



Universität Hamburg

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August 29. 2003

Cruise Summary Report METEOR 59/1

Ship:	FS METEOR
Cruise:	no. 59, leg 1 (M59/1)
Dates:	June 27 th – July 21 st 2003
Port Calls:	Ponta Delgada/Portugal and Reykjavik/Iceland
Institute:	Institut für Meereskunde, Universität Hamburg
Number of Scientists:	21
Chief Scientist:	Dr. John Mortensen
Principal Project:	EU project ASOF-W (Arctic Subarctic Ocean Fluxes – West, for more information on the program see asof.npolar.no)
Research area:	North Atlantic: northern and western Irminger Sea, Mid-Atlantic Ridge
Time Zone:	UTC
To be submitted by	Leitstelle METEOR Institut für Meereskunde, Universität Hamburg
Master:	Kapitän Henning Papenhagen

Scientific Crew:

Name	Speciality	Institute
Mortensen, John, Dr.	Chief Scientist	IfM HH
da Rocha, Régine	Freon	IUP HB
Demmler, Petra	CTD	Uni-Munich
Drübbisch, Ulrich	Mooring	IFM HH
Dye, Steven, Dr.	CTD, mooring	CEFAS
Eriksson, Patrick	CTD, mooring	FIMR
Giese, Holger	Mooring	BSH
Hägele, Daniela	SF6	IfM K
Halm, Hannah	Freon	IUP HB
Hargreaves, Geoff	Mooring	POL
Kahl, Gerhard	Meteorology	DWD
Kreus, Markus	CTD	IfM HH
Read, John	Mooring	CEFAS
Sander, Hendrik	Freon	IUP HB
Sprenger, Judith	CTD	IfM HH
Tanhua, Toste, Dr.	SF6	IfM K
Truscheit, Thorsten	Meteorology	DWD
Uhde, Hans-Hermann	Mooring	BSH
Vassie, Ian, Dr.	Mooring	SAMS
Verch, Norbert	CTD, salinometer	IfM HH
Wieczorek, Gunda	CTD, mooring	IfM HH

Participating Institutions:

BSH

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CEFAS

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DWD

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FIMR

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IUP HB

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POL

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SAMS

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Scientific Objectives

The first leg of RV METEOR M59 cruise (Circulation and Variability in the subpolar North Atlantic) was conducted by the *Institut für Meereskunde, Universität Hamburg* with the main objective to collect observations in the overflow water along the East Greenland continental slope and on the shelf as part of the EU project ASOF-W. The main goal of ASOF is the development of an optimised monitoring system to study the role of the arctic region for the global circulation. Decadal long time series are necessary to obtain crucial information's on the interplay of the coupled atmosphere - ocean system, they are not available yet. The M59/1 had the following aims:

1. to carry out hydrographic investigations in the overflow water along the East Greenland continental slope and the fresh water on the shelf. The investigation included CTD-casts (a Sea-Bird 911 plus CTD, titanium, was used during the cruise).
2. recover 7 mooring's (O1, F1, F2, Uk1, G1, Uk2 and G2), one ADCP (F2 ADCP) and one inverted echo sounder (Uk1 IES) on the East Greenland continental slope as part of the EU project ASOF-W.
3. deploy 8 mooring's (O1, F1, F2, Uk1, G1, Uk2, G2 and O2) and one HOMER (F2 HOMER or HOMing Environmental Recorder) on the East Greenland continental slope as part of the EU project ASOF-W. The HOMER is the first of it's kind to ever be deployed in deep water.
4. service two tube mooring's (in Tube3 and Tube8; out Tube11 and Tube12) on the East Greenland shelf as part of the EU project ASOF-W.
5. service 3 mooring's at the WOCE section A2 on the western flank of the Mid-Atlantic Ridge at 46°N for BSH.
6. deploy five APEX for BSH in the vicinity of the three BSH moorings.
7. collect samples for analysis of SF6 (IfM K).

8. collect samples for analysis of Freon (IUP HB).
9. collect continuous underway measurements of surface temperature and salinity.
10. collect continuous underway ADCP (38kHz and 75kHz).
11. collect continuous underway weather data.

Narrative of the Cruise

The advance and main parties for METEOR cruise M59 leg 1 arrived according to schedule at Ponta Delgada, Azores Islands on June the 24th and 25th respectively. Containers were smoothly loaded and partly emptied during June 25th and 26th. All scientific equipment was made sea safe in late afternoon of June 26th. During the afternoon of June 26th the scientific crew of 21 persons were given a safety on board introduction by a crew-member of METEOR. Five different nationalities are represented on this leg of M59: Swedish, Finnish, British, German and Danish scientists from a number of different institutes in Europe. For more information see expedition folder on the homepage for METEOR at the Institut für Meereskunde Universität Hamburg (www.ifm.uni-hamburg.de).

FS METEOR left the port of Ponta Delgada according to plan on Friday morning, June 27th at 1000 hours marking the start of the programme: *Circulation and Variability in the subpolar North Atlantic (Zirkulation und Variabilität im subpolaren Nordatlantik)*.

Course was set for the first of the three Bundesamt für Seeschifffahrt und Hydrographie, Hamburg (BSH) moorings (K-ost). Weather and sea state were fine during the afternoon of June 27th and the estimated time of arrival (ETA) was set to 1600 hours on June 29th. During the second day winds increased to strong gales (>20 m/s) from the Northeast, these conditions continued into early evening of June 29th. During the night of June 30th wind and wave conditions improved so much that recovery of K-ost commenced at 0600 hours. Due to mooring material defects two releases and one current meter were lost during the recovery operation. After a calibration CTD station the mooring K-ost was re-deployed and METEOR headed for the next BSH mooring (K1) at 1440 hours. Mooring work at K1 started Tuesday morning July 1st at 0800 hours. Recovery, calibration CTD station and redeployment were completed at 1721 hours when the upper float of the mooring was observed to submerge. In very fine weather, course was set for the third and final BSH mooring K3. Meteor arrived at the mooring site K3 on the morning of Wednesday July 2nd at 0800 hours. Several attempts were made to recover mooring K3 without luck. Analysis of the response of the acoustic releases suggests that the releases are lying on the bottom without any instruments or buoyancy attached above. Recovery attempts were given up in the afternoon and a new K3 mooring was deployed 6 nm Northeast of the old site. The deployment finished at 1851 hours and course was set for the first EU ASOF-W (Arctic/Subarctic Ocean Fluxes – West) CTD (Conductivity (or salinity), Temperature and Depth) station located 860 nm to the North in the Irminger Sea. ETA was set to Saturday July 5th at 1800 hours.

Meteor arrived at the first ASOF-W CTD station (59°28'N, 37°30'W) on Saturday July 5th at 1800 hours and began occupying the CTD section toward Greenland and Cape Farvel (see cruise track below).

The CTD section which was started Saturday July 5th was completed on Monday morning July 7th with a CTD station 6 nautical miles (nm) from the coast of Greenland. There was no sea ice in the area and only very few icebergs were in sight. Course was then set for the first of two EU ASOF-W Tube moorings around 189 nm away (63°N, 41°W). After only a few

nautical mile, winds increased to 17-20 m/s from the north-east slowing down the advance of RV METEOR to 6 to 8 knots.

Mooring work at Tube 03 started on Tuesday morning July 8th at 0630 hours. Due to sea ice conditions last year Tube 03 had not been recovered as planned last year this mooring has thus been in the water for about 2 years. This year Tube 03 was released and recovered without problems. Following recovery, a calibration CTD station was performed and the mooring was re-deployed as Tube 11 and completed at 1539 hours when the 40 meter long tube was observed to submerge. During the operation we had winds in the range of 15 to 17 m/s from north-east with an acceptable sea state. All three recovered microcats contained data for the complete deployment period i.e. ~ 2 years of data. The microcats used in Tube 03 were re-used in Tube 11 and a lot of time was required to make the microcats ready for deployment. Arrangements were made to reduce the time between recovery of Tube 08 and deployment of Tube 12. Recovery of Tube 08 started at 1649 hours and deployment of Tube 12 was completed at 1949 hours when the tube submerged. Course was set for the EU ASOF-W section 3 and the first of nine moorings to be recovered along this section. The plan was to start recovery early morning Wednesday July 9th and continue recovery work all day until all moorings were on board. On leaving the tube mooring site winds were still in the range of 15 to 17 m/s from north-east.

The recovery of the first EU ASOF-W mooring O1 started on Wednesday morning July 9th at 0807 hours. The mooring was on deck 45 minutes later at 0852. We continued to mooring F1 and could receive no return signal from the releaser. Use of a second deck unit and transducer gave the same negative result. Winds had now increased to 19-20 m/s and the size of the swell was increasing. We abandoned the station at 1100 hours and headed for mooring F2. At 1200 hours we made contact with the F2 releaser but postponed the recovery due to bad weather. This was the third time during the cruise where we experienced a strong gale (>20 m/s) from the north-east. Having made our way to the southern (deepest) end of the mooring array we resumed the recovery work at noon Thursday July 10th at 1200 hours by the recovery of mooring G2. During the afternoon we recovered moorings: G2, UK2 and G1. In the evening we recovered moorings: UK1, UK1 IES and F2. Our luck ran out with the attempts to recover F2 ADCP and F1. Several recovery attempts were made without results. We had contact with F2 ADCP but no contact with F1 could be established. Recovery attempts of F2 ADCP and F1 were abandoned 40 minutes after midnight and will be resumed later in the cruise.

CTD work commenced along ASOF-W Section 3 on Friday night July 11th at 0212 hours in the shallowest part the section. The CTD section was delayed for some time whilst a more intense search for mooring F2 ADCP was made. We now had good contact with both releases on the mooring but for some unknown reason remained resolutely stuck to the bottom despite giving a positive response to multiple release commands. CTD work was resumed and section 3 was finished on Saturday evening July 12th at 2240 hours. After a short steam to ASOF-W Section 4 on Sunday morning July 13th at 0510 hours we began CTD work along this line.

The weather conditions of the third week of the cruise were as favourable as those of the previous week were not. The CTD work started along EU ASOF-W section 4 Sunday morning July 13th at 0510 hours in the deepest part the section were completed Monday noon July 14th just 5 nm from the coast of Greenland. Course was again set for the EU ASOF-W section 3 and the first of nine moorings to be deployed along this section. The plan was to start deployment early morning Tuesday July 15th and continue deployment work all day until all moorings were out. The night of the 15th was used to make a detailed search for the missing F1 mooring and a last attempt to recover F2 ADCP, unfortunately neither proved to be successful.

The deployment of the first EU ASOF-W mooring F2 started on Tuesday morning July 15th at 0705 hours. The mooring was out 22 minutes later at 0727 hours. During the morning

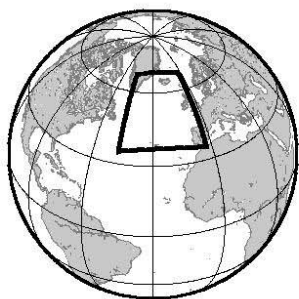
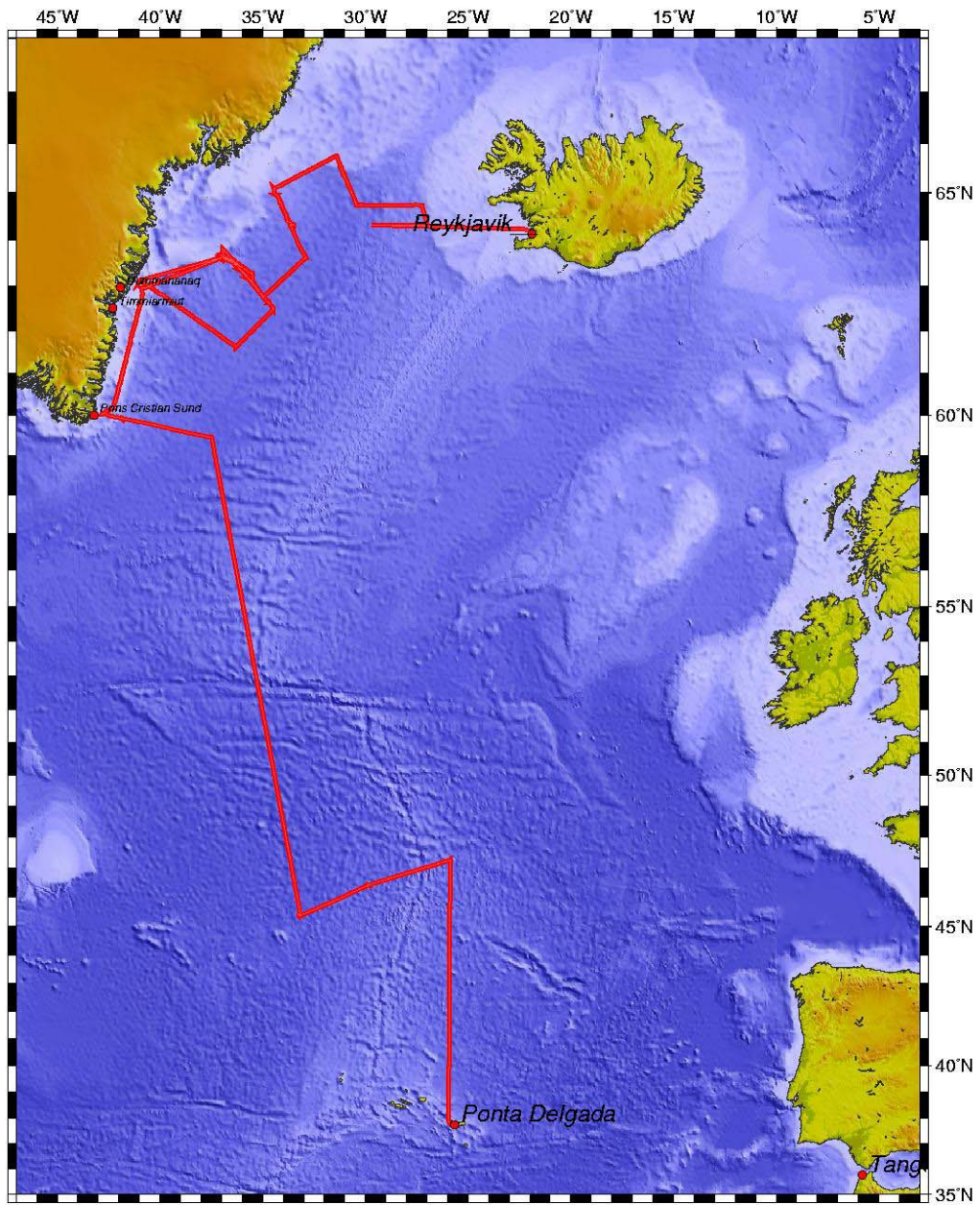
we deployed moorings: F2, O1 and F1. The afternoon began with the maiden deep-water (1800 m) deployment of HOMER. This instrument is moored in a frame and pays out (and reels in) fishing line headed by a buoyant glass sphere containing a CTD. It was designed specifically to examine the variability in the properties and thickness of the dense Denmark Strait overflow layer that the current meter moorings monitor. This first HOMER has been programmed to make a profile of the bottom 400 m once a week until it is recovered next year, future deployments should extend its range and reduce the time between samples. If all goes well HOMER could become an important oceanographic tool allowing high temporal resolution measurements to be made in areas where sampling has been infrequent, irregular or nearly impossible (e.g. under ice) until now. The HOMER team paid tribute to the FS Meteor and her crew which allowed them to make the deployment possible.

After HOMER, moorings UK1, G1 and UK2 were deployed during the afternoon in extremely good weather. The two last moorings G2 and O2 were deployed during the evening with the last mooring O2 completed at 2145 hours. METEOR cruise M59/1 celebrated the recovery of the 100th Aanderaa current meter from East Greenland since the start of the EU VEINS programme in 1997. The loss of moorings on this cruise highlighted the thought that though we may control their deployment it is within the gift of the ocean to allow us to recover them.

CTD work commenced along ASOF-W section 2 on Wednesday morning July 16th at 0415 hours in the deepest part of the section. Section 2 was finished on Thursday morning July 17th at 0645 hours. The next ASOF-W section, section 1, was started on Thursday afternoon July 17th at 1345 hours in the shallowest part of the Greenland continental shelf and ended on the Icelandic shelf Saturday morning July 19th at 0356 hours. The last ASOF-W CTD section was started Saturday morning July 19th at 0609 hours. This section coincides with the Icelandic standard section Faxaflói but covers only the steepest part of the Icelandic continental slope. After the last station was occupied on Saturday evening July 19th at 1820 hours course was set for Reykjavík. RV METEOR berthed in Reykjavík Sunday afternoon July 20th at 1400 hours.

Further Remarks

We very much appreciate the professionalism and seamanship of the crew, officers and Captain of the F.S. Meteor which made this work a success. Financial support came from EU EC FP5 ASOF-W, through contract EVK2-CT-2002-00149.



M59/1 Ponta Delgada - Reykjavik
26.06.2003 - 22.07.2003
University of Hamburg
1:30,000,000 scale
Mercator projection (WGS 84)
km
0 500
Map processed with GMT on board R/V Meteor of cruise M59/1
by RF Forschungsschiffahrt GmbH

Cruise track for METEOR cruise M59/1 (27.06-21.07.2003).