Current Measurements from the Northern Nordic Seas 1983 - 1986
Current Measurements from the
Northern Nordic Seas
1983 - 1986

by
Susumu Honjo, Christine M. Wooding, and Gerold Wefer*

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Technical Report

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and
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NORDIC SEAS SEDIMENTATION

DATA FILE, Vol. 2

CURRENT MEASUREMENTS FROM THE
NORTHERN NORDIC SEAS

1983 - 1986

Sponsored by
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Nordic Seas Sedimentation: Data File; Volume 2

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1983 - 1986

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April, 1987

Abstract:

Records from ten Aanderaa current meters deployed along with 5
current meter/sediment trap mooring arrays in the Fram Strait and
Greenland Basin, each deployed for approximately one year between 1983
and 1986, are presented in this data file. Data included are current
vectors, temperatures, frequency spectra, and two- and three-dimensional
vector diagrams.

Introduction

Supported by the United States Office of Naval Research, the Woods
Hole Oceanographic Institution (WHOI) in cooperation with the University
of Kiel and the University of Bremen, Federal Republic of Germany, has
conducted basin-wide sedimentological research in the Nordic Sea since
the summer of 1983. One of the major field programs was the deployment
of 16 moorings with sediment traps and current meters for a period of
about one year throughout the basin between 1983 and 1988. As the first
step in the program, we deployed 6 year-round moorings between August,
1983 and August, 1986 in the Fram Strait and Norwegian Basin (Fig. 1).
In the second phase of the study, sediment trap and current meter
deployments will continue around Iceland and coastal Greenland in
cooperation with the Marine Research Institute, Reykjavik (refer to Fig.
1 and Table 1).
On five of the mooring arrays deployed in the northern Nordic Seas, Aanderaa current meters with thermister chains were attached. At least one of the current meters on an array was positioned close to the sediment trap - usually 50 or 100 meters below the trap. Information on the design of the mooring arrays deployed in the Nordic Seas experiment will be published elsewhere in this data series. Of the 11 current meters deployed in this area, two meters (the only current meter on the BI-1 station, off Bear Island-Storfjord, and one of three deployed at the shallower depth at GB-1 station, Greenland Basin during 1985-1986) failed to record data. At the Lofoten Basin Station (LB-1) 2 current meters were deployed at 2,650 m and 2,975 m. Although both current meters worked, the record from only the shallower instrument is included in this data file.

All other current meters functioned for about one year or a slightly shorter period, and the data greatly contributed to an understanding of the relationship between current and mass fluxes of ocean particles in this area. In this data file are presented current vectors, vector components, vector average diagrams and temperature records. Also, the east and north components of frequency auto-spectrum and frequency rotary spectrum were computed and attached. We follow the style taken by "Fram Strait Current Measurements, 1984-1985" by Aagaard et al., 1985, 85 pp., published in Bergen, Norway, to compile this data file.

Technical note

For spectrum calculations, each data series was divided into roughly 5 pieces, each about 2-1/2 months long (2048 hourly points, 512 4-hourly points). Means were removed from each piece separately, and they were pre-whitened. Pre-whitening is using first differences, in the time domain, to reduce the low-frequency components of a series. On plotting, the spectra were averaged in increasingly large groups at the high frequencies to reduce superfluous points. They also were "re-colored" to restore the low-frequency information. The confidence levels indicate how closely the spectral estimates match the true variance. The rotary spectra represent the circular decomposition of a 2-dimensional vector series into clockwise (here, negative) and counterclockwise (positive) harmonic components. Unfortunately, only 4-hourly data was available for LB-1. All other spectra are on hourly data.
Acknowledgments

The Nordic Sea is one of the most difficult ocean areas for oceanographic logistics. We have received a great deal of help and good will from international colleagues in pursuing this project. In particular, Dr. Jörn Thiede, Chief Scientist of the 1984 and 1985 legs, rendered us every possible opportunity to make this experiment successful on board R/V Polarstern, Alfred Wegener Institution for Polar and Marine Research, Bremerhaven. In memory of the first recovery cruise in 1984 on board R/V Polarstern, a track chart of Arktis II, leg 4 is included in this data file as Fig. 2. We also thank R/V Meteor (old) and the Deutsche Hydrographische Institute, Hamburg, which supported us during a difficult mission to recover a malfunctioned mooring and to deploy a large array in the Greenland Sea during 1985. Dr. Jens Meike made recovery of the FS-1 mooring possible through his care and competence as Chief Scientist of R/V Valdivia during the summer of 1985.

Dr. Vernon Asper, University of Southern Mississippi, Steven Manganini and Dorinda Ostermann, WHOI, contributed to the preparations and deployment of arrays in this difficult ocean. Their dedication and imagination made this program take off. Peter Clay and Thomas Crook provided vital assistance in recovering a stranded GB-1 mooring in the summer of 1985 on board R/V Meteor (old).

Without the encouragement and funding support from the Office of Naval Research, this basin-wide sedimentation study would never have been started. We sincerely thank Dr. G. Leonard Johnson for his insight and commitment to this project.
Table 1.


<table>
<thead>
<tr>
<th>No.</th>
<th>Year</th>
<th>ID No.</th>
<th>Location</th>
<th>Latitude/Longitude</th>
<th>Water depth (m)</th>
<th>Mooring height (m)</th>
<th>No. 50lb spheres</th>
<th>Trap type and number/mooring</th>
<th>Trap depth, m (off Floor)</th>
<th>Cups/duration</th>
<th>Extra Instrs.</th>
<th>Deploy/Recover</th>
<th>Ship: dep/rec</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1983</td>
<td>LB-1</td>
<td>Lofoten Basin</td>
<td>69°30.11'N 10°00.02'E</td>
<td>3,161</td>
<td>432</td>
<td>25</td>
<td>Mark 5 (1)</td>
<td>2,761 (400)</td>
<td>12/</td>
<td>2 CH</td>
<td>8/11/83</td>
<td>Pstern/p stern</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Same mooring moved north as BI-1 in 1984.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1983</td>
<td>GB-1</td>
<td>Greenland Basin</td>
<td>74°32.31'N 06°39.82'W</td>
<td>3,417</td>
<td>2,008</td>
<td>34</td>
<td>Mark 5 (2)</td>
<td>2,817 (600)</td>
<td>12/</td>
<td>2 CH</td>
<td>8/11/83</td>
<td>Pstern/Meteor</td>
</tr>
<tr>
<td>3</td>
<td>1984</td>
<td>BI-1</td>
<td>West of Storfjord</td>
<td>75°51.35'N 11°28.01'E</td>
<td>2,123</td>
<td>473</td>
<td>25</td>
<td>Mark 5 (1)</td>
<td>1,700 (418)</td>
<td>12/</td>
<td>1 CM</td>
<td>8/12/84</td>
<td>Pstern/p stern</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Last cup closed 14:00: 8/10/85. To be moved to LB-2 in '85 w/Kiel release.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1984</td>
<td>FS-1</td>
<td>Central Fram Str.</td>
<td>78°51.9'N 01°22.0'E</td>
<td>2,527</td>
<td>2,079</td>
<td>15</td>
<td>Mark 6 (1)</td>
<td>2,442 (381)</td>
<td>13/</td>
<td>1 CM</td>
<td>8/20/84</td>
<td>Pstern/Meteor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>#13 closed 0900: 7/19/85. Transmissometer worked all year long. Redeployed in FS-2 location; app. 50 miles east.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1985</td>
<td>GB-2</td>
<td>Greenland Basin</td>
<td>74°35'N 06°43'W</td>
<td>3,445</td>
<td>2,008</td>
<td>34</td>
<td>Mark 5 (2)</td>
<td>2,823 (622)</td>
<td>25/</td>
<td>None</td>
<td>8/02/85</td>
<td>Meteor/Valdivia</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>All equipment worked.</td>
<td>14:0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>1985</td>
<td>FS-2</td>
<td>Central Fram Str.</td>
<td>79°00'N 04°55.0'E</td>
<td>2,430</td>
<td>1,862</td>
<td>32</td>
<td>Mark 6 (2)</td>
<td>1,929 (501)</td>
<td>13/</td>
<td>1 CH</td>
<td>7/29/85</td>
<td>Pstern/Valdivia</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Only 5 cups worked. Transmissometer flooded. Current record OK.</td>
<td>27:0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ID No: OCN/WHOI mooring identification number
Ship, deployment and recovery:
Pstern: R/V Polarstern, Bremerhaven
Meteor: R/V Meteor, Hamburg
Valdivia: R/V. Valdivia, Hamburg
CM: Current meter
TMH: Transmissometer
DEP: Dissolution experiment package
Figure 1. Distribution of sediment trap/current meter moorings.
Figure 2. Cruise track of R/V Polarstern, Bremerhaven, from Tromso to Alesund, Norway, August 8 to 26, 1984.
1983 - 1984

DATA

Lofoten Basin

Greenland Basin
Current Meter 713

Lofoten Basin

August 11, 1983 – August 15, 1984

60° 30'N
10° 00'E
2,650 meters

Record length: 8,856 hours

Deployed by R/V Polarstern, Bremerhaven, 08/11/83
Recovered by R/V Polarstern, Bremerhaven, 08/15/84

Deployed with Mooring LB-1, 1983-84
713G
0  #M
83-VIII-16 TO 84-11-13

LB-1, 2,650 m
EAST COMP

SPECTRAL DENSITY

(cm/s)^2 / cph

10^9

10^8

10^7

10^6

10^5

10^4

10^3

10^2

10^1

10^0

FREQUENCY

AUTO-SPECTRUM

NORTH COMP

SPECTRAL DENSITY

(cm/s)^2 / cph

10^9

10^8

10^7

10^6

10^5

10^4

10^3

10^2

10^1

10^0

FREQUENCY

AUTO-SPECTRUM

ROTARY SPECTRA

SPECTRAL DENSITY

(cm/s)^2 / cph

10^9

10^8

10^7

10^6

10^5

10^4

10^3

10^2

10^1

10^0

FREQUENCY

ROTARY SPECTRUM

CLOCKWISE IS SOLID LINE

713

83-84
Current Meter 1484

Greenland Basin

August 1, 1983 – March 12, 1984

74° 32'N
06° 40'W
945 meters

Record length: 5,126 hours

Deployed by R/V Polarstern, Bremerhaven, 08/1/83
Recovered by R/V Meteor, Hamburg, 07/30/85

Deployed with Mooring GB-1, 1983-85
Current Meter 1485

Greenland Basin

August 1, 1983 – August 22, 1984

74° 32'N
06° 40'W
1,842 meters

Record length: 9,120 hours

Deployed by R/V Polarstern, Bremerhaven, 08/1/83
Recovered by R/V Meteor, Hamburg, 07/30/85

Deployed with Mooring GB-1, 1983-85
1485°C
0  #M
83-VIII-02 TO 84-VIII-29

GB-1, 1,842 m
Current Meter 2752

Greenland Basin

August 1, 1983 - September 27, 1984

74° 32'N
06° 40'W
2,929 meters

Record length: 9,408 hours

Deployed by R/V Polarstern, Bremerhaven, 08/1/83
Recovered by R/V Meteor, Hamburg, 07/30/85

Deployed with Mooring GB-1, 1983-85
GREENLAND BASIN  CURRENT METER 2752 AT 2929 METERS

EAST

WEST

NORTH

SOUTH

CURRENT VECTORS

TEMPERATURE

AUG 1984  SEP  OCT  NOV  DEC  JAN 1985

3-FOB-87 14:30
Greenland Basin
1983 - 1984

Vector Diagram

Three-dimensional plots

August 1, 1983 - July 30, 1984

945 m, #1484
1,842 m, #1485
2,929 m, #2752
VECTOR DIAGRAM
GREENLAND BASIN, GB-1
74 32'N, 06 40'W

AUGUST, 1983 - AUGUST 1984

Anchor depth: 3,417 m
1984 - 1985

DATA

Fram Strait

Greenland Basin
Current Meter 2814

Fram Strait

August 20, 1984 – August 10, 1985

78° 52'N
01° 22'E

2,476 meters

Record length: 8,520 hours

Deployed by R/V Polarstern, Bremerhaven, 08/20/84
Recovered by R/V Meteor, Hamburg, 08/10/85

Deployed with Mooring FS-1, 1984-85
1985 - 1986

DATA

Fram Strait
Current Meter 2814

Fram Strait

78° 52'N
01° 22'E
2,476 meters

Record length: 8,686 hours

Deployed by R/V Polarstern, Bremerhaven
Recovered by R/V Valdivia, Hamburg

Deployed with Mooring FS-2, 1985-86
Current Meter 1484

Greenland Basin

August 1, 1985 - March 20, 1986

74° 35' N
06° 43' W
980 meters

Record length: (partial)

Deployed by R/V Meteor, Hamburg, 08/02/85
Recovered by R/V Valdivia, Hamberg, 08/23/86

Deployed with Mooring GB-2, 1985-86
Current Meter 1485

Greenland Basin

August 1, 1985 - August 20, 1986

74° 35'N

06° 43'W

1,857 meters

Record length: 8,688

Deployed by R/V Meteor, Hamburg, 08/02/85

Recovered by R/V Valdivia, Hamburg, 08/23/86

 Deployed with Mooring GB-2, 1985-86
Current Meter 2752

Greenland Basin

August 1, 1985 - April 19, 1986

74° 35'N
06° 43'W
2,923 meters

Record length: 6,264

Deployed by R/V Meteor, Hamburg, 08/02/85
Recovered by R/V Valdivia, Hamburg, 08/23/86

Deployed with Mooring GB-2, 1985-86
2752G
85-VIII-01 TO 86-IV-27

GB-2, 2,923 m
Current Meter 1484
and
Current Meter 1485

Greenland Basin
August 1, 1985 – April 16, 1986

74° 35'N
06° 43'W

Conductivity Measurements

Deployed by R/V Meteor, Hamburg, 08/02/85
Recovered by R/V Valdivia, Hamburg, 08/23/86

Deployed with Mooring GB-2, 1985-86
Greenland Basin

1985 – 1986

Vector Diagram

Three-dimensional plots

August 1, 1985 – August 20, 1986

(960 m, #1484)
1,857 m, #1485
2,923 m, #2752
VECTOR DIAGRAM
GREENLAND BASIN, GB-2

74 35' N, 06 43' W

AUGUST, 1985 - AUGUST 1986

Anchor depth: 3,445 m

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   Woods Hole, Massachusetts 02543

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