		45	18-10-98	14:00	59	22.09	1	1.37	
D1		46	18-10-98	14:04	59	22.03	1	1.44	
D1		47	18-10-98	14:08	59	21.99	1	1.38	107
D1		48	18-10-98	14:12	59	21.93	1	1.35	
D1		49	18-10-98	14:16	59	21.87	1	1.34	
D1		50	18-10-98	16:52	59	20.87	1	2.47	104
D1		51	18-10-98	16:58	59	20.86	1	2.63	
D1		52	18-10-98	17:03	59	20.81	1	2.66	
D1		53	18-10-98	17:07	59	20.76	1	2.66	
D1		54	18-10-98	17:12	59	20.72	1	2.72	103
D1		55	18-10-98	19:19	59	21.12	1	2.08	
D1		56	18-10-98	19:23	59	21.14	1	1.99	

PROVESS 1998									
Station	Point	Cast	Day	Time [UTC]	LAT	LAT	LON	LON	LOT
D1		57	18-10-98	19:28	59	21.14	1	1.85	
D1		58	18-10-98	19:32	59	21.13	1	1.73	
D1		59	18-10-98	19:37	59	21.13	1	1.7	104
D1		60	18-10-98	22:35	59	20.2	1	3.43	103
D1		61	18-10-98	22:42	59	20.13	1	3.38	
D1		62	18-10-98	22:47	59	20.04	1	3.36	
D1		63	18-10-98	22:51	59	19.97	1	3.33	
D1		64	18-10-98	22:55	59	19.89	1	3.27	
D1		65	19-10-98	04:44	59	20.52	1	3.47	104
D1		66	19-10-98	04:48	59	20.49	1	3.43	
D1		67	19-10-98	04:53	59	20.46	1	3.36	104
D1		68	19-10-98	04:58	59	20.43	1	3.3	
D1		69	19-10-98	07:19	59	21.69	1	1.51	105
D1		70	19-10-98	07:23	59	21.67	1	1.43	105
D1		71	19-10-98	07:27	59	21.67	1	1.46	105
D1		72	19-10-98	07:32	59	21.68	1	1.48	105
D1		73	19-10-98	07:37	59	21.62	1	1.51	105
D1		74	19-10-98	10:29	59	21.71	1	2.93	
D1		75	19-10-98	10:33	59	21.6	1	2.86	
D1		76	19-10-98	16:50	59	22.6	1	0.42	
D1		77	19-10-98	16:54	59	22.64	1	0.28	
D1		78	19-10-98	16:59	59	22.68	1	0.13	
D1		79	19-10-98	17:04	59	22.73	0	59.96	109
D1		80	19-10-98	17:09	59	22.79	0	59.81	
D1		81	19-10-98	19:34	59	19.67	1	4.08	
D1		82	19-10-98	19:38	59	19.71	1	4.02	
D1		83	19-10-98	19:42	59	19.76	1	3.9	
D1		84	19-10-98	19:46	59	19.81	1	3.78	
D1		85	19-10-98	19:50	59	19.84	1	3.71	
D1		86	19-10-98	22:36	59	20.67	1	4.09	
D1		87	19-10-98	22:41	59	20.61	1	4.03	
D1		88	19-10-98	22:45	59	20.6	1	3.85	
D1		89	19-10-98	22:50	59	20.55	1	3.73	
D1		90	19-10-98	22:54	59	20.5	1	3.66	
D1		91	20-10-98	01:54	59	21.42	1	3.41	
D1		92	20-10-98	01:58	59	21.49	1	3.22	
D1		93	20-10-98	02:03	59	21.46	1	3.1	
D1		94	20-10-98	02:07	59	21.49	1	2.94	105
D1		95	20-10-98	02:11	59	21.5	1	2.78	
D1		96	20-10-98	04:32	59	22.11	1	4.66	
D1		97	20-10-98	04:36	59	22.2	1	4.55	
D1		98	20-10-98	04:40	59	22.24	1	4.4	
D1		99	20-10-98	04:45	59	22.31	1	4.22	109
D1		100	20-10-98	04:49	59	22.36	1	4.09	
D1		101	20-10-98	07:37	59	22.44	1	1.76	
D1		102	20-10-98	07:41	59	22.47	1	1.86	
D1		103	20-10-98	07:46	59	22.52	1	2	
D1		104	20-10-98	07:51	59	22.62	1	1.97	
D1		105	20-10-98	07:55	59	22.65	1	1.9	
D1		106	20-10-98	10:26	59	21.59	1	5.51	
D1		107	20-10-98	10:31	59	21.61	1	5.44	
D1		108	20-10-98	10:35	59	21.61	1	5.44	
D1		109	20-10-98	10:39	59	21.57	1	5.45	
D1		110	20-10-98	10:43	59	21.6	1	5.41	
D1		111	20-10-98	14:01	59	21.06	1	4.84	
D1		112	20-10-98	14:05	59	21.12	1	4.8	

PROVESS 1998									
Station	Point	Cast	Day	Time [UTC]	LAT	LAT	LON	LON	LOT
D1		113	20-10-98	14:09	59	21.16	1	4.77	
D1		114	20-10-98	14:13	59	21.12	1	4.73	
D1		115	20-10-98	14:17	59	21.26	1	4.69	107
D1		116	20-10-98	16:53	59	21.11	1	5.38	
D1		117	20-10-98	16:57	59	21.07	1	5.56	
D1		118	20-10-98	17:01	59	21.05	1	5.71	
D1		119	20-10-98	17:06	59	21.02	1	5.89	
D1		120	20-10-98	17:10	59	21	1	6.08	
D1		121	20-10-98	19:36	59	19.43	1	4.76	
D1		122	20-10-98	19:40	59	19.41	1	4.89	105
D1		123	20-10-98	19:44	59	19.38	1	5.03	
D1		124	20-10-98	19:48	59	19.35	1	5.17	105
D1		125	20-10-98	19:52	59	19.33	1	5.29	106
D1		126	20-10-98	22:32	59	19.73	1	5.06	
D1		127	20-10-98	22:36	59	19.67	1	5.3	
D1		128	20-10-98	22:41	59	19.69	1	5.54	
D1		129	20-10-98	22:52	59	19.5	1	6.25	
D1		130	20-10-98	22:57	59	19.45	1	6.45	
D1		131	21-10-98	07:16	59	18.78	1	4.89	99
D1		132	21-10-98	07:20	59	18.71	1	5.02	99
D1		133	21-10-98	07:24	59	18.68	1	5.13	99
D1		134	21-10-98	07:28	59	18.63	1	5.24	99
D1		135	21-10-98	07:32	59	18.6	1	5.38	99
D1		136	21-10-98	07:36	59	18.54	1	5.5	99
D1		137	21-10-98	07:41	59	18.48	1	5.65	99
D1		138	21-10-98	10:28	59	18.53	1	3.53	104
D1		139	21-10-98	10:33	59	18.42	1	3.59	104
D1		140	21-10-98	10:37	59	19.29	1	3.63	104
D1		141	21-10-98	10:41	59	18.19	1	3.68	104
D1		142	21-10-98	10:45	59	18.04	1	3.71	104
D1		143	21-10-98	10:49	59	17.97	1	3.75	104
D1		144	21-10-98	14:05	59	21.09	1	1.9	
D1		145	21-10-98	14:09	59	21.02	1	1.88	
D1		146	21-10-98	14:12	59	20.96	1	1.86	
D1		147	21-10-98	14:17	59	20.87	1	1.81	
D1		148	21-10-98	14:22	59	20.77	1	1.79	
D1		149	21-10-98	16:36	59	22.42	1	1.58	
D1		150	21-10-98	16:40	59	22.4	1	1.54	
D1		151	21-10-98	16:44	59	22.37	1	1.47	
D1		152	21-10-98	16:48	59	22.36	1	1.43	108
D1		153	21-10-98	16:52	59	22.38	1	1.46	
D1		154	21-10-98	19:32	59	20.28	1	3.61	
D1		155	21-10-98	19:36	59	20.23	1	3.69	
D1		156	21-10-98	19:40	59	20.17	1	3.77	
D1		157	21-10-98	19:44	59	20.08	1	3.84	
D1		158	21-10-98	19:49	59	20.01	1	3.93	
D1		159	21-10-98	22:32	59	18.68	1	4.1	
D1		160	21-10-98	22:37	59	18.54	1	4.17	
D1		161	21-10-98	22:41	59	18.44	1	4.24	
D1		162	21-10-98	22:45	59	18.34	1	4.31	
D1		163	21-10-98	22:49	59	18.24	1	4.38	
D1		164	22-10-98	01:48	59	16.67	1	1.49	
D1		165	22-10-98	01:53	59	16.55	1	1.51	
D1		166	22-10-98	01:57	59	16.43	1	1.5	
D1		167	22-10-98	02:01	59	16.35	1	1.53	
D1		168	22-10-98	02:06	59	16.28	1	1.56	

PROVESS 1998									
Station	Point	Cast	Day	Time [UTC]	LAT	LAT	LON	LON	LOT
D1		169	22-10-98	02:10	59	16.17	1	1.6	
D1		170	22-10-98	02:15	59	16.07	1	1.64	
D1		171	22-10-98	05:09	59	18.79	0	59.01	
D1		172	22-10-98	05:14	59	18.78	0	59.09	
D1		173	22-10-98	05:19	59	18.74	0	59.13	
D1		174	22-10-98	05:24	59	18.72	0	59.19	
D1		175	22-10-98	05:28	59	18.73	0	59.3	
D1		176	22-10-98	06:03	59	19.19	0	59.85	
D1		177	22-10-98	06:08	59	18.16	0	59.91	
D1		178	22-10-98	06:13	59	18.13	1	0.02	
D1		179	22-10-98	06:17	59	18.07	1	0.13	
D1		180	22-10-98	06:22	59	18.05	1	0.24	
D1		181	22-10-98	08:05	59	17.77	0	58.51	
D1		182	22-10-98	08:09	59	17.73	0	58.62	
D1		183	22-10-98	08:14	59	17.71	0	58.77	
D1		184	22-10-98	08:19	59	17.67	0	58.9	
D1		185	22-10-98	08:24	59	17.62	0	59.03	
D1		186	22-10-98	10:04	59	17.55	1	0.22	
D1		187	22-10-98	10:10	59	17.39	1	0.49	
D1		188	22-10-98	10:15	59	17.34	1	0.59	
D1		189	22-10-98	10:20	59	17.23	1	0.74	
D1		190	22-10-98	10:29	59	17.02	1	1.02	
D1		191	22-10-98	12:04	59	15.89	1	1.83	
D1		192	22-10-98	12:14	59	15.69	1	2.01	
D1		193	22-10-98	12:18	59	15.49	1	2.18	
D1		194	22-10-98	12:24	59	15.33	1	2.3	
D1		195	22-10-98	12:29	59	15.19	1	2.43	
D1		196	22-10-98	14:09	59	17.17	1	1.77	
D1		197	22-10-98	14:13	59	17.06	1	1.73	
D1		198	22-10-98	14:18	59	16.97	1	1.71	
D1		199	22-10-98	14:22	59	16.89	1	1.67	
D1		200	22-10-98	14:26	59	16.81	1	1.6	
D1		201	22-10-98	16:03	59	16.95	1	0.02	
D1		202	22-10-98	16:08	59	16.88	1	0	
D1		203	22-10-98	16:13	59	16.81	1	0	
D1		204	22-10-98	16:17	59	16.76	1	0	
D1		205	22-10-98	16:22	59	16.67	0	59.99	
D1		206	22-10-98	18:04	59	18.72	0	56.99	
D1		207	22-10-98	18:09	59	18.66	0	56.99	
D1		208	22-10-98	18:13	59	18.6	0	56.98	
D1		209	22-10-98	18:18	59	18.56	0	56.99	
D1		210	22-10-98	18:23	59	18.51	0	56.99	
D1		211	22-10-98	20:03	59	18.75	0	55.97	
D1		212	22-10-98	20:07	59	18.74	0	56	
D1		213	22-10-98	20:11	59	18.72	0	56.03	
D1		214	22-10-98	20:15	59	18.71	0	56.09	
D1		215	22-10-98	20:20	59	18.71	0	56.13	
D1		216	22-10-98	22:07	59	19.13	0	56.11	
D1		217	22-10-98	22:11	59	19.1	0	56.22	
D1		218	22-10-98	22:15	59	19.05	0	56.37	
D1		219	22-10-98	22:20	59	18.69	0	56.53	
D1		220	22-10-98	22:25	59	18.87	0	56.68	
D1		221	23-10-98	00:02	59	17.97	0	57.25	
D1		222	23-10-98	00:06	59	17.9	0	57.36	
D1		223	23-10-98	00:10	59	17.81	0	57.46	
D1		224	23-10-98	00:14	59	17.73	0	57.58	

PROVESS 1998									
Station	Point	Cast	Day	Time [UTC]	LAT	LAT	LON	LON	LOT
D1		225	23-10-98	00:18	59	17.66	0	57.67	
D1		226	23-10-98	02:02	59	17.42	1	0.13	
D1		227	23-10-98	02:06	59	17.34	1	0.18	
D1		228	23-10-98	02:10	59	17.26	1	0.23	
D1		229	23-10-98	02:14	59	17.17	1	0.29	
D1		230	23-10-98	02:19	59	17.09	1	0.33	
D1		231	23-10-98	04:05	59	16.68	0	59.73	
D1		232	23-10-98	04:10	59	16.6	0	59.48	
D1		233	23-10-98	04:14	59	16.54	0	59.36	
D1		234	23-10-98	04:18	59	16.48	0	59.2	
D1		235	23-10-98	04:22	59	16.42	0	59.04	
D1		236	23-10-98	06:04	59	18.71	1	2.79	
D1		237	23-10-98	06:09	59	18.74	1	2.64	
D1		238	23-10-98	06:13	59	18.76	1	2.49	
D1		239	23-10-98	06:17	59	18.78	1	2.35	
D1		240	23-10-98	06:21	59	18.81	1	2.2	
D1		241	23-10-98	08:04	59	18.7	1	4.98	
D1		242	23-10-98	08:08	59	18.72	1	4.85	
D1		243	23-10-98	08:12	59	18.75	1	4.68	
D1		244	23-10-98	08:16	59	18.78	1	4.56	
D1		245	23-10-98	08:20	59	18.8	1	4.46	
D1		246	23-10-98	10:34	59	20.15	1	4.27	
D1		247	23-10-98	10:38	59	20.13	1	4.2	
D1		248	23-10-98	10:42	59	20.09	1	4.11	
D1		249	23-10-98	10:47	59	20.06	1	4.04	
D1		250	23-10-98	10:51	59	20.02	1	3.99	
D1		251	23-10-98	14:07	59	20.48	1	4.26	
D1		252	23-10-98	14:12	59	20.36	1	4.28	
D1		253	23-10-98	14:18	59	20.19	1	4.16	
D1		254	23-10-98	14:24	59	20.03	1	4.16	
D1		255	23-10-98	14:28	59	19.88	1	4.19	
D1		256	23-10-98	16:36	59	21.46	1	3.16	
D1		257	23-10-98	16:40	59	21.63	1	3.11	
D1		258	23-10-98	16:45	59	21.28	1	3.01	
D1		259	23-10-98	16:49	59	21.19	1	3.05	
D1		260	23-10-98	16:54	59	21.11	1	2.97	
D1		261	23-10-98	19:35	59	21.82	1	1.48	
D1		262	23-10-98	19:39	59	21.8	1	1.36	
D1		263	23-10-98	19:43	59	21.76	1	1.3	
D1		264	23-10-98	19:47	59	21.73	1	1.12	
D1		265	23-10-98	19:52	59	21.71	1	0.95	
D1		266	23-10-98	22:36	59	22.35	0	59.33	
D1		267	23-10-98	22:41	59	22.3	0	59.31	
D1		268	23-10-98	22:45	59	22.24	0	59.29	
D1		269	23-10-98	22:49	59	22.17	0	59.28	
D1		270	23-10-98	22:54	59	22.09	0	59.27	
D1		271	24-10-98	02:05	59	21.68	0	59.24	
D1		272	24-10-98	02:09	59	21.59	0	59.26	
D1		273	24-10-98	02:13	59	21.48	0	59.25	
D1		274	24-10-98	02:18	59	21.39	0	59.28	
D1		275	24-10-98	02:22	59	21.27	0	59.31	
D1		276	24-10-98	04:46	59	20.07	1	3.75	
D1		277	24-10-98	04:50	59	20	1	3.83	
D1		278	24-10-98	04:55	59	19.9	1	3.9	
D1		279	24-10-98	05:00	59	19.8	1	3.98	
D1		280	24-10-98	05:04	59	19.68	1	4.04	

PROVESS 1998									
Station	Point	Cast	Day	Time [UTC]	LAT	LAT	LON	LON	LOT
D1		281	24-10-98	07:36	59	19.32	1	4.19	
D1		282	24-10-98	07:40	59	19.26	1	4.23	
D1		283	24-10-98	07:45	59	19.2	1	4.33	
D1		284	24-10-98	07:49	59	19.14	1	4.4	
D1		285	24-10-98	07:53	59	19.08	1	4.49	
D1		286	24-10-98	10:39	59	18.92	1	3.73	
D1		287	24-10-98	10:44	59	18.88	1	3.83	
D1		288	24-10-98	10:48	59	18.8	1	3.94	
D1		289	24-10-98	10:52	59	18.72	1	4.07	
D1		290	24-10-98	10:56	59	18.69	1	4.2	
D1		291	24-10-98	14:06	59	17.7	1	5.64	
D1		292	24-10-98	14:11	59	17.72	1	5.84	
D1		293	24-10-98	14:16	59	17.78	1	6.04	
D1		294	24-10-98	14:20	59	17.76	1	6.24	
D1		295	24-10-98	14:25	59	17.84	1	6.43	
D1		296	24-10-98	16:36	59	17.58	1	3.08	
D1		297	24-10-98	16:42	59	17.58	1	3.32	
D1		298	24-10-98	16:46	59	17.55	1	3.56	
D1		299	24-10-98	16:51	59	17.55	1	3.79	
D1		300	24-10-98	16:56	59	17.53	1	3.99	