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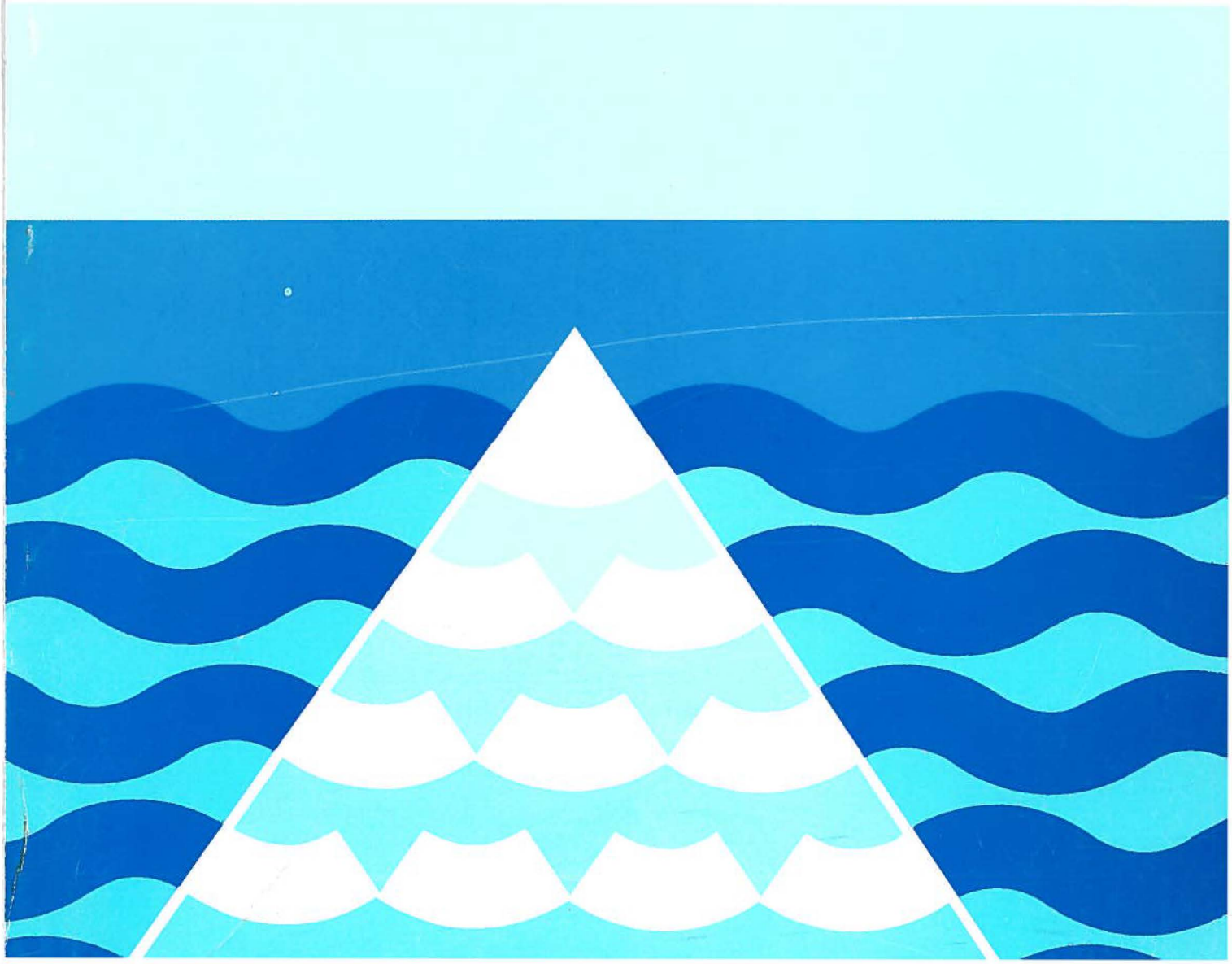
CURRENT MEASUREMENTS SOUTHEAST OF SENTRALBANKEN IN THE BARENTS SEA



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Title

CURRENT MEASUREMENTS SOUTHEAST OF SENTRALBANKEN IN THE BARENTS SEA.

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Project no. ***OKN agreement C 89247***	Responsible ***Harald Loeng***

Summary

This report presents the results from current measurements carried out southeast of Sentralbanken (Central Bank) in the Barents Sea during the period 25.08 - 29.10.1989.

Key words

Current conditions

Aanderaa RCM instruments

ADCP measurements

Barents Sea

INTRODUCTION

It is of general interest to acquire better knowledge of the current conditions in the whole Barents Sea. During the last 10 years a great deal of measurements have been carried out in the western part of the Barents Sea, both with recording current meters from permanent moorings and with drifting Argos-buoys. In the eastern Barents Sea, however, there is almost no data from current measurements available.

Sentralbanken (Central Bank) is an interesting area in several contexts. Existing current maps indicate a southward flow of cold water in this area (Fig. 1). Some of this water is fed into the anti-cyclonic circulation around the bank, while some of it is carried to the south. It is assumed that this southward flow influences the distribution of sea ice during winter. Sentralbanken is also an interesting area for formation of dense bottom water in the Barents Sea. The dense water is formed during winter when ice is formed and brine is rejected. The cold dense water is flowing to the deeper areas around the bank.

With financial support from OKN under agreement C 89247, the Institute of Marine Research carried out current measurements south-east of Sentralbanken during autumn 1989. The objective of the project was to increase the understanding of the current system in the eastern part of the Barents Sea, through collection of current velocity, temperature and salinity from deployed current meters. The flow pattern in these parts of the Barents Sea is important for the current regime and ice conditions of areas opened for oil and gas exploration.

OBSERVATION PROGRAM

The current meter moorings were deployed from R/V "G.O. Sars" during a survey lasting from 21 August to 11 September 1989. During the same period, observations of temperature, salinity and the density fields were carried out in the entire Barents Sea by three research vessels from the Institute of Marine Research. All moorings were recovered during an other survey lasting from 23 October to 1 November 1989, also with R/V "G.O. Sars". During this survey, hydrographical observations were carried out only along the actual sections with Neil Brown CTD-system. Current observations by ADCP (Acoustic Doppler Current Profiler) were also carried out by R/V "G.O. Sars" during both surveys. The ADCP gives the mean velocity in depth layers which are 8 m thick. The current measurements are averaged over 10 minutes (about 430 samples) and the tidal current is included.

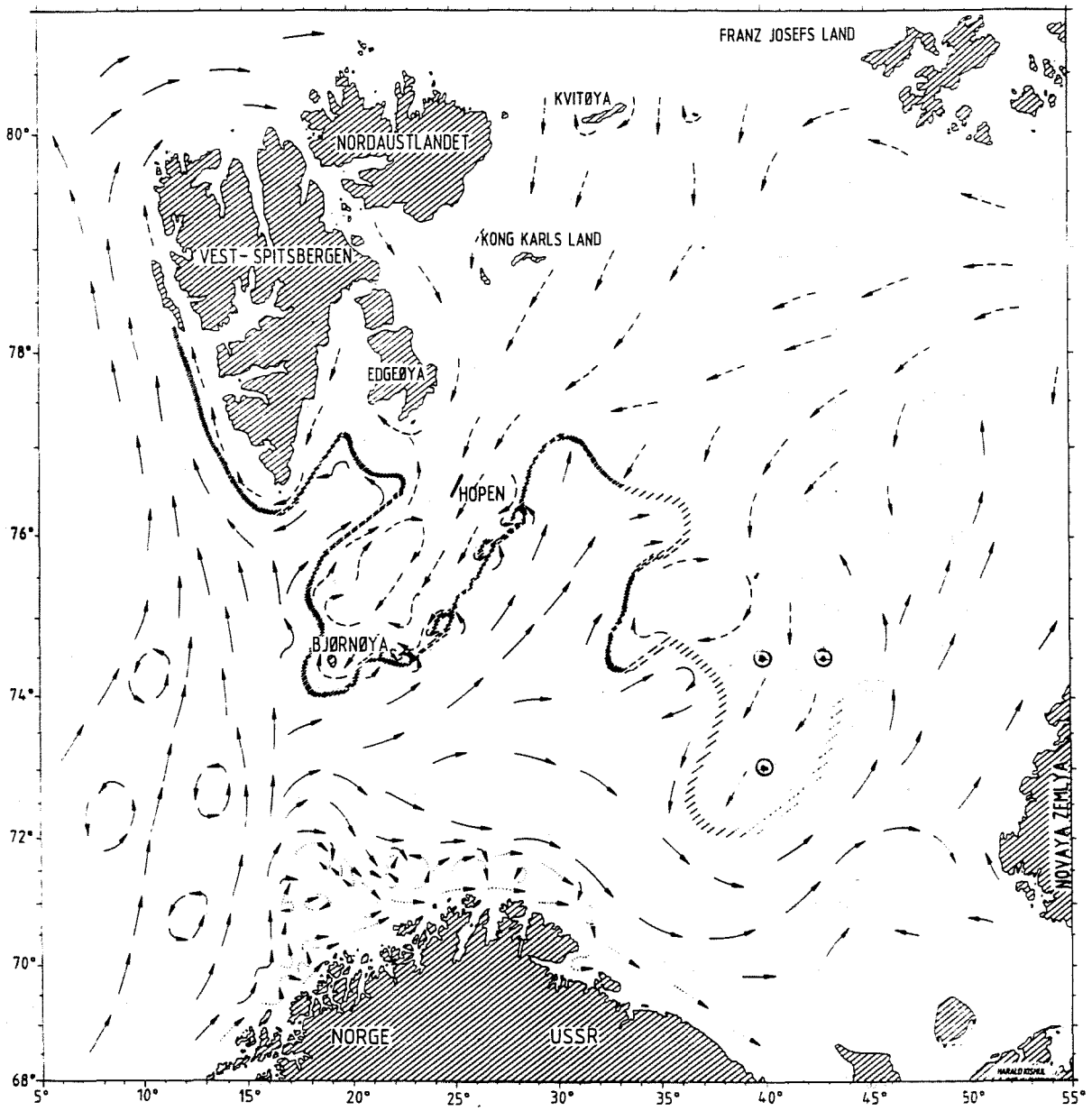

Fig. 1. Surface currents in the Barents Sea (Loeng, 1989). The position of the three moorings are indicated by ⊙.

Information on location of the moorings and dates for deployment and recovery, are given in Table 1, while Table 2 gives information on measurement depth and measuring period. The position of the moorings in relation to the assumed currents and the bottom topography is indicated in Figs. 1 and 2.

The measurement sites and three depths were suggested by OKN. In addition to the nine current meters agreed upon, the Institute of Marine Research placed a current meter 10 m above bottom at each of the two deepest locations, mooring 1 and 3 (Table 2).

Table 1. The position of the moorings and data for when the moorings were deployed and recovered.

Mooring	Position	Bottom depth	No. of current meters	Instruments deployed	Instruments recovered
1	N 73°04.80' E 40°00.90'	315 m	4	25.08.89	28.10.89
2	N 74°30.00' E 39°59.00'	186 m	3	26.08.89	29.10.89
3	N 74°29.80' E 43°00.60'	285 m	4	26.08.89	29.10.89

Table 2. Type of instrument and measuring period in each depth at the different moorings.

Mooring	Instrument no.	Instrument type	Instrument depth (m)	Measuring period Start	End	Number of days
1	1	RCM-7	25	25.08.89	21.10.89	56
	2	RCM-7	50	25.08.89	17.10.89	52
	3	RCM-7	150	25.08.89	07.10.89	42
	4	RCM-4	305	25.08.89	28.10.89	63
2	1	RCM-7	20	26.08.89	21.10.89	56
	2	RCM-7	45	26.08.89	10.10.89	45
	3	RCM-7	150	26.08.89	26.09.89	31
3	1	RCM-7	20	26.08.89	24.10.89	59
	2	RCM-7	45	26.08.89	07.10.89	42
	3	RCM-7	100	26.08.89	03.10.89	38
	4	RCM-4	275	26.08.89	29.10.89	63

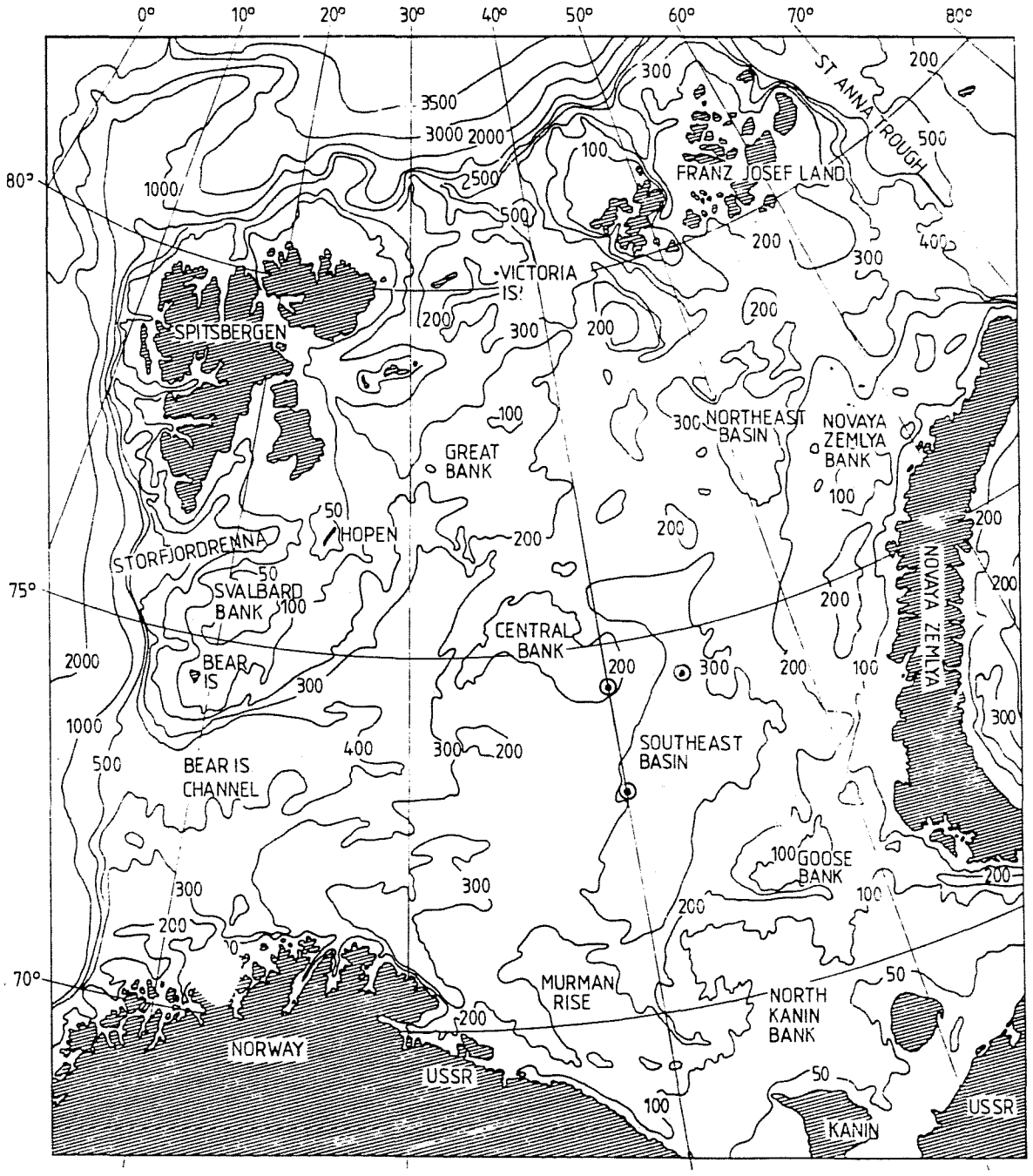

Fig. 2. Bathymetry of the Barents Sea with depth in metres (Loeng, 1989). The position of the moorings are indicated by ⊙.

INSTRUMENTATION AND MOORING SYSTEM

Current meters of type RCM-4 and RCM-7 from Aanderaa Instruments were used. Description and specification of the instruments are given by Aanderaa Instruments (1978, 1987). The parameters observed by each instrument are given in Table 3. The sampling interval for all instruments were 10 min.

Table 3. Parameters observed by the different current meters.

Mooring	Instrument type	Instrument depth (m)	Speed	Direc-tion	Tempera-ture	Sali-nity	Pres-sure
1	RCM-7	25	x	x	x	x	x
	RCM-7	50	x	x	x	x	
	RCM-7	150	x	x	x	x	
	RCM-4	305	x	x	x		
2	RCM-7	20	x	x	x	x	x
	RCM-7	45	x	x	x	x	
	RCM-7	150	x	x	x	x	
3	RCM-7	20	x	x	x	x	x
	RCM-7	45	x	x	x	x	
	RCM-7	150	x	x	x	x	
	RCM-4	275	x	x	x		x

As seen from Table 2, none of the new RCM-7 current meters worked for the entire period due to battery failure. All the current meters were delivered from the factory with new Lithium batteries. The capasity of that specific type of batteries used, however, showed up to be too small to give sufficient power through the whole measurement period. In particular, the colder water masses surrounding the current meter, caused a shorter measurement period.

The mooring system is shown in Fig. 3. The anchor weight was 600 kg and the net buoyancy of the subsurface buoy was about 300 kg. 14 mm rope of type Karat was used in the mooring. A small trawl float was connected to the subsurface buoy by a 15 m long rope. In order to release the mooring from the anchor weight at recovery, an acoustic release from OCEANO was used.

The depth of the current meters are given in Tables 2 and 3. The depth of the upper current meter does not always coincide with the results from the pressure sensor. At mooring 1, the pressure sensor showed the right depth during the first week, then it increased to show about 30 m during the rest of the measuring period. There was also a lot of noise in the results, indicating something wrong with the sensor.

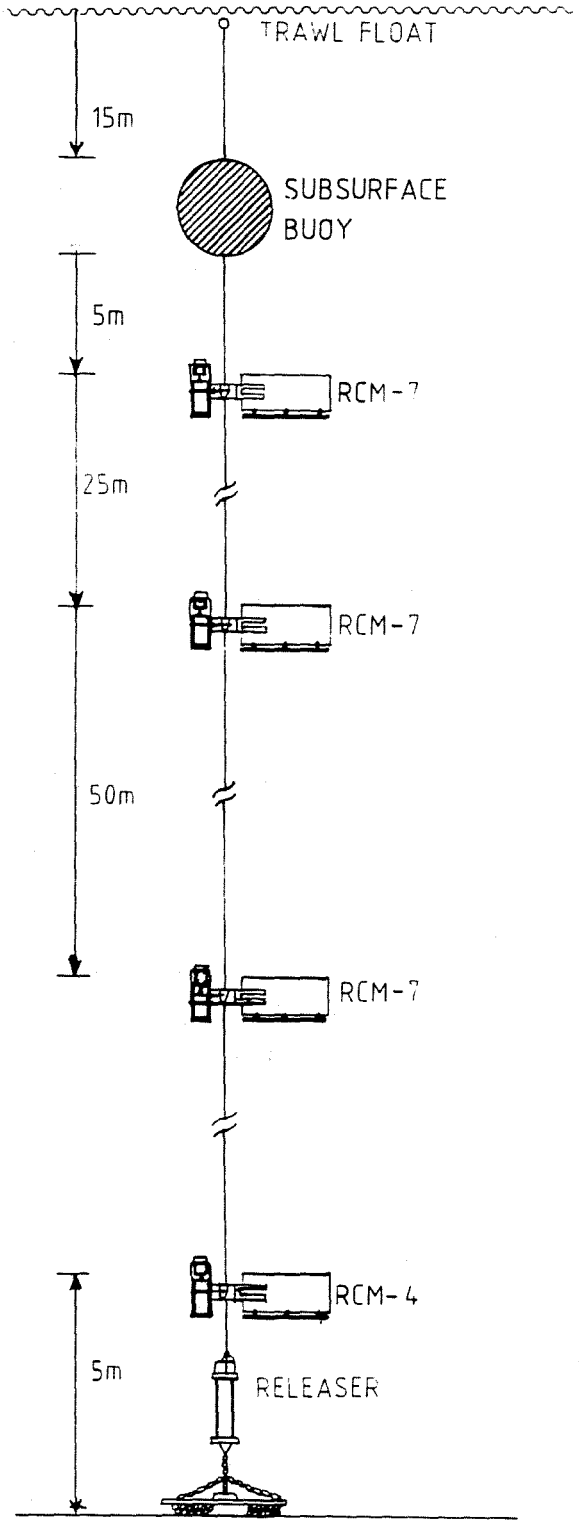

Fig. 3. The mooring system.

At mooring 2, the pressure sensor showed a constant depth of 10-11 m during the whole period. According to the position of the trawl float in the water (Fig. 3), the depth of the upper current meter must have been close to 20 m. At the third mooring, the pressure sensor showed a depth of 18-19 m which was in good accordance with the position of the trawl float in the water.

PRESENTATION OF RESULTS

The Aanderaa RCM current meter data are treated as described by Sagen (1990), and the results are presented in appendices B-D. The figures have got number after the following system:

Fig. M - N - x

where

- M - the mooring number (see Table 1)
- N - the instrument number on each mooring (see Table 2)
- x - the figure number for each instrument. Each number represents one specific type of data presentation (see below).

The data analysis resulted in the following types of presentations:

1) Current velocity distribution presented as current roses for
   - the maximum velocity in each sector (15^0)
   - the mean velocity in each sector
   - the relative flux in each sector
   - the number of observations in each sector.

2) Histogram showing
   - the number of observations in each sector
   - the distribution of current speed in each interval.

3) Velocity distribution diagram showing the scattering of observations.

4) Joint frequency distributions of measured current velocity vs. direction.

5) Progressive vector diagram which gives an indication of the movement of the water masses.

6) Time series of N-S and E-W components of current velocity.

7) Time series of current speed and direction.

8) Time series of temperature, salinity and pressure.

9) Harmonic analysis of currents. The table shows all tidal components with major axis of tidal ellipses greater than 1 cm s^{-1}. Total 36 tidal components are included in the analysis.

10) Tidal current ellipses for M2 and K1.

Some results from the ADCP-measurements are presented in appendix A. In addition some hydrographical observations are presented in the text part of the report, and related to the current conditions.

RESULTS

Hydrographical conditions

The horizontal distribution of temperature and salinity at 50 m, 100 m and bottom in late August and early September 1989 are shown in Figs. 4-6. In general, the temperature was high in the south-western part of the Barents Sea, and especially along the Norwegian and Murman coast. In central areas (along 30°E) the temperature was the highest observed since late 1950's, while further east (about 40°E) the temperature conditions were close to the long term mean (ANON. 1989).

The position of the current moorings in relation to the water masses is indicated in Fig. 4. The choice of position seems to be fairly good in relation to the aim of the project: to measure current in the cold tongue of water south of Sentralbanken.

Figs 7 and 8 show the hydrographic conditions in a south-north section through mooring 1 and 2, while Figs. 9 and 10 show the east-west section through moorings 2 and 3. The uppermost current meters were all placed in the surface layer while the current meters at 50 m (45 m) were situated in the rather sharp transition layer between the surface water and cooled Barents Sea water. The current meters at 150 m and 10 m above bottom were all situated in water masses with temperature below 0°C at the time of deployment and recovery.

The temperature observations from the current meters seem to be in good accordance with the CTD-observations. The time development of the temperature conditions given in Fig. M-N-8 are therefore probably correct (M and N explained on page 7). The salinity values from the current meters differ a little from the CTD-observation, but the time development is correct.

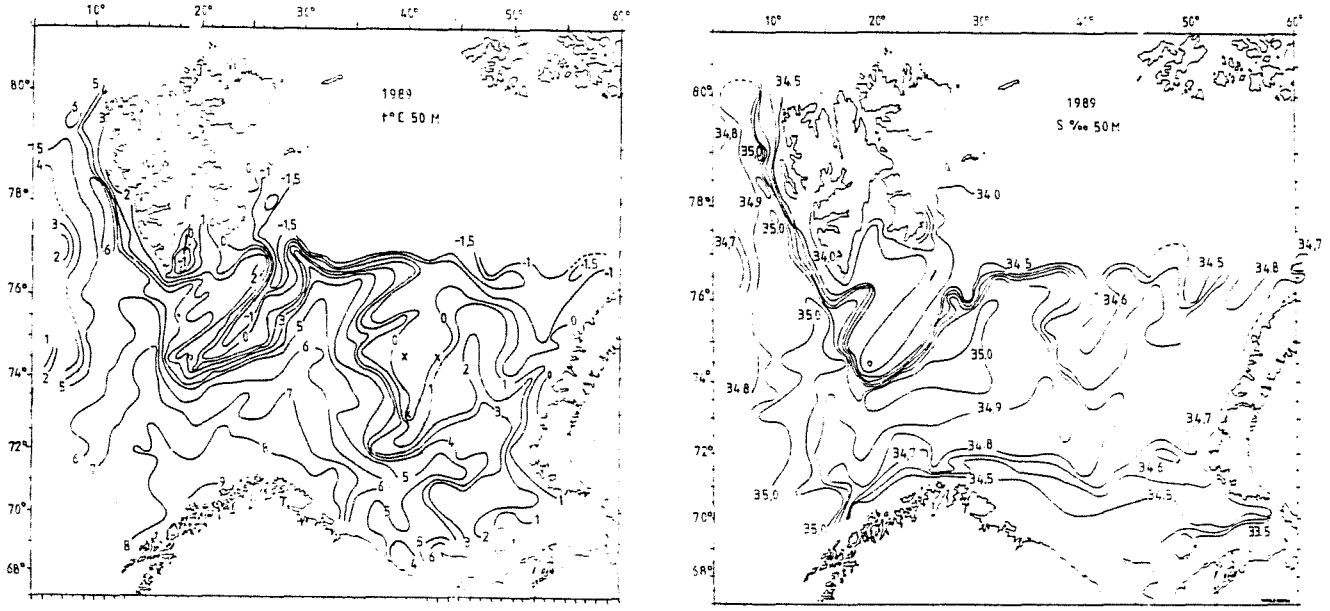

Fig. 4. Horizontal temperature (left) and salinity conditions at 50 m in late August - early September 1989. The positions of the moorings are indicated by X at the temperature map.

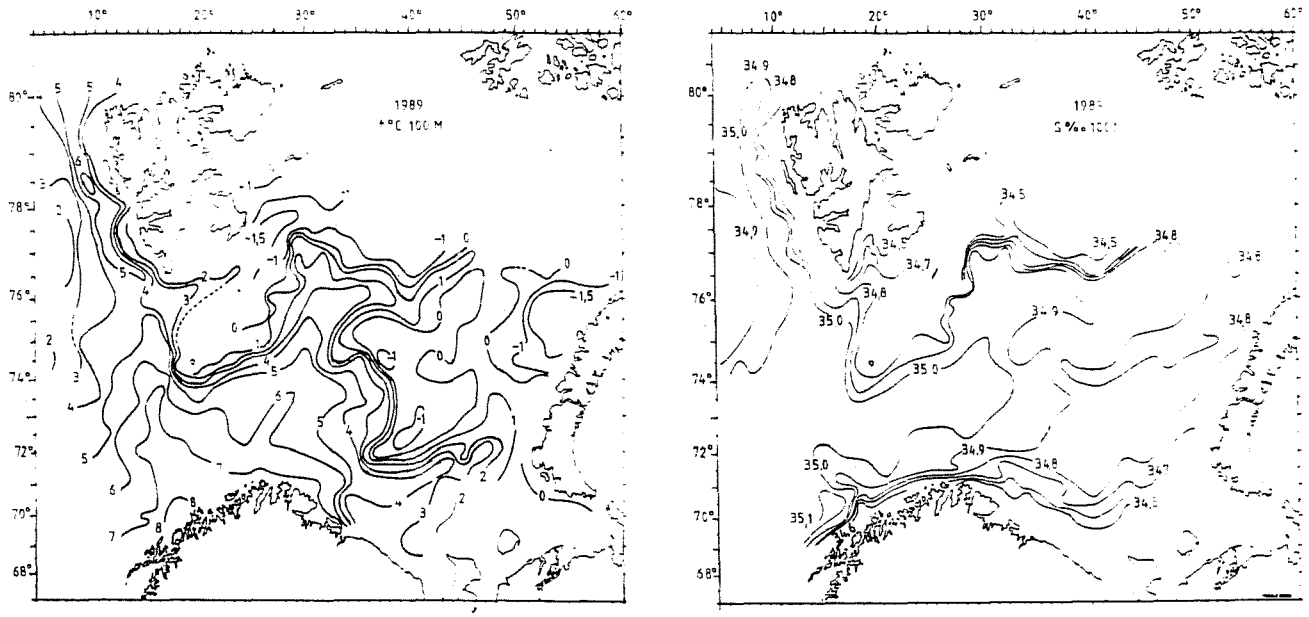

Fig. 5. Horizontal temperature (left) and salinity conditions at 100 m in late August - early September 1989.

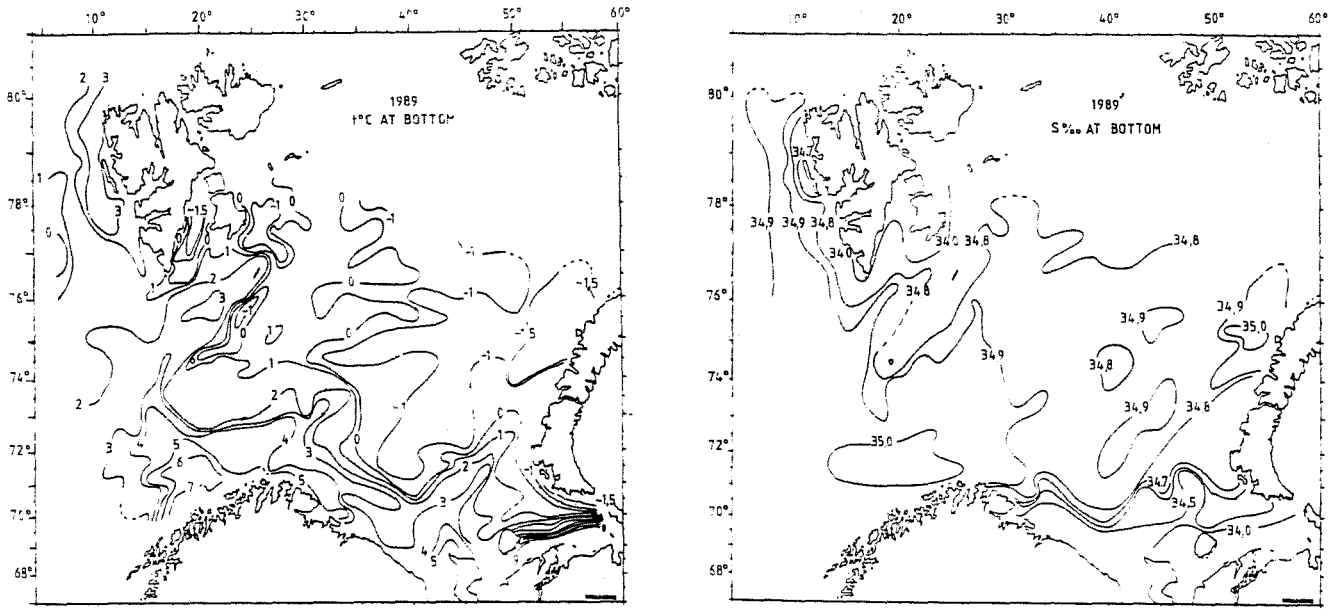

Fig. 6. Horizontal temperature (left) and salinity conditions at the bottom in late August - early September 1989.

ADCP - measurements

Some results from the ADCP-measurements are presented in appendix A. The figures show the total current, including the tidal component.

Figs. A1 and A2 show the current conditions at 50 m depth during the two surveys from 21 August to 11 September and from 23 October to 1 November 1989. The results show that all the three moorings with Aanderaa current meters were placed within an area with low current velocity. During both surveys, the area southwest of Sentralbanken had the lowest velocities observed along the course tracks.

Figs. A3 - A6 show the current velocity at six different depths along the hydrographic sections presented in Figs. 7 - 10. Typical features of the recordings are:

- almost all velocity observations were lower than 20 cm s-1, which is in good accordance with the results from the Aanderaa current meters.

- the direction of the current was almost the same at all depth layers.

- the velocity seems to decrease a little with depth.

Aanderaa current meter data

The current conditions at all depths and all sites were dominated by the tidal current. The residual current was usually low and was, with a couple of exceptions, of low directional stability. There are two

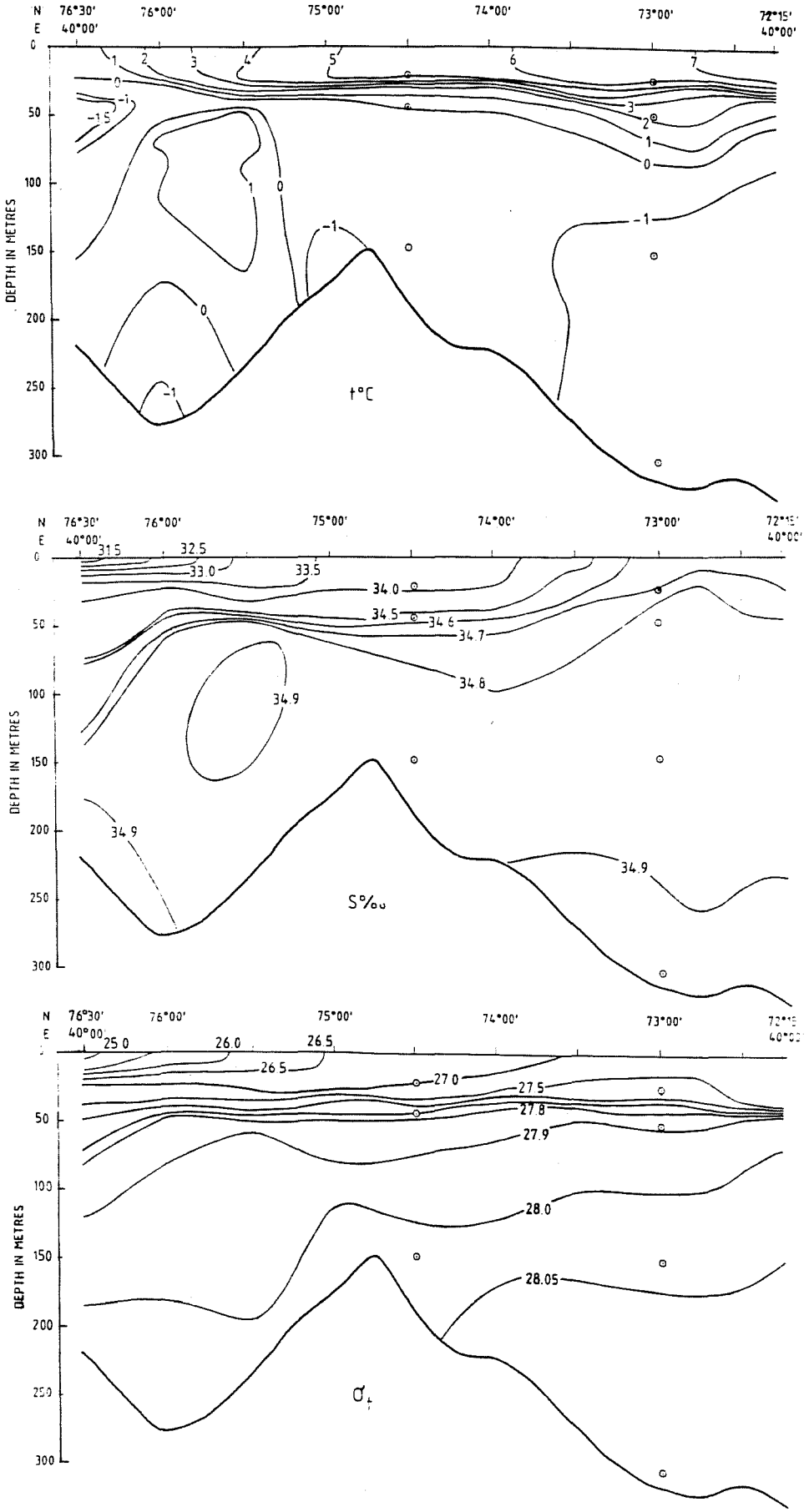

Fig. 7. Vertical distribution of temperature, salinity and σ_t along a section through moorings 1 and 2 at the time of deployment. The position of the current meters are indicated by ⊙.

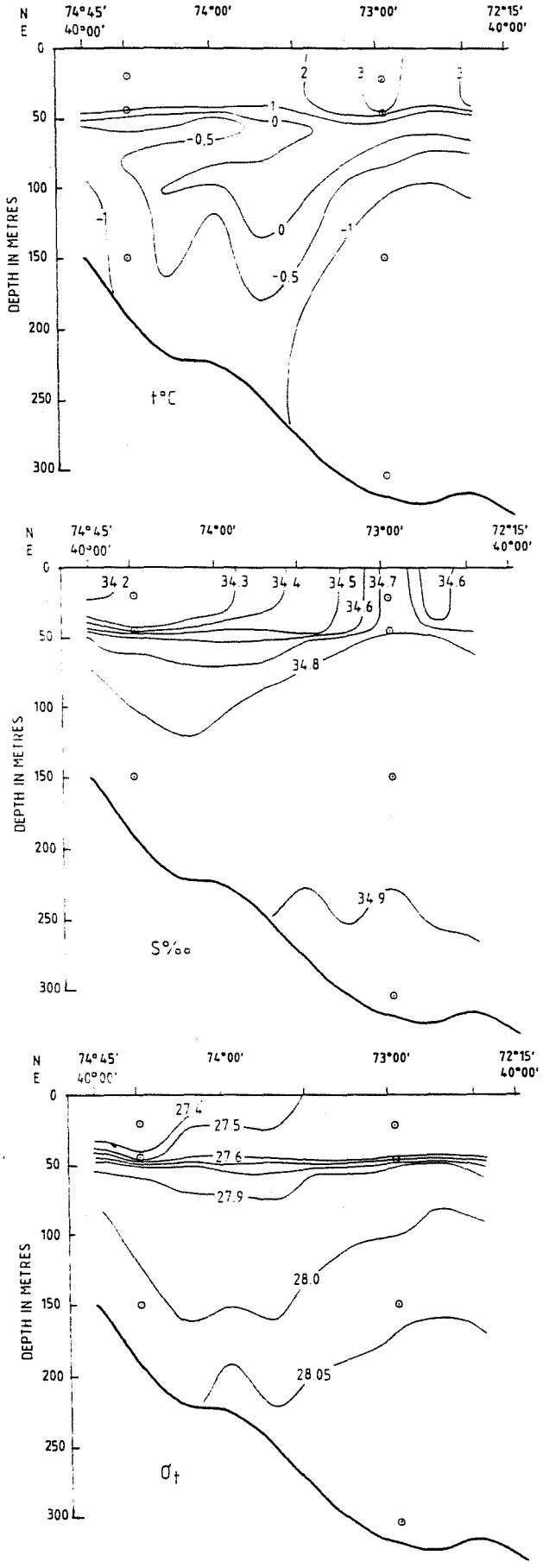

Fig. 8. Vertical distribution of temperature, salinity and σ_t along a section through moorings 1 and 2 at the time of recovery. The position of the current meters are indicated by ⊙.

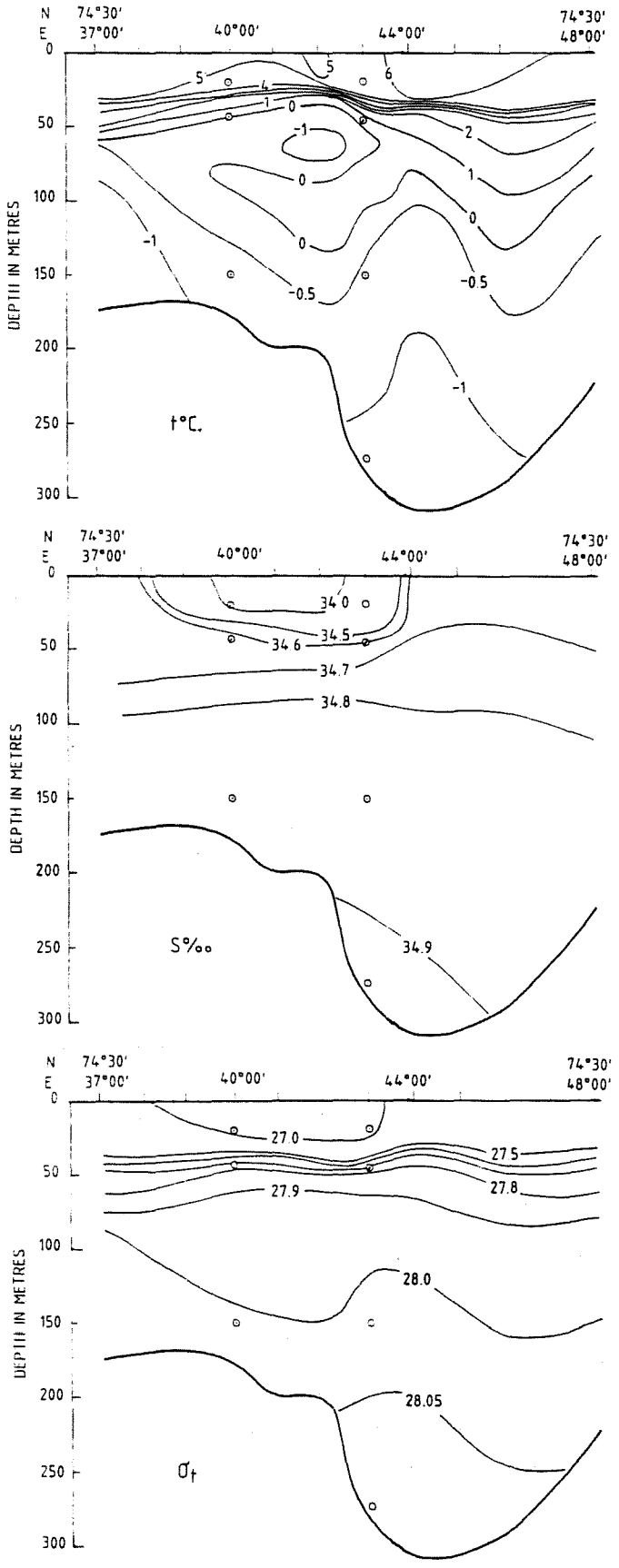

Fig. 9. Vertical distribution of temperature, salinity and σ_t along a section through moorings 2 and 3 at the time of deployment. The position of the current meters are indicated by ⊙.

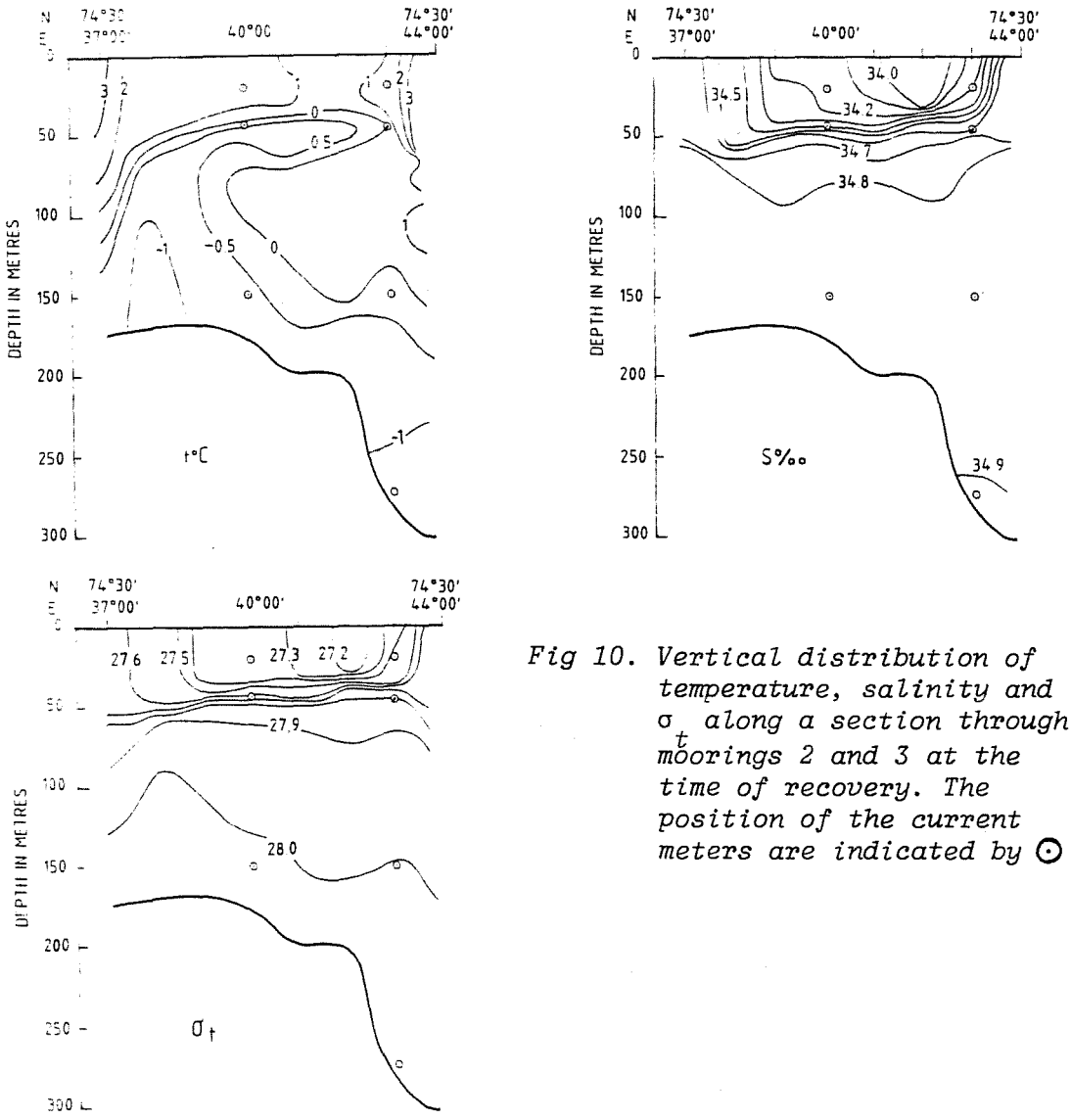

Fig 10. Vertical distribution of temperature, salinity and σ_t along a section through moorings 2 and 3 at the time of recovery. The position of the current meters are indicated by ⊙.

periods where higher current speed were observed by almost all current meters. Those periods were in the midle of September and beginning of October. This is mainly due to spring tidal current corresponding to the moon phase, as it was full moon the 15 September and new moon 29 September. The last one was strengthened by the autumnal equinox.

The uppermost current meter at all moorings was situated in the surface water, while the next one (45-50 m) was situated in the transition layer. This is clearly demonstrated in the temperature and salinity records (Figs M-N-8), which all show a large variability in time. The current meters at 150 m show the conditions in the Barents Sea water, while the two current meters 10 m above bottom show the conditions in the basin water.

An other common feature, was the small change in current direction down to 150 m, which is a typical feature for the Barents Sea where current measurement has been carried out. (Blindheim and Loeng, 1978; Loeng, 1979; Johansen,Mathisen and Steinbakke,1988) The basin water,

however, may have other features. Typical during the measuring period was the changing in direction, in periods of 2-4 days (Figs 1-4-6 and 3-4-6). It indicates oscillations forth and back in the basin.

Special features

Mooring 1

Depth: 25 m.

97% of speed observations below 16 cm s^{-1}
Maximum speed: 24 cm s^{-1}
Mean speed: 8.2 cm s^{-1}
Mean velocity: 1.3 cm s^{-1} in direction south-southeast
In periods up to one week, the residual current was rather stable towards south.

Depth: 50 m.

96% of speed observations below 12 cm s^{-1}
Maximum speed: 24 cm s^{-1}
Mean speed: 7.0 cm s^{-1}
Mean velocity: 1.2 cm s^{-1} in direction south-southeast
In long periods, the residual current was towards south.

Depth: 150 m

97% of speed observation below 8 cm s^{-1}
Maximum speed: 15 cm s^{-1}
Mean speed: 4.1 cm s^{-1}
Mean velocity: 0.5 cm s^{-1} in direction east.
Very variable residual current.

Depth: 305 m

96% of speed observations below 12 cm s^{-1}
Maximum speed: 18 cm s^{-1}
Mean speed: 6.1 cm s^{-1}
Mean velocity: 1.2 cm s^{-1} in direction south-southeast.
Variable residual current up to 13 October, thereafter permanent southward current.

Mooring 2

Depth: 20 m

97% of observations below 25 cm s^{-1}
Maximum speed: 45 cm s^{-1}
Mean speed: 12.2 cm s^{-1}
Mean velocity: 0.7 cm s^{-1} in direction south-southwest.
Very variable residual current.

Depth: 45 m

97% of observations below 20 cm s^{-1}
Maximum speed: 40 cm s^{-1}
Mean speed: 8.9 cm s^{-1}
Mean velocity: 0.8 cm s^{-1} in direction southwest.
Very variable residual current.

Depth: 150 m

96% of observations below 14 cm s^{-1}
Maximum speed: 22 cm s^{-1}
Mean speed: 5.8 cm s^{-1}
Mean velocity: 2 cm s^{-1} in direction west-southwest.
Rather stable residual current.

Mooring 3

Depth: 20 m

97% of speed observations below 24 cm s^{-1}
Maximum speed: 35 cm s^{-1}
Mean speed: 11.4 cm s^{-1}
Mean velocity: 3 cm s^{-1} in direction south-southwest.
Stable residual current during most of the period.

Depth: 45 m

97% of speed observations below 12 cm s^{-1}
Maximum speed: 24 cm s^{-1}
Mean speed: 6.5 cm s^{-1}
Mean velocity: 1.2 cm s^{-1} in direction southwest.
In long periods stable residual current, but in short periods the residual current goes in the opposite direction, northeastwards.

Depth: 150 m

97% of speed observations below 11 cm s^{-1}
Maximum speed: 18 cm s^{-1}
Mean speed: 4.3 cm s^{-1}
Mean velocity: 0.1 cm s^{-1} in direction southwest.
The residual current changed beween periods towards southwest and northeast.

Depth: 275 m

97 % of speed observations below 16 cm s^{-1}
Maximum speed: 24 cm s^{-1}
Mean speed: 6.1 cm s^{-1}
Mean velocity: 2 cm s^{-1} in direction north.
In shorter periods, the residual current was towards south.

CONCLUSION

The observations from the ADCP indicated that the moorings were situated in an area with general low current velocity. The current conditions were dominated by the tidal current. The residual current was usually weak (<5 cm s^{-1}), but in shorter periods it could exceed 10 cm s^{-1}. In the surface layer the main direction of the current was towards the south, and in rather good agreement with the existing current map for the surface layer (Fig. 1). Down to 200 m the main direction was the same as in the surface layer. Close to the bottom, in the basin water, the direction changes. At mooring 1 the residual current was mainly towards the south while at mooring 3 it was towards the north. A common feature, was the oscilations of the basin water within periods of 2-4 days.

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Appendix A

ADCP OBSERVATIONS

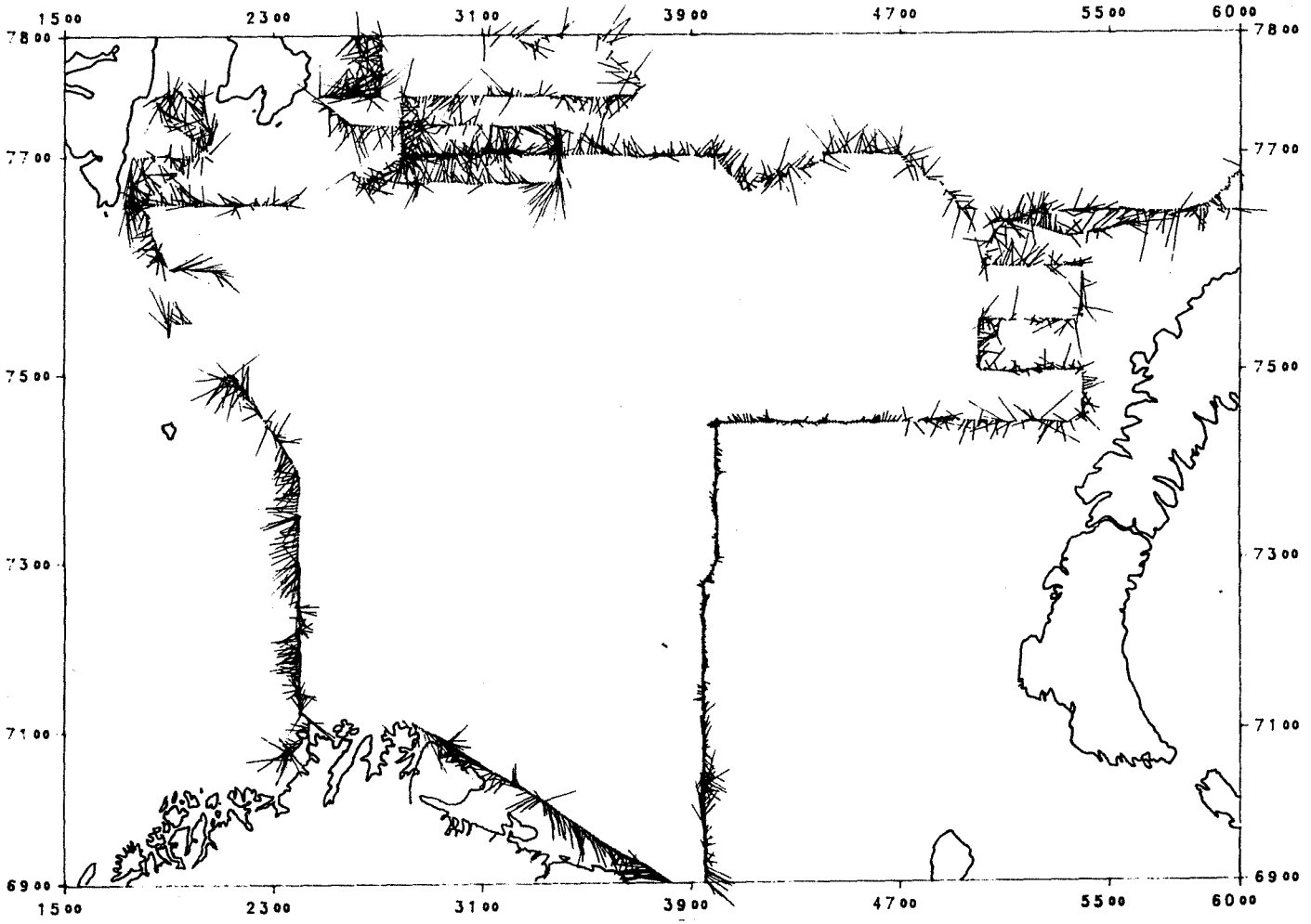


Fig. A1 Current conditions at 50 m, measured with ADCP, during the survey with R/V "G.O.Sars" from 21 August to 11 September 1989.

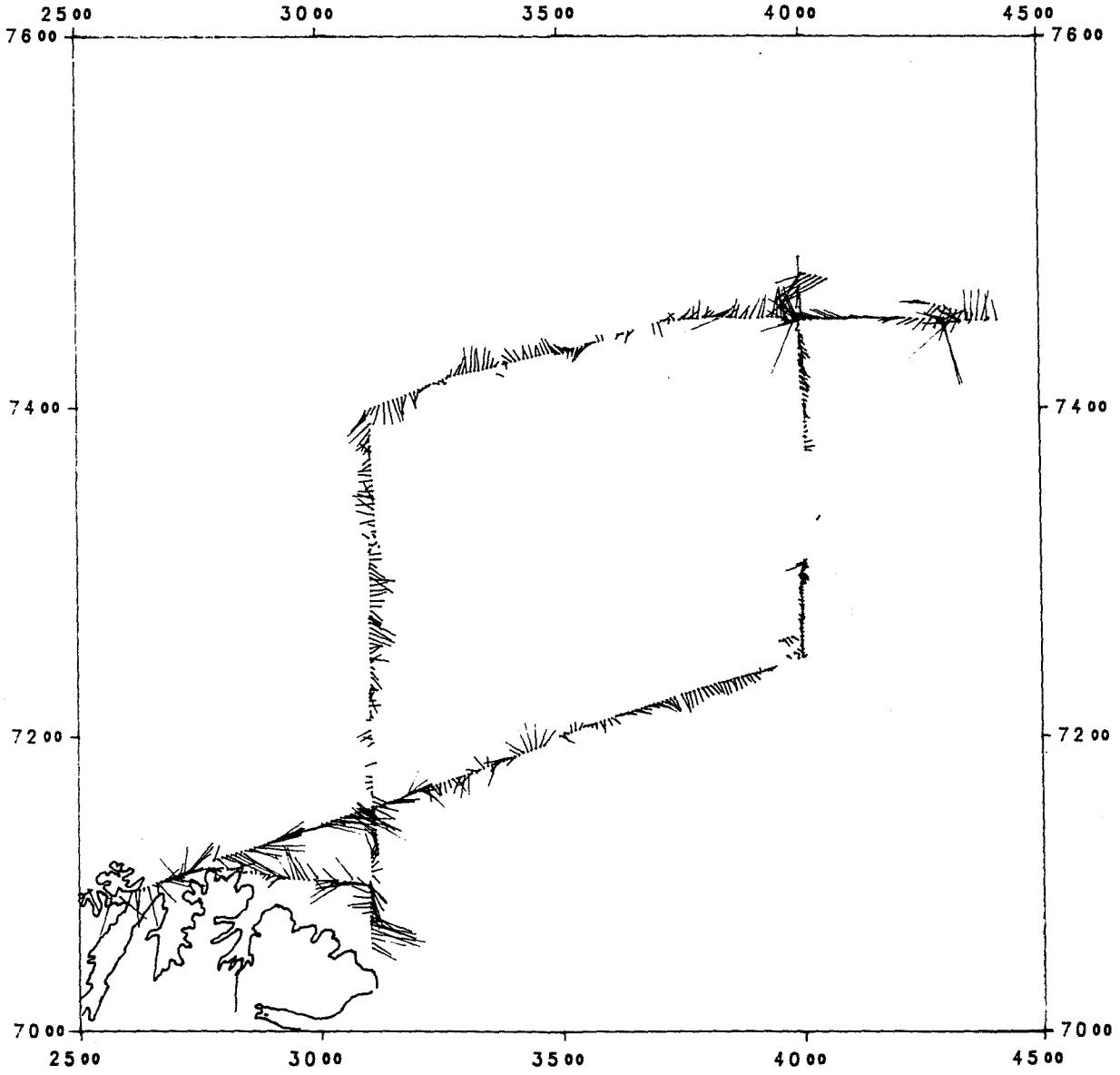


Fig. A2 Current conditions at 50 m, measured with ADCP, during the survey with R/V "G.O.Sars" from 23 October to 1 November 1989.

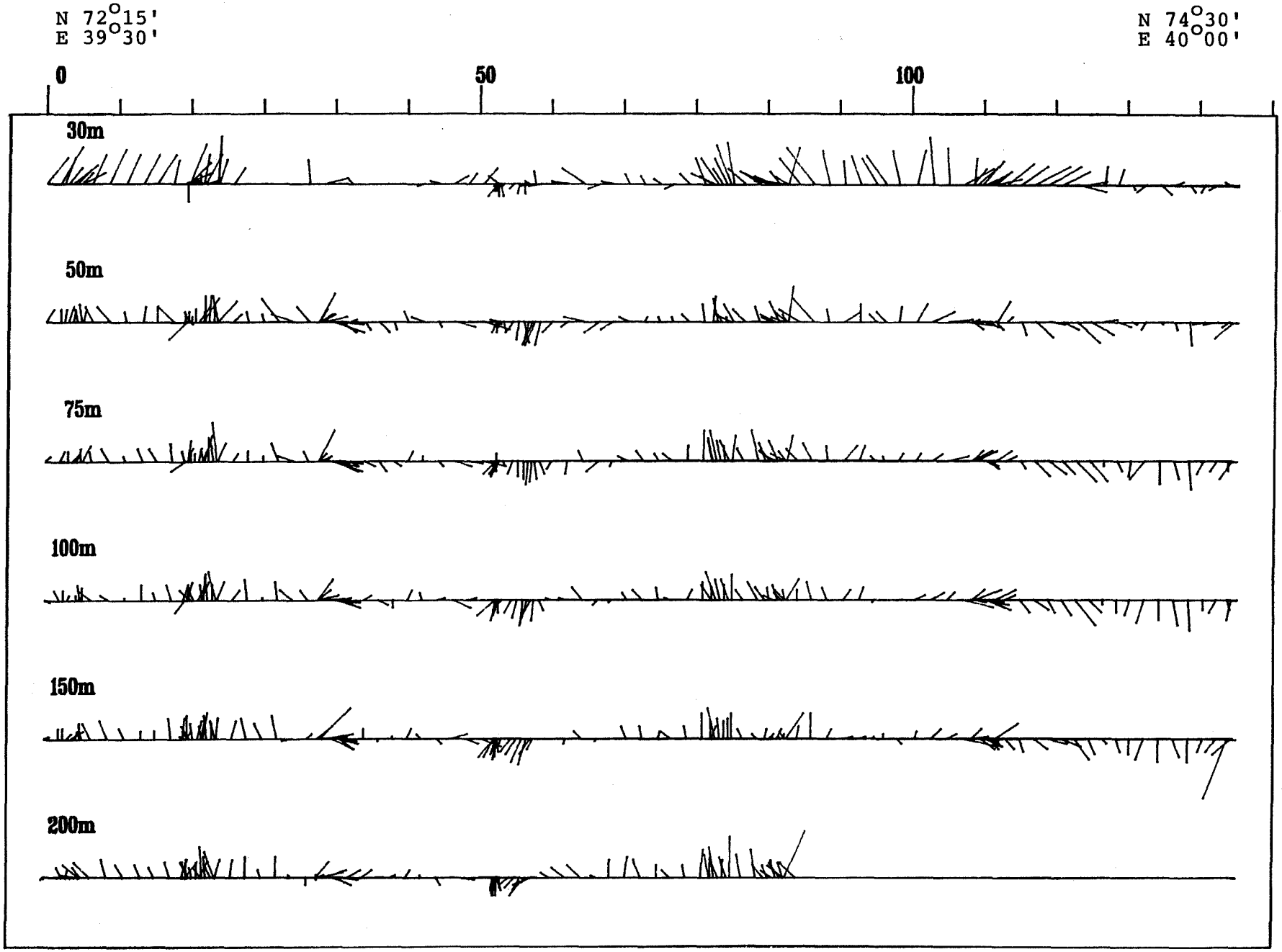


Fig. A3 ADCP observation at six depths along E40°00′ 25-26 August 1989. ⊢—⊣ = 20 cm/s

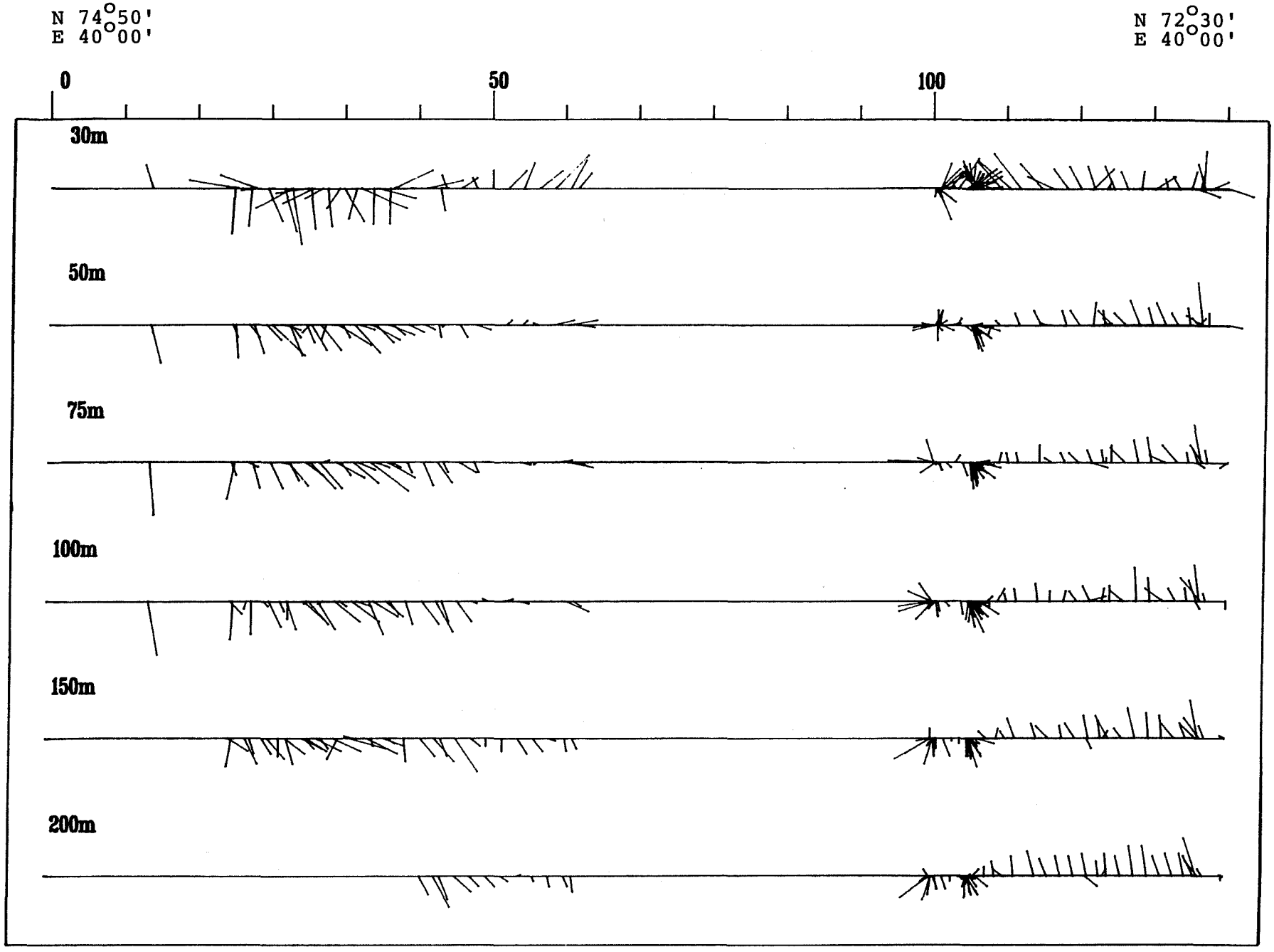


Fig. A4 ADCP observation at six depths along E40°00′ 27-28 October 1989. ⊢—⊣ = 20 cm/s

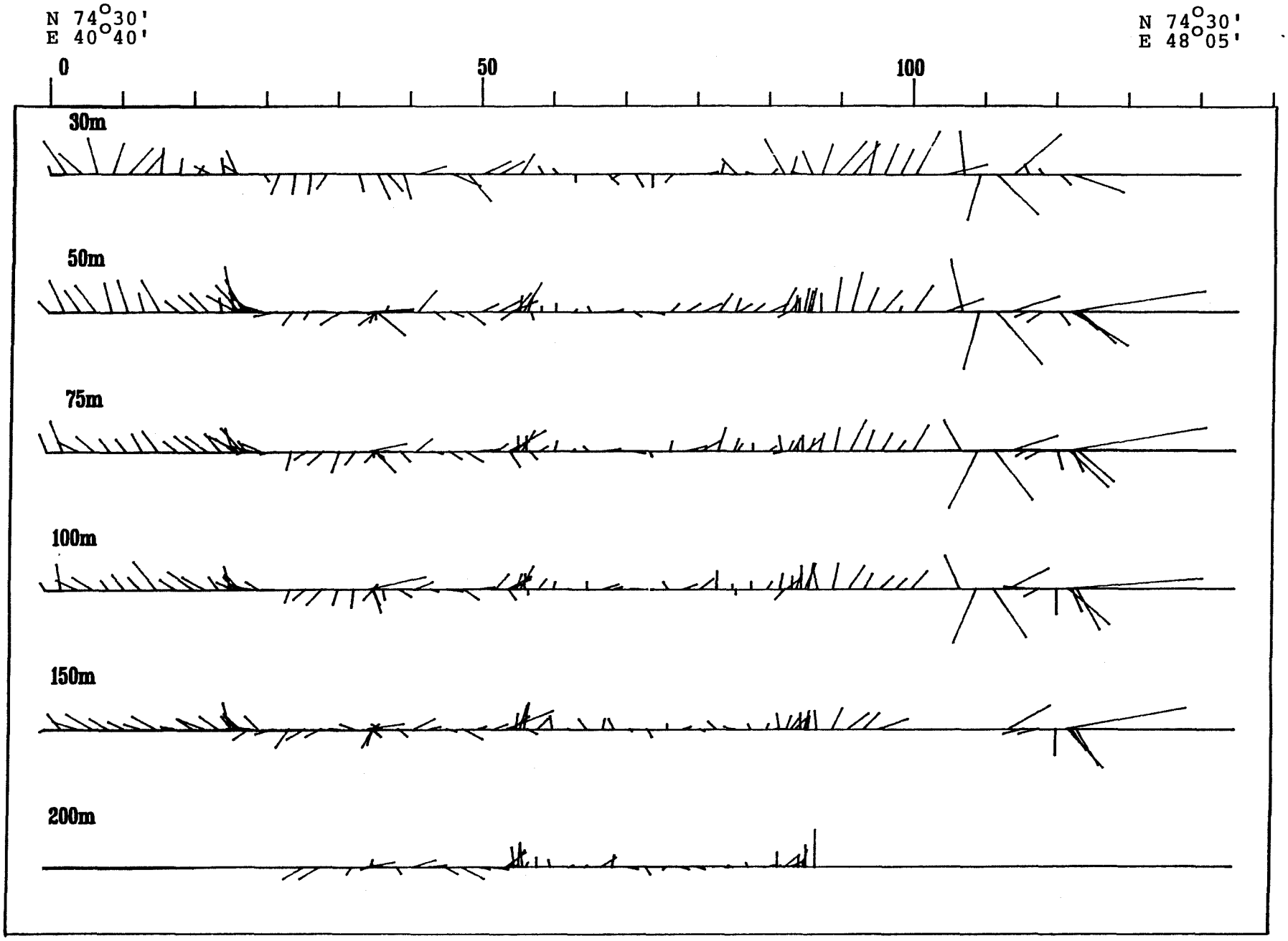


Fig. A5 ADCP observation at six depths along N74°30′ 26 August 1989. ⊢—⊣ = 20 cm/s

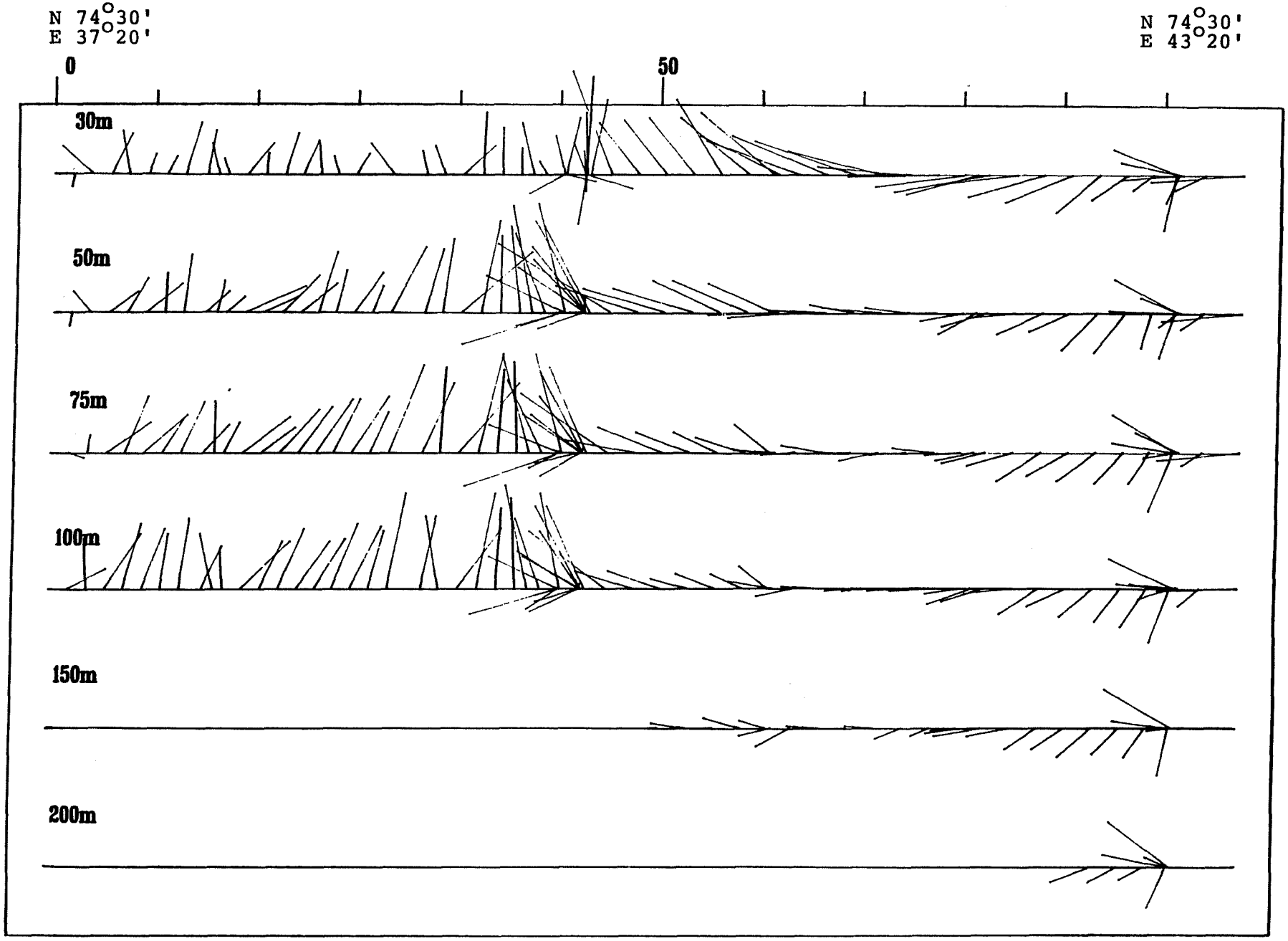


Fig. A6 ADCP observation at six depths along N74°30′ 29 October 1989. ⊢—⊣ = 20 cm/s

Appendix B

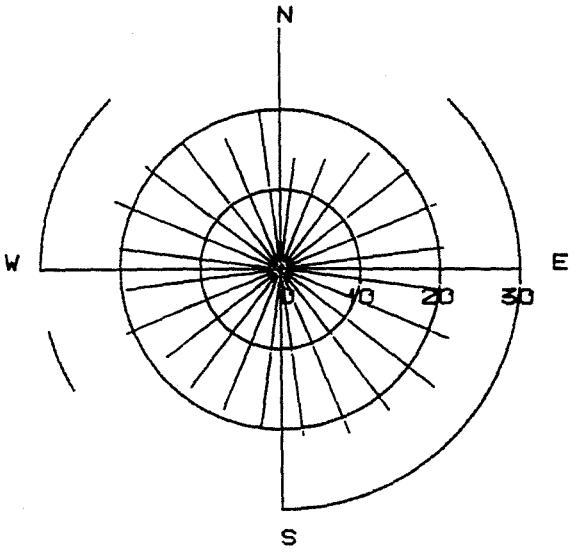
AANDERAA RCM CURRENT DATA

Mooring : 1

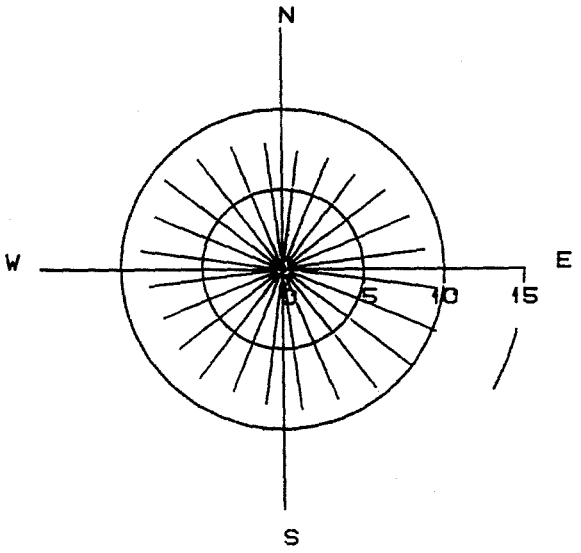
Position : N 73° 04.81' E 40° 00.86'

Instrument depths : 25, 50, 150 and 305 m.

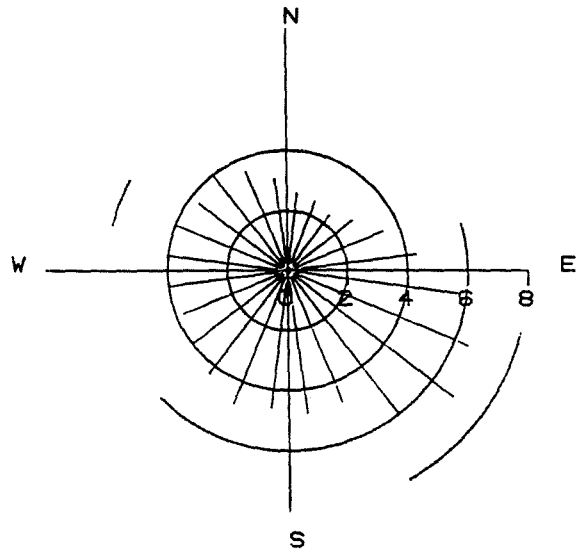
CURRENT VELOCITY DISTRIBUTION



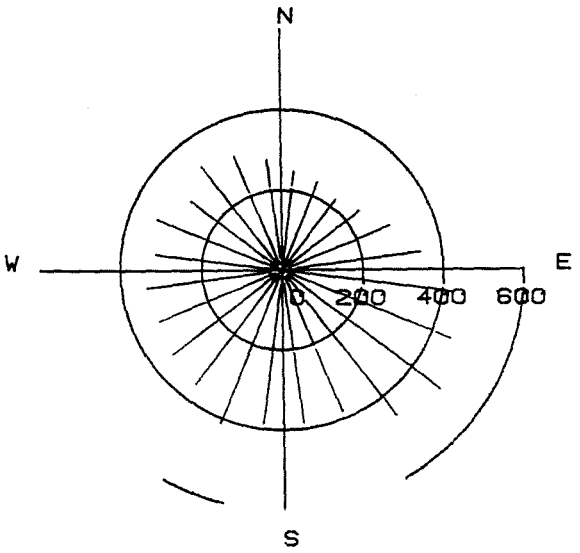
Makeimum velocity (cm/s)



Mean velocity (cm/s)



Relative flux in %



Number measured

Number of observations : 8175

The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 25.0 m Bottom depth : 315.0 m

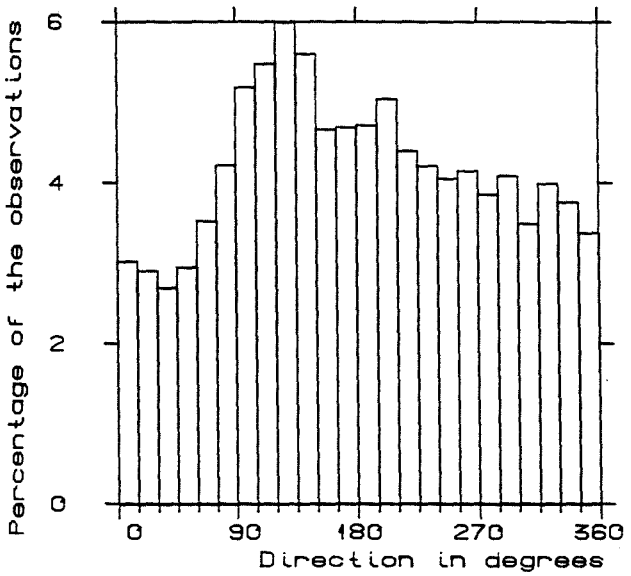
Time interval : 10.00 minutes.

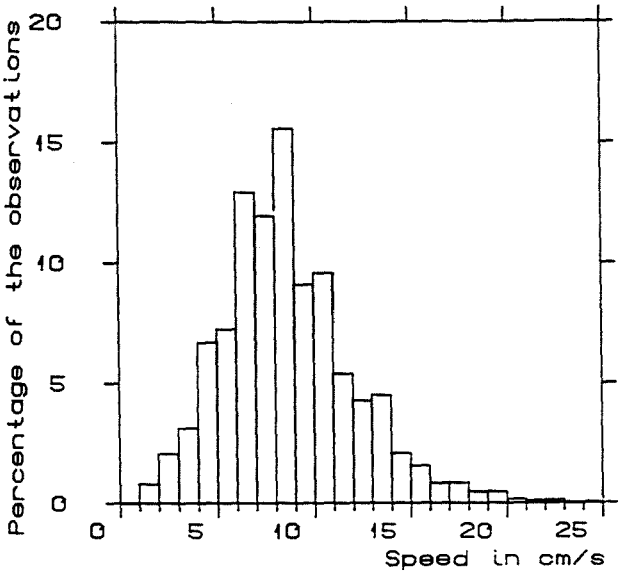
Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

H 1

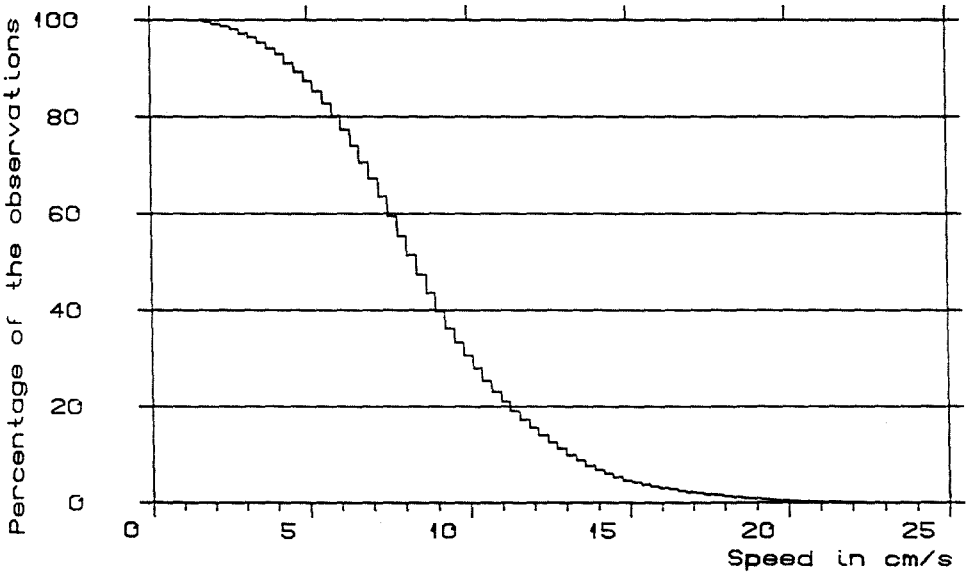
Fig. 1-1-1 Current velocity distribution.

HISTOGRAM





CURRENT SPEED DISTRIBUTION



Number of observations : 8175

The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 25.0 m Bottom depth : 315.0 m

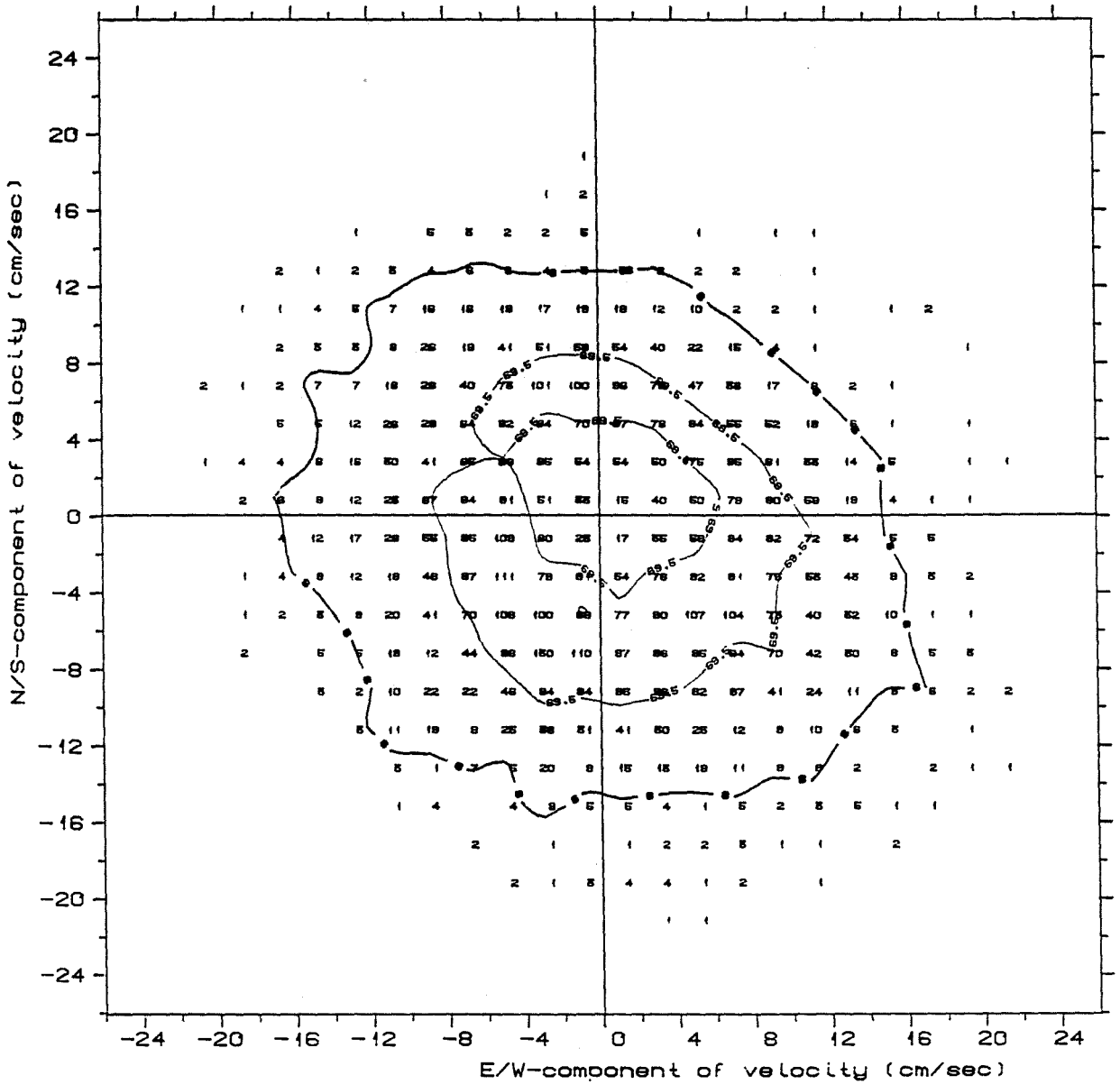
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

H 1

Fig. 1-1-2 Histogram of speed and direction. Current speed distribution.

VELOCITY DISTRIBUTION DIAGRAM



Number of obeservations : 8175

Isoline for 50% and 96%

Number of obeservations : 8175

The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

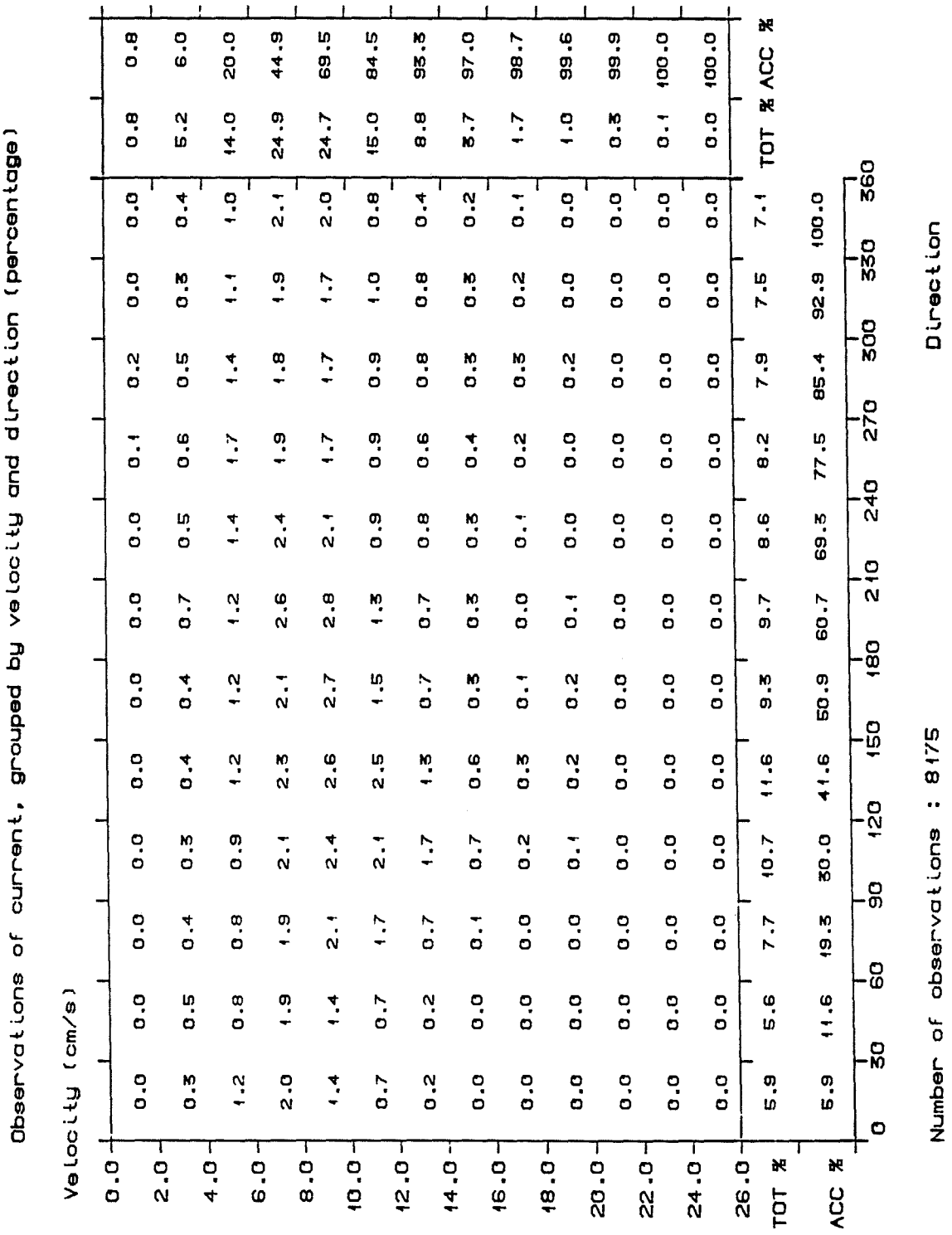
Instrument depth : 25.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

Fig. 1-1-3 Velocity distribution diagram.

DIRECTION DISTRIBUTION OF CURRENT VELOCITY



Number of observations : 8175

The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

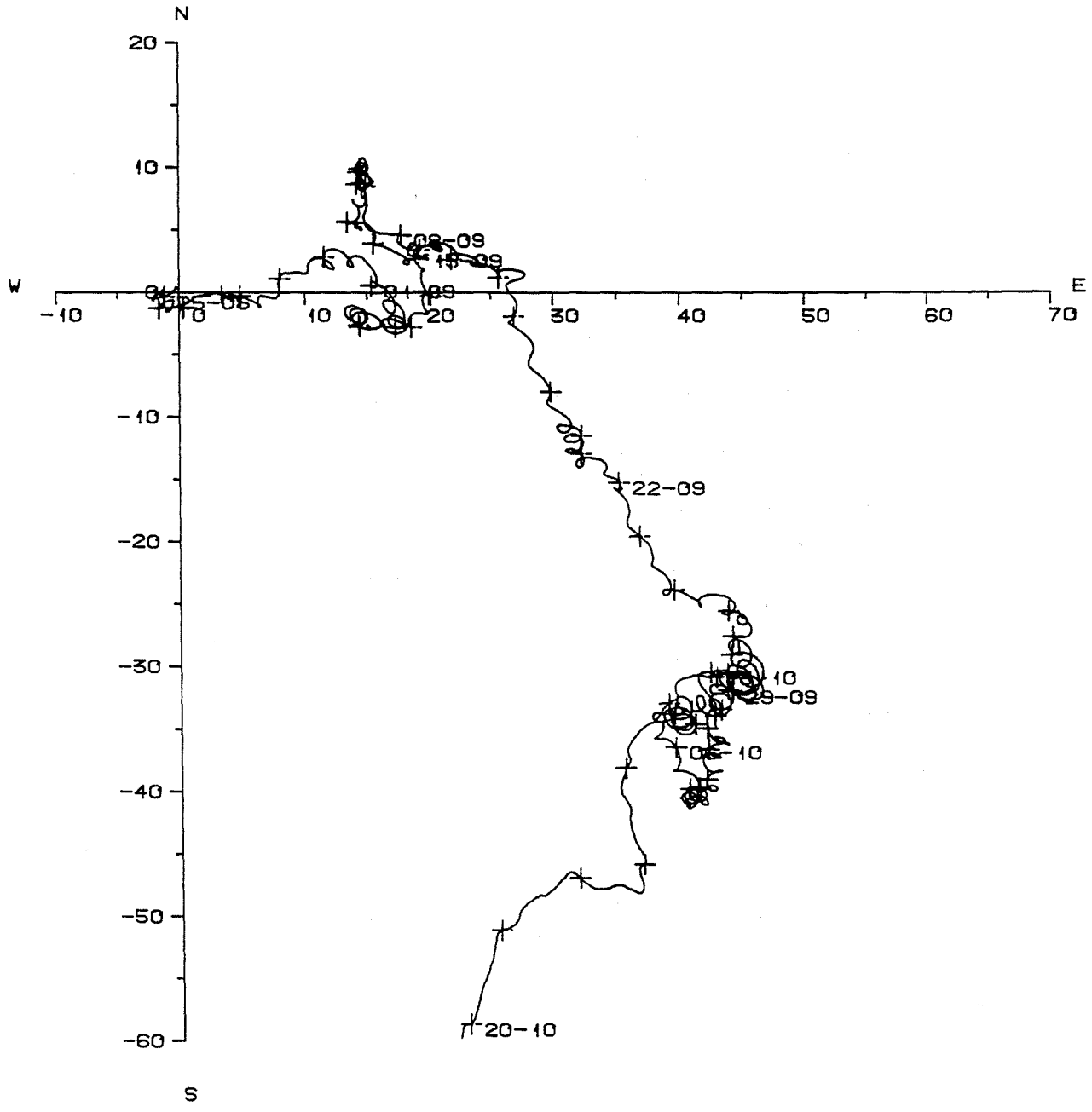
Instrument depth : 25.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

Fig. 1-1-4 Velocity distribution table.

PROGRESSIVE VECTOR DIAGRAM



Units in km

Number of observations : 8175

The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

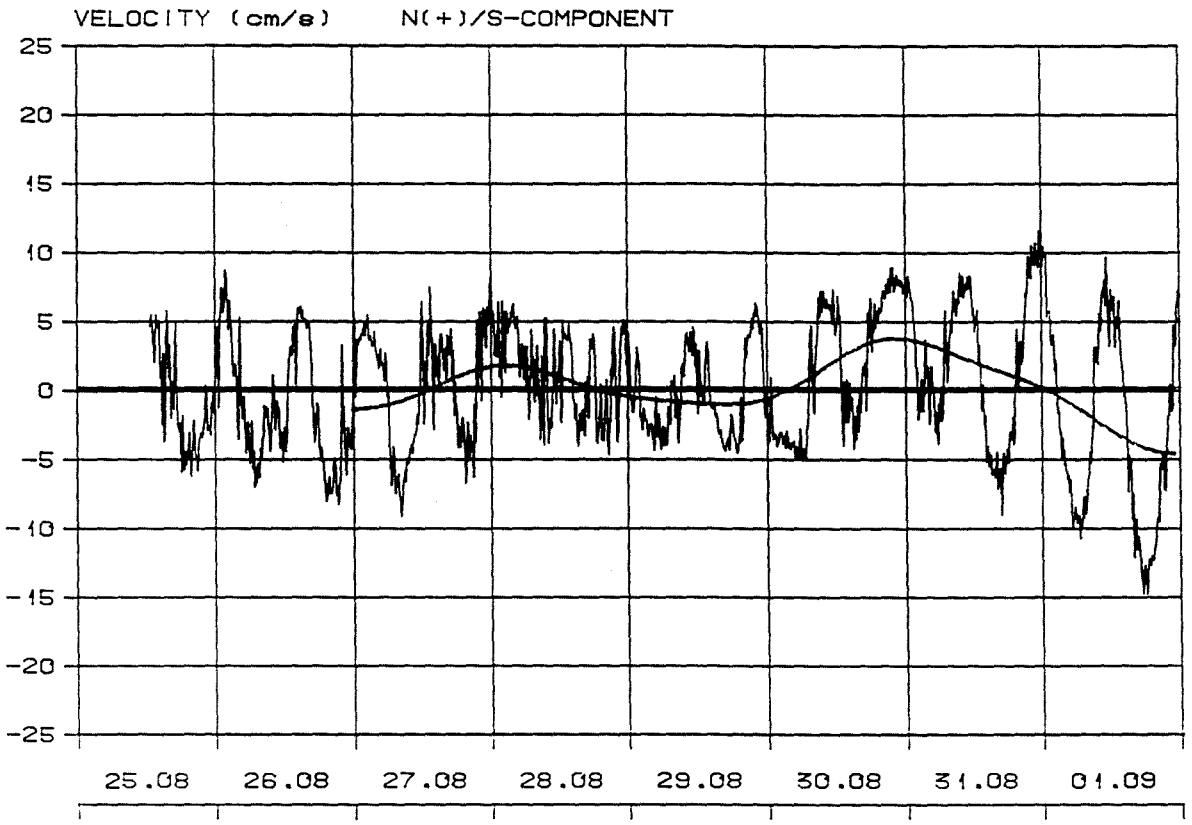
Instrument depth : 25.0 m Bottom depth : 315.0 m

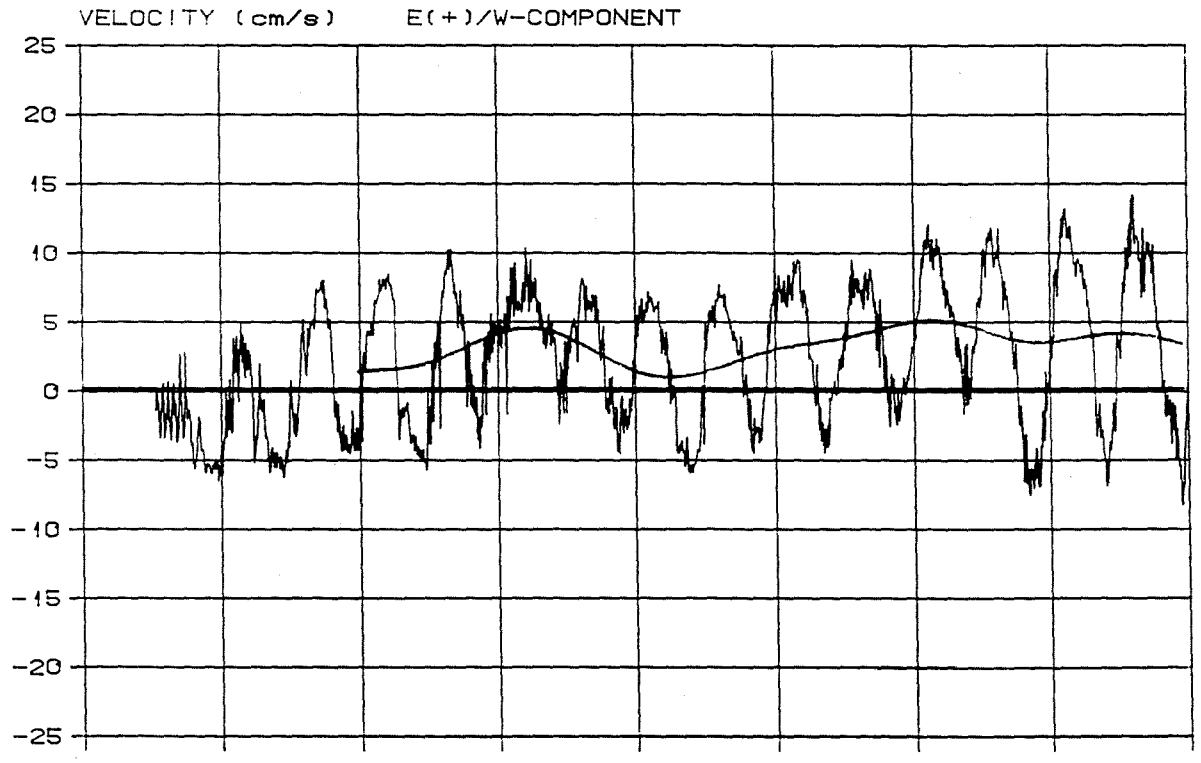
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

H 1

Fig. 1-1-5 Progressive vector diagram.





The Barents Sea

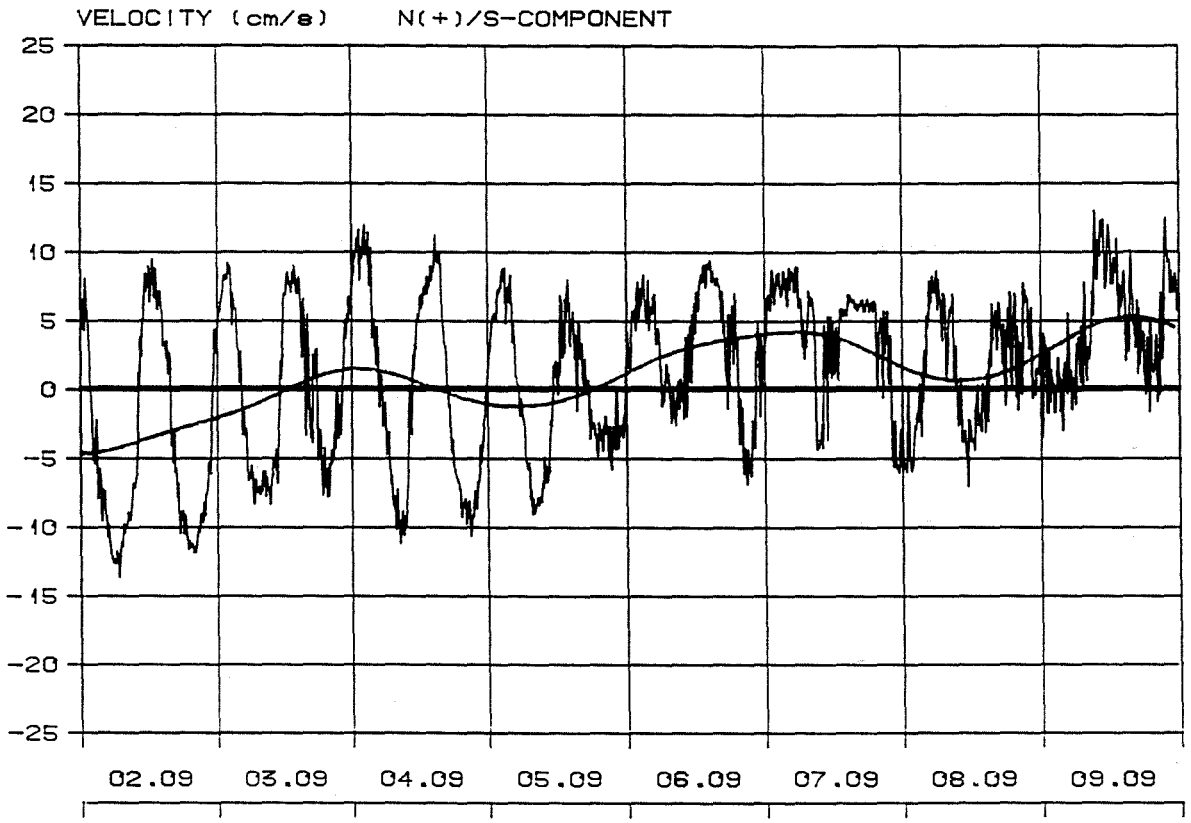
Position : N 73° 4.80' E 40° 0.00'

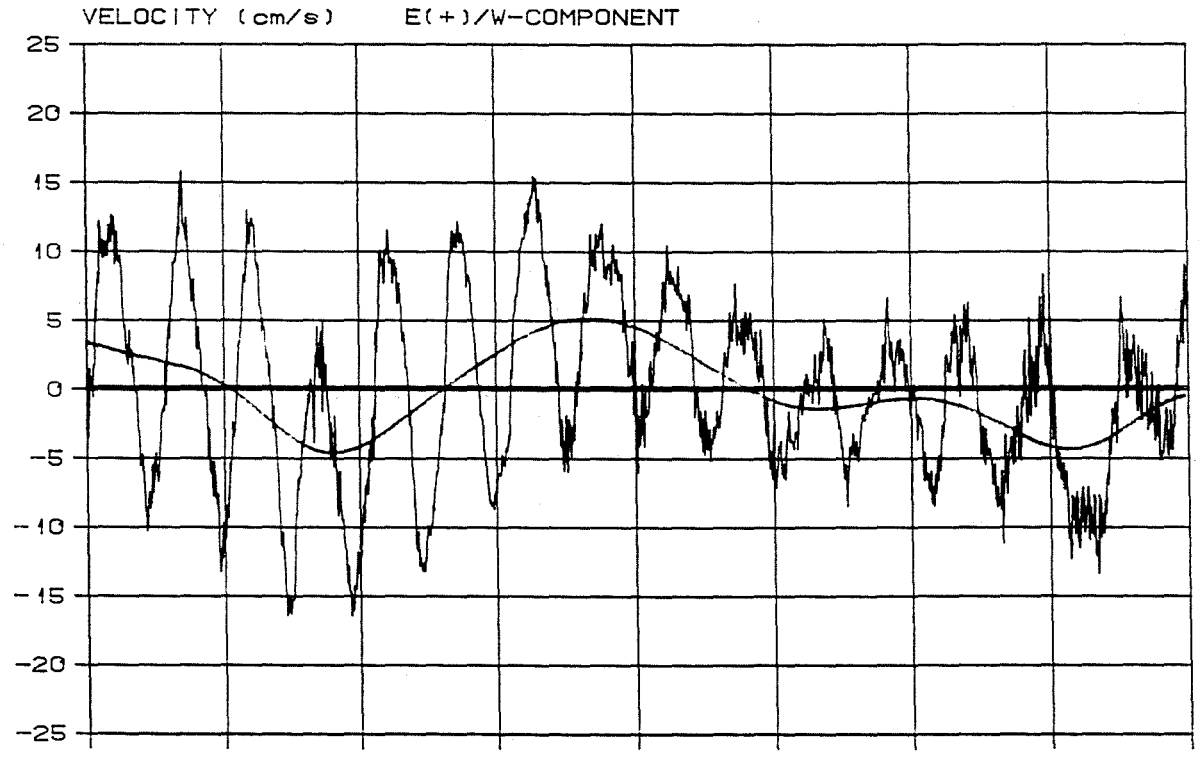
Instrument depth : 25.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

Fig. 1-1-6 N/S and E/W components of current.





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

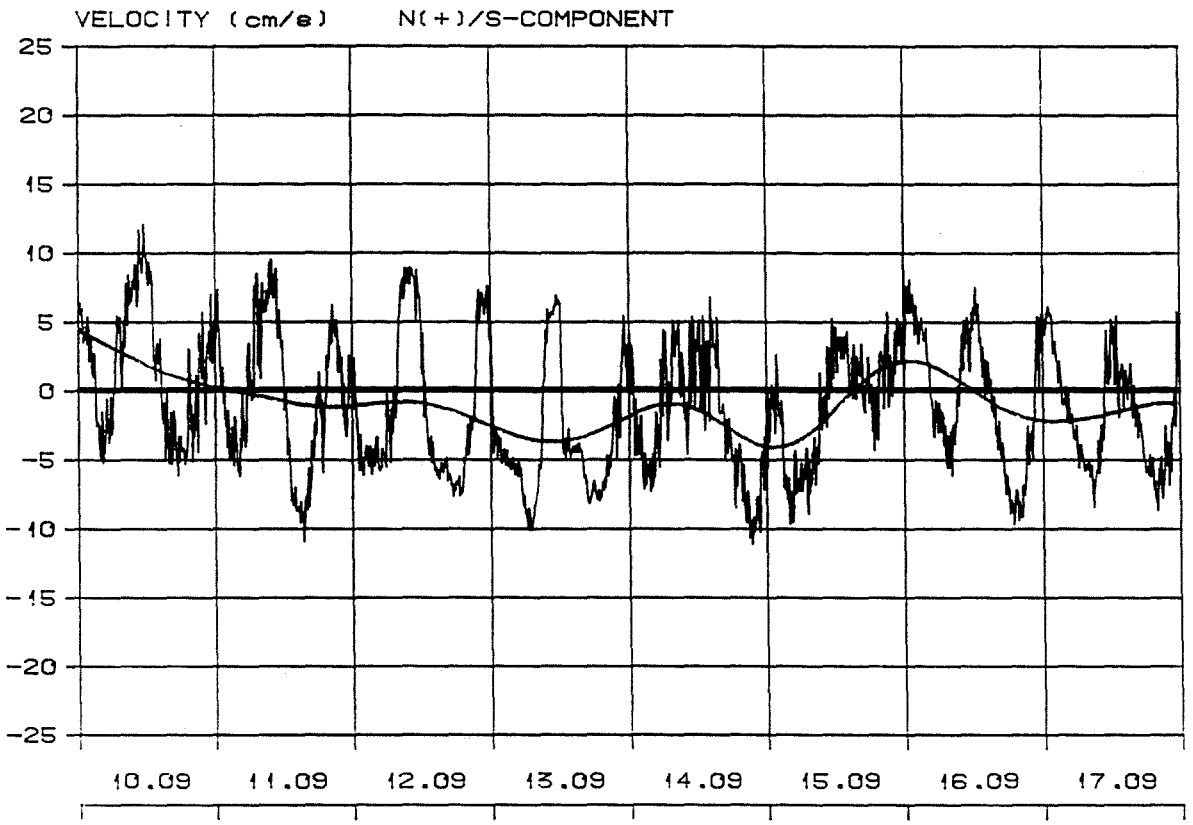
Instrument depth : 25.0 m Bottom depth : 315.0 m

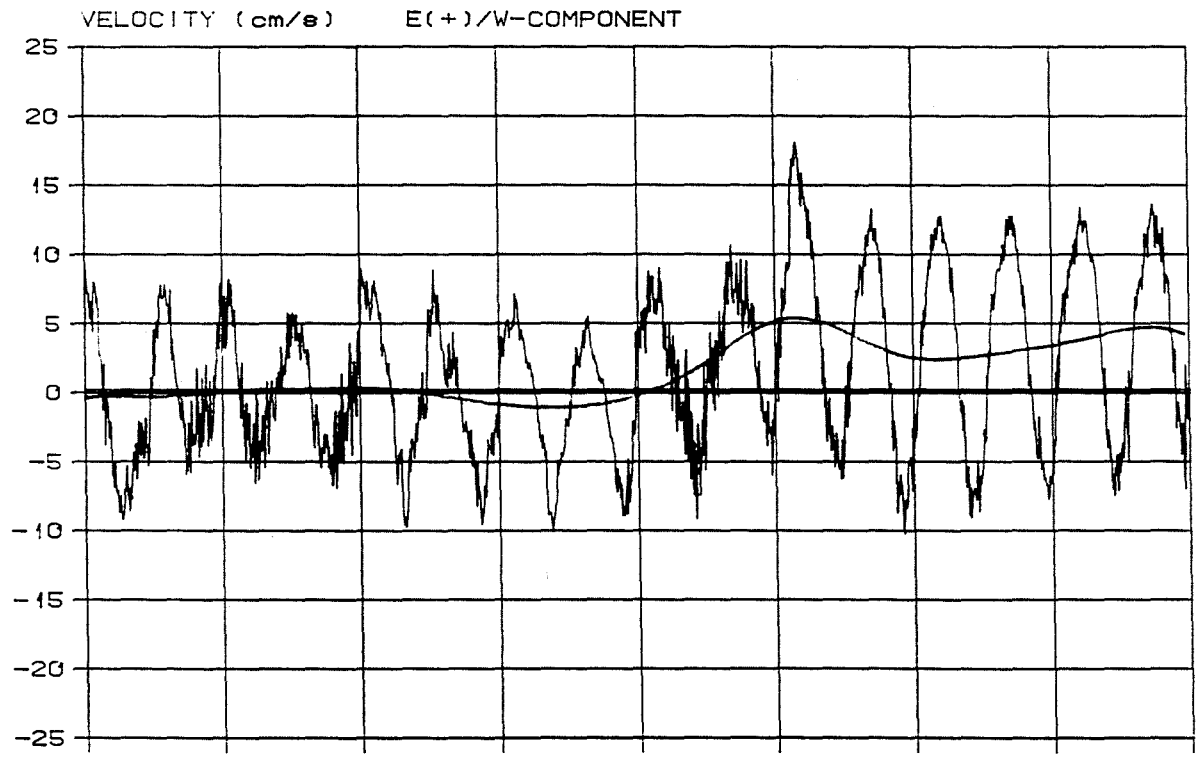
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

Fig. 1-1-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 25.0 m Bottom depth : 315.0 m

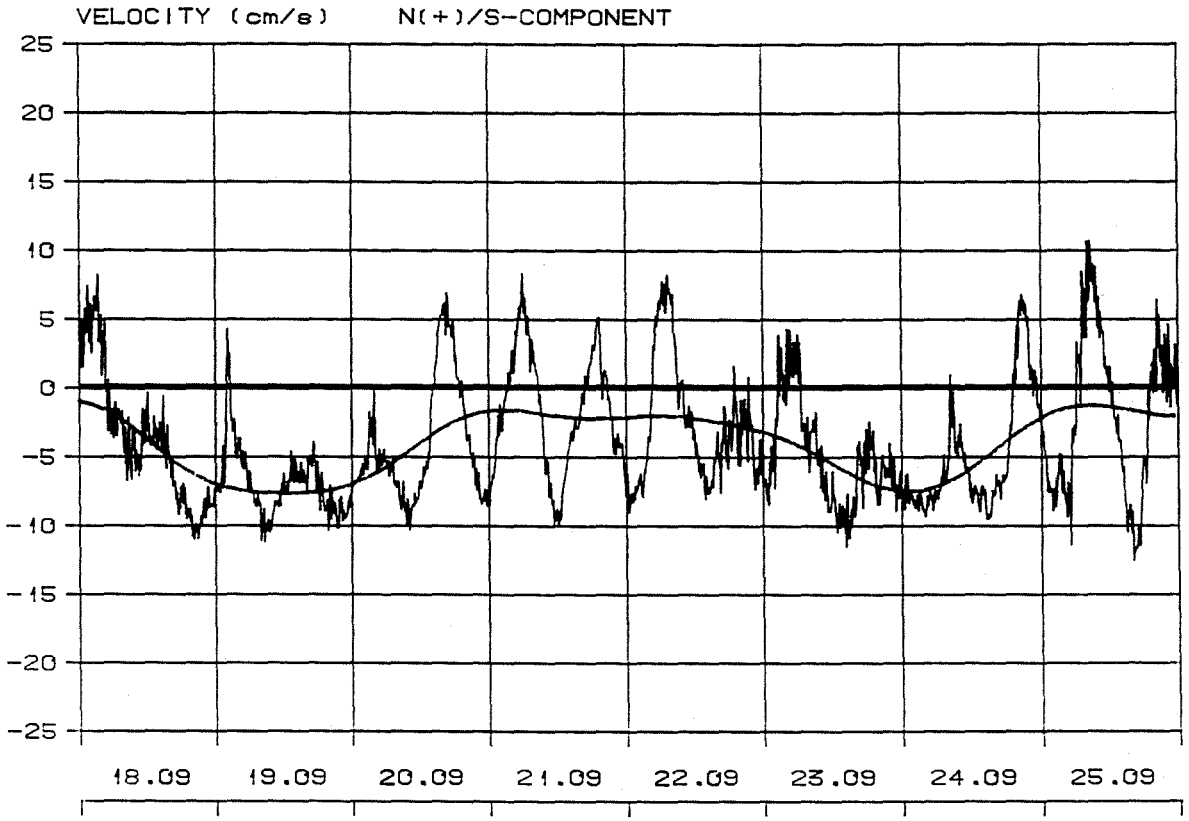
Time interval : 10.00 minutes.

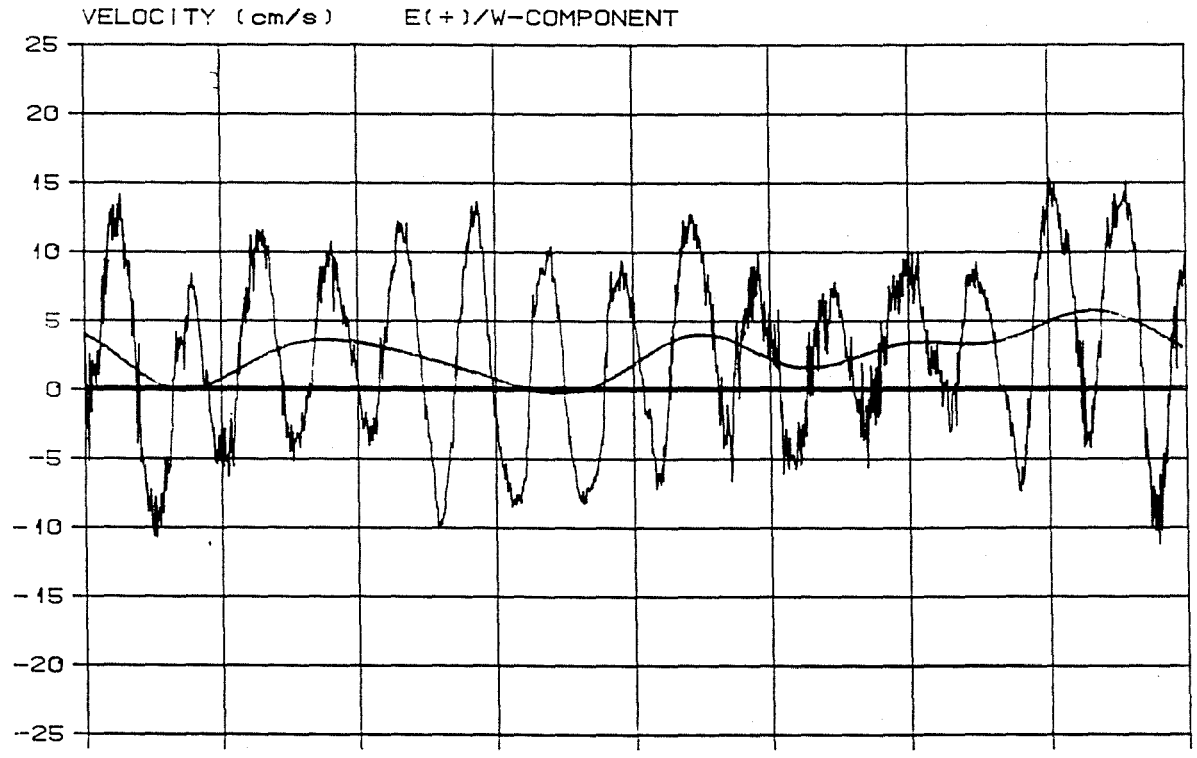
Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

H I

Fig. 1-1-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

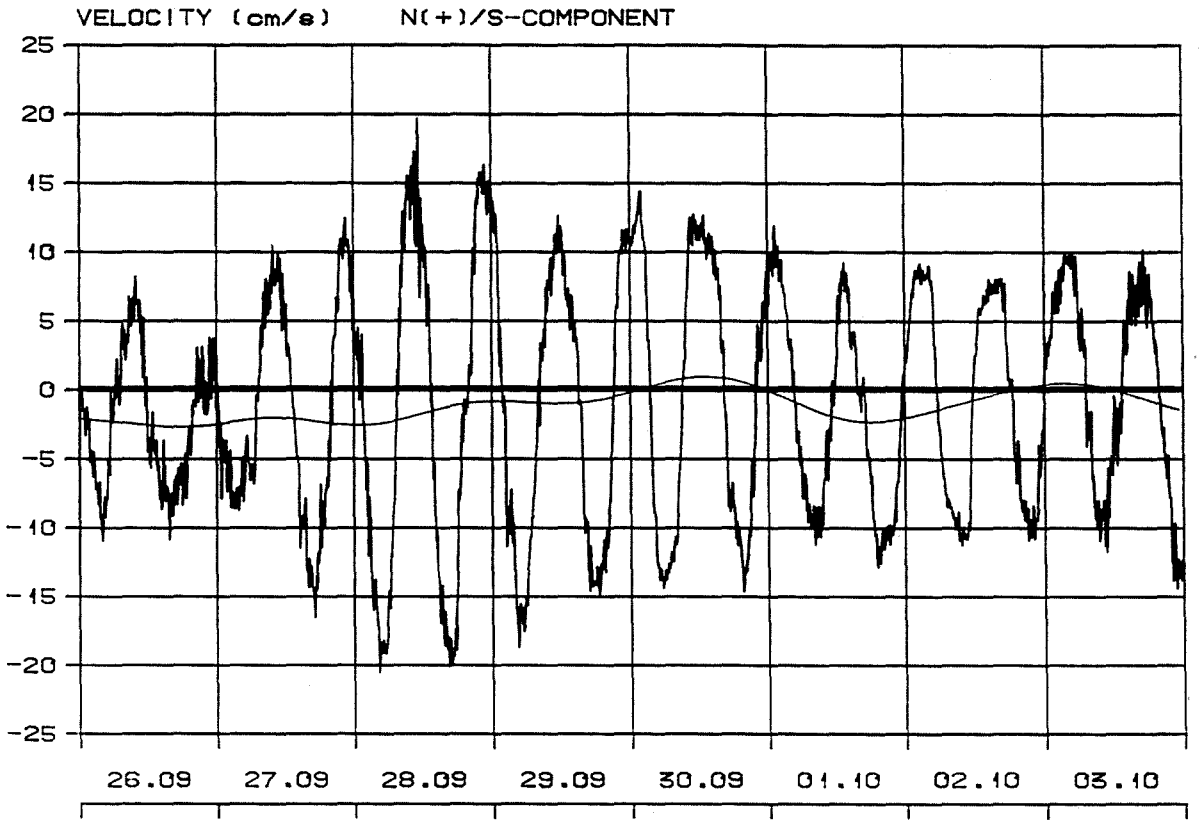
Instrument depth : 25.0 m Bottom depth : 315.0 m

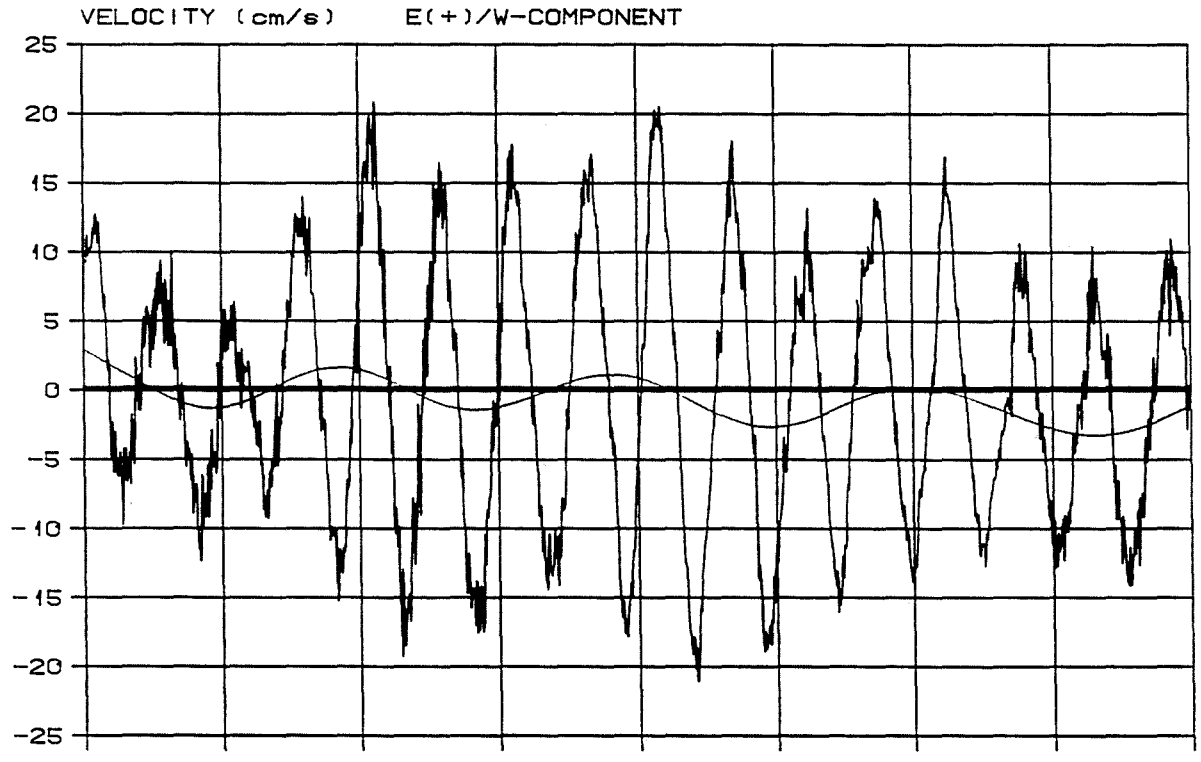
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

Fig. 1-1-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 25.0 m Bottom depth : 315.0 m

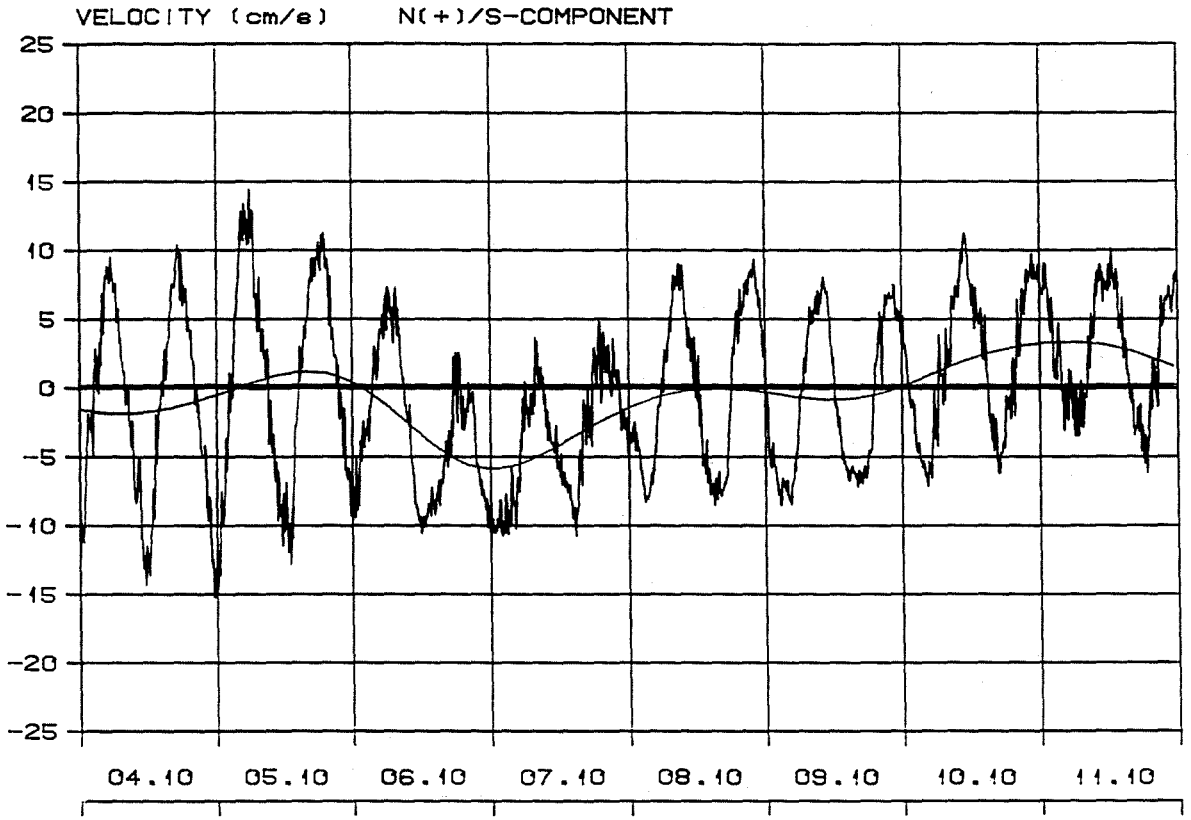
Time interval : 10.00 minutes.

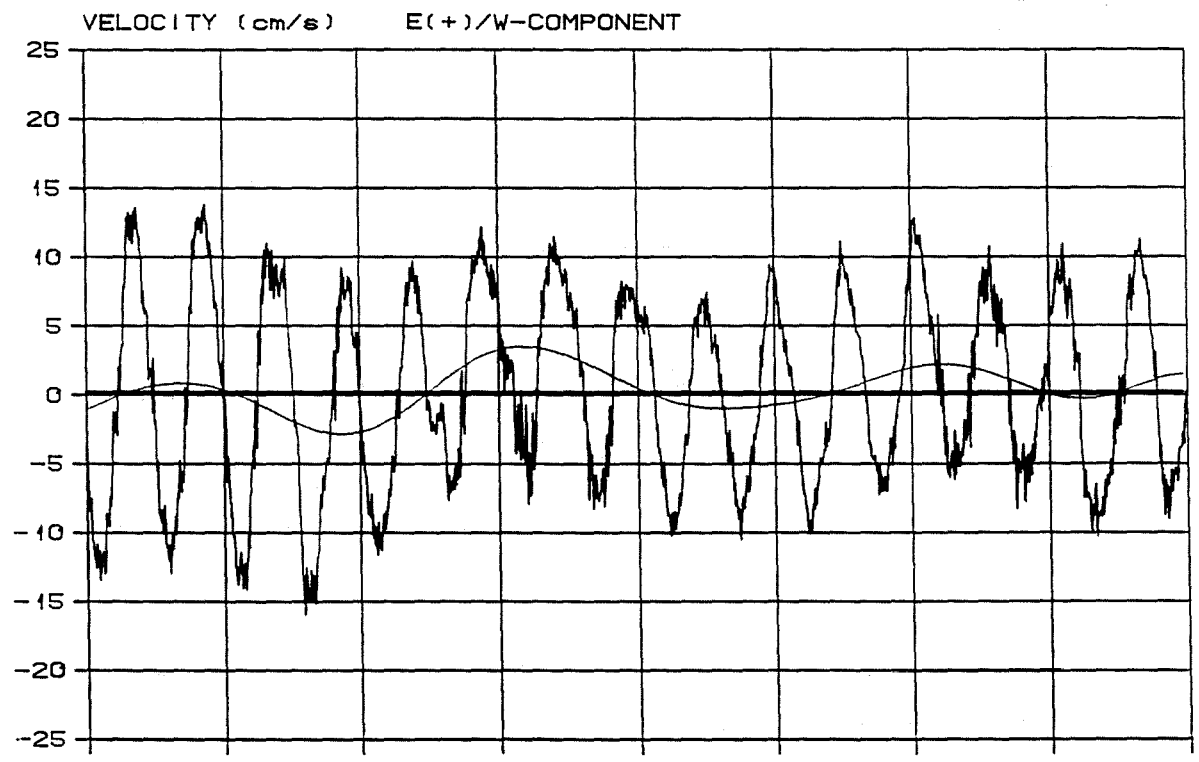
Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

H 1

Fig. 1-1-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 25.0 m Bottom depth : 315.0 m

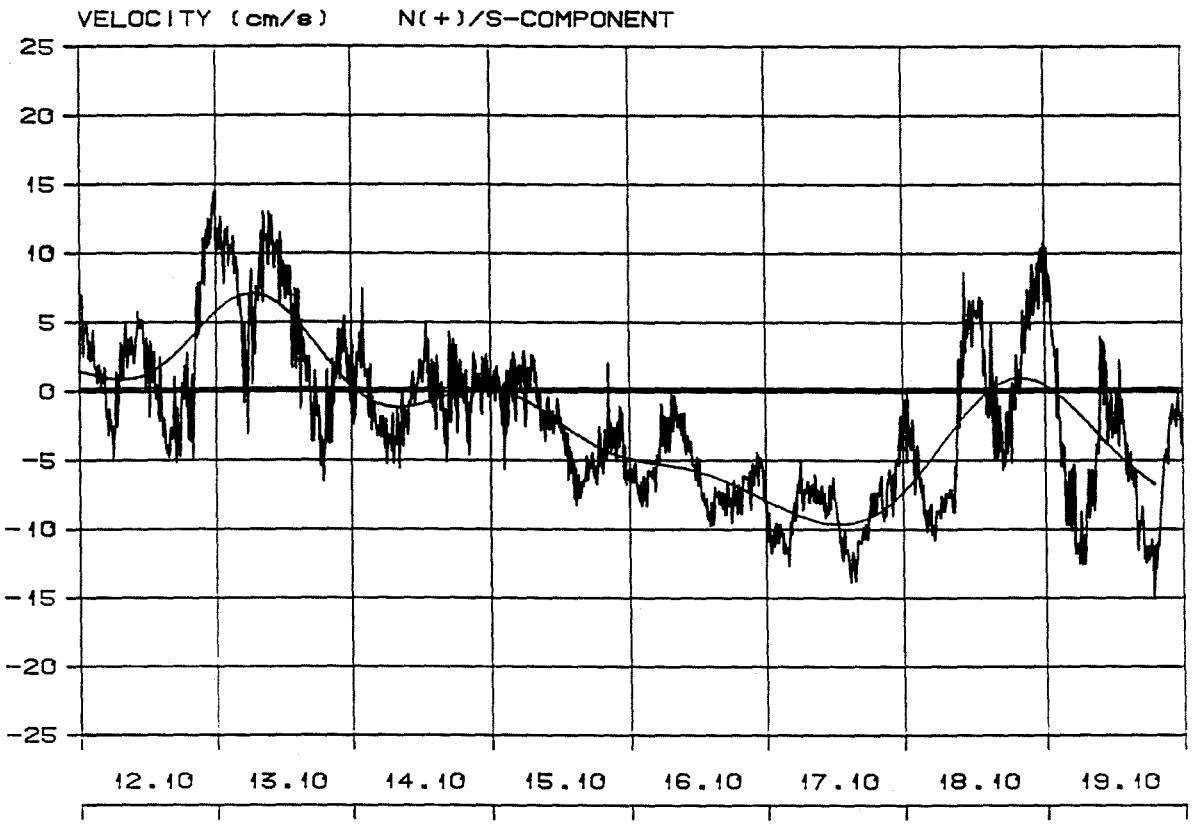
Time interval : 10.00 minutes.

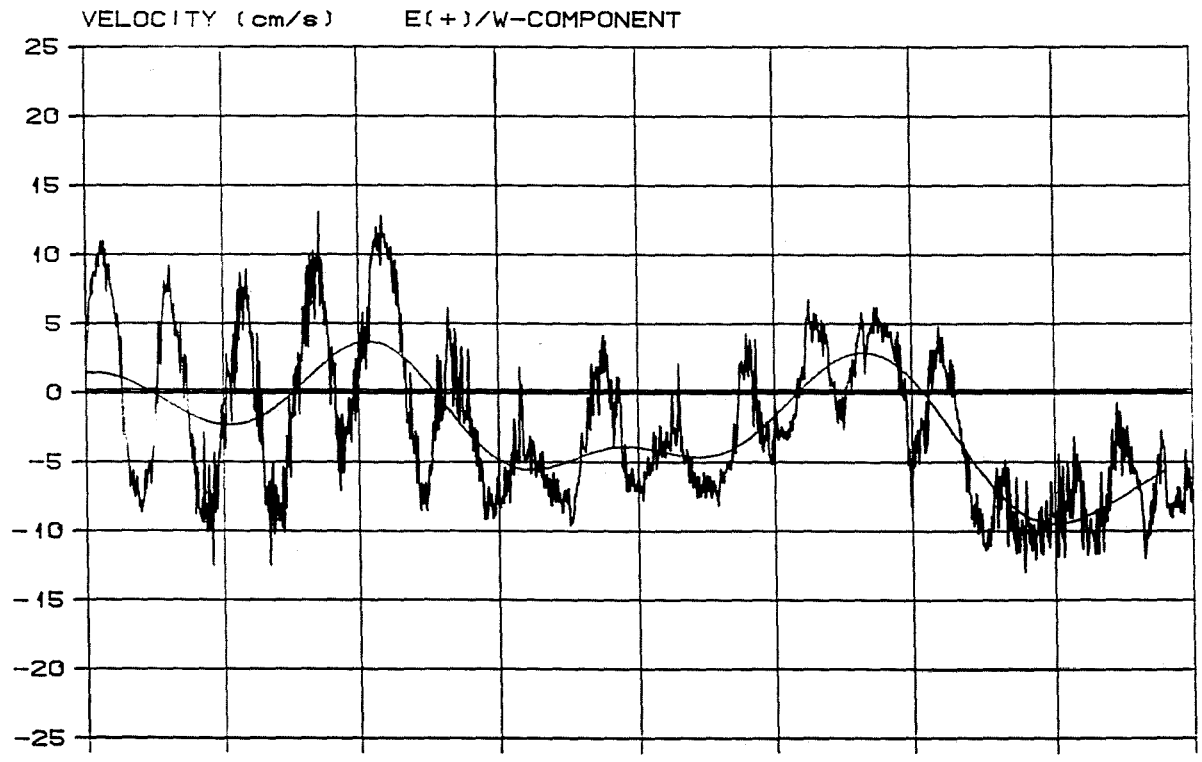
Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

H 1

Fig. 1-1-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 25.0 m Bottom depth : 315.0 m

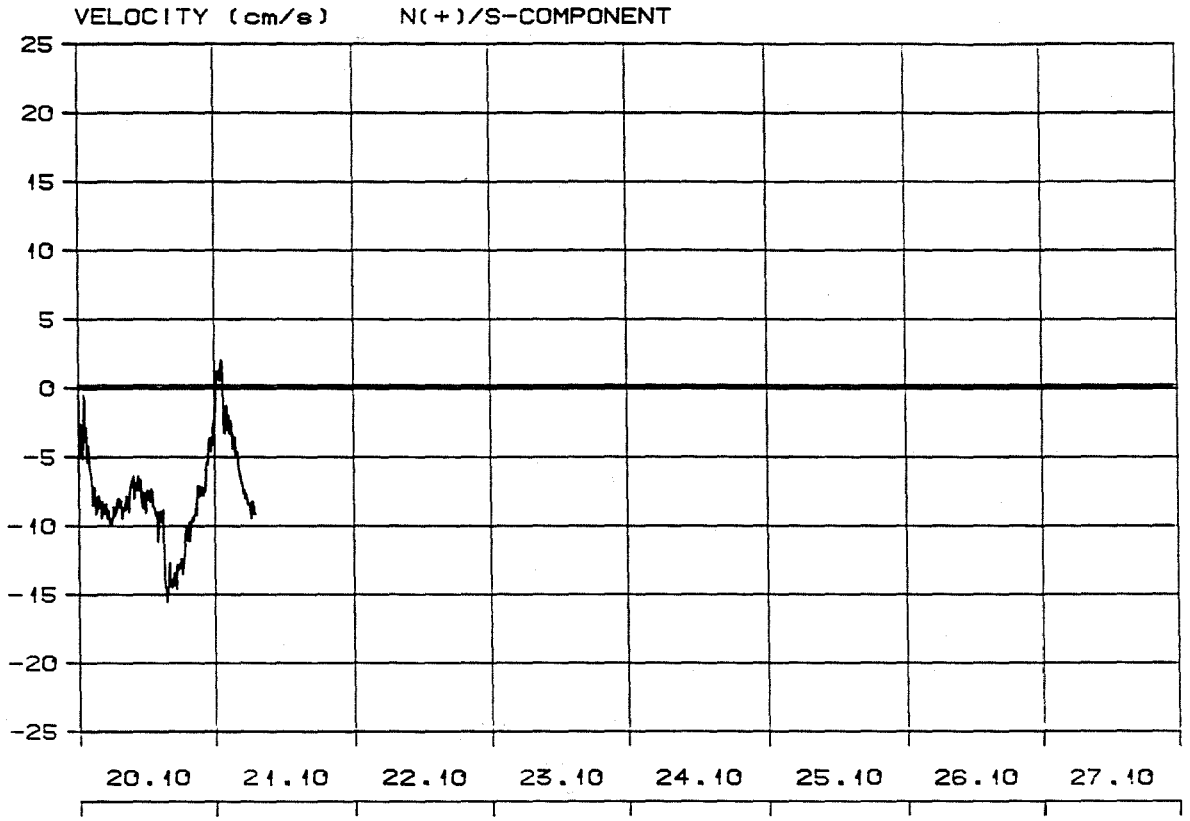
Time interval : 10.00 minutes.

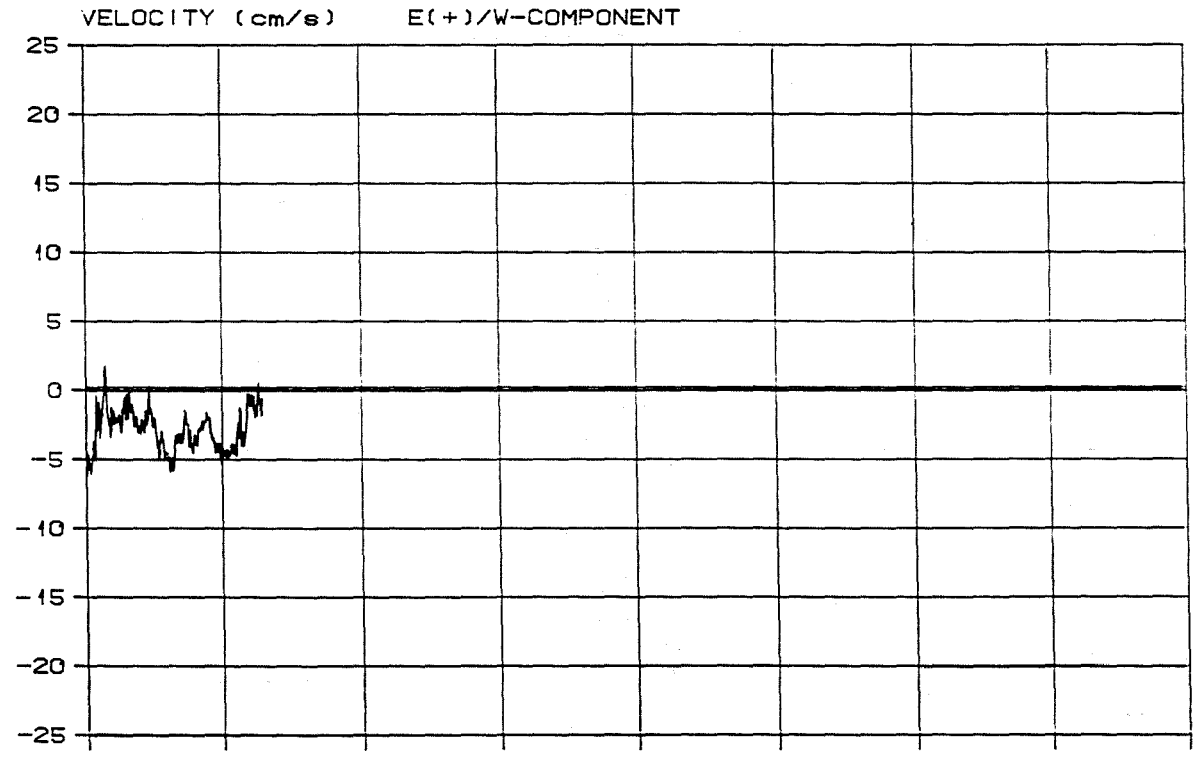
Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

H 1

Fig. 1-1-6

Continues.....





The Barents Sea

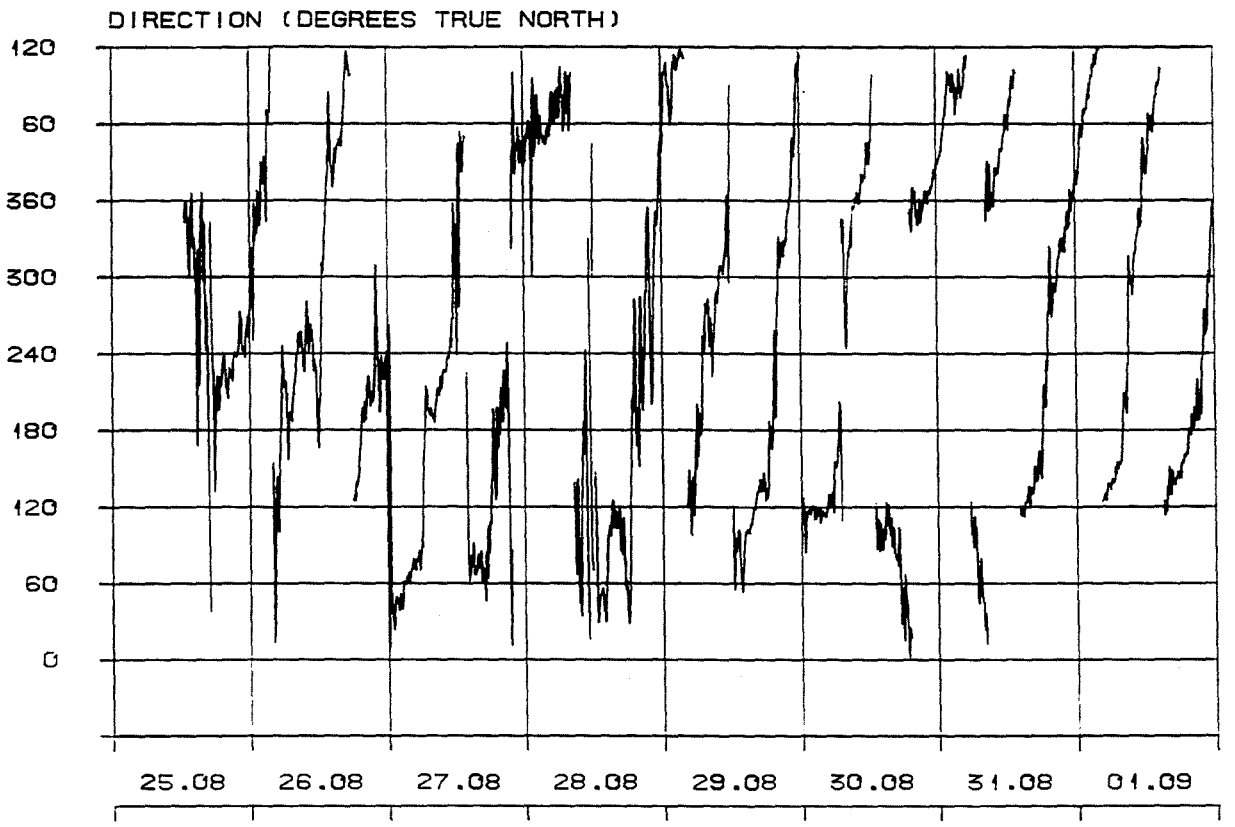
Position : N 73° 4.80' E 40° 0.00'

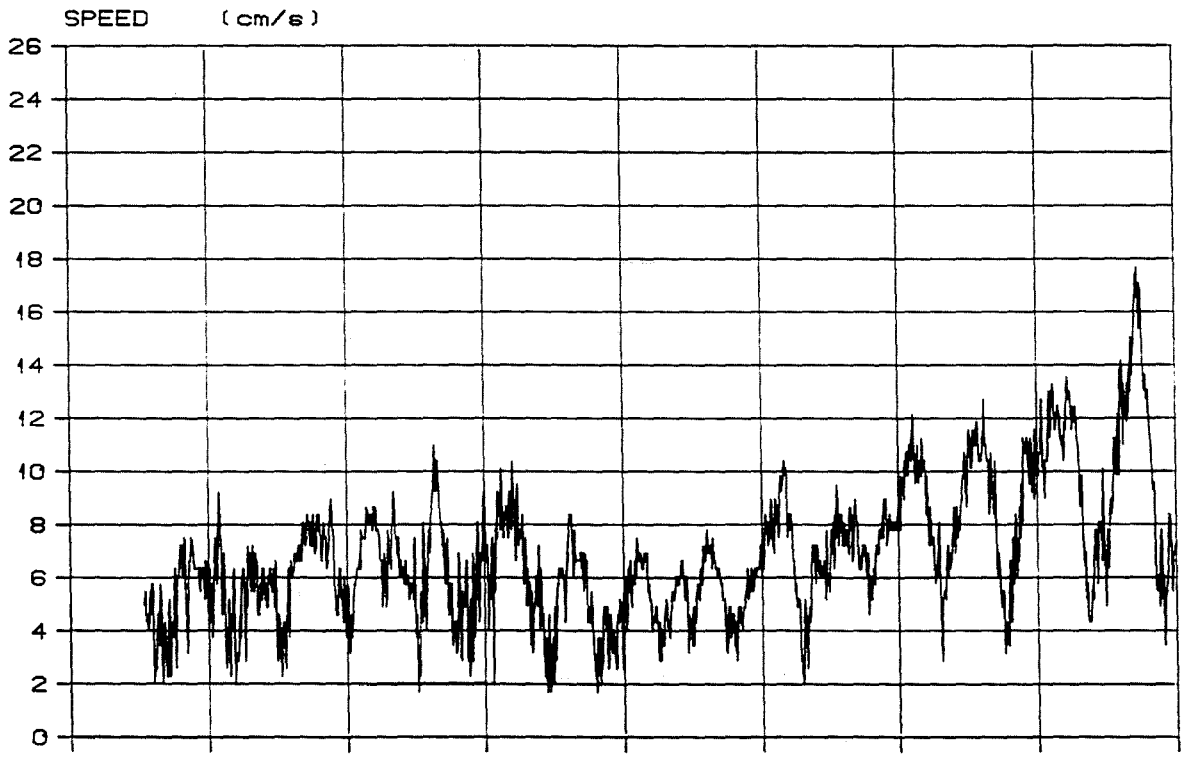
Instrument depth : 25.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

Fig. 1-1-6 Continues





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

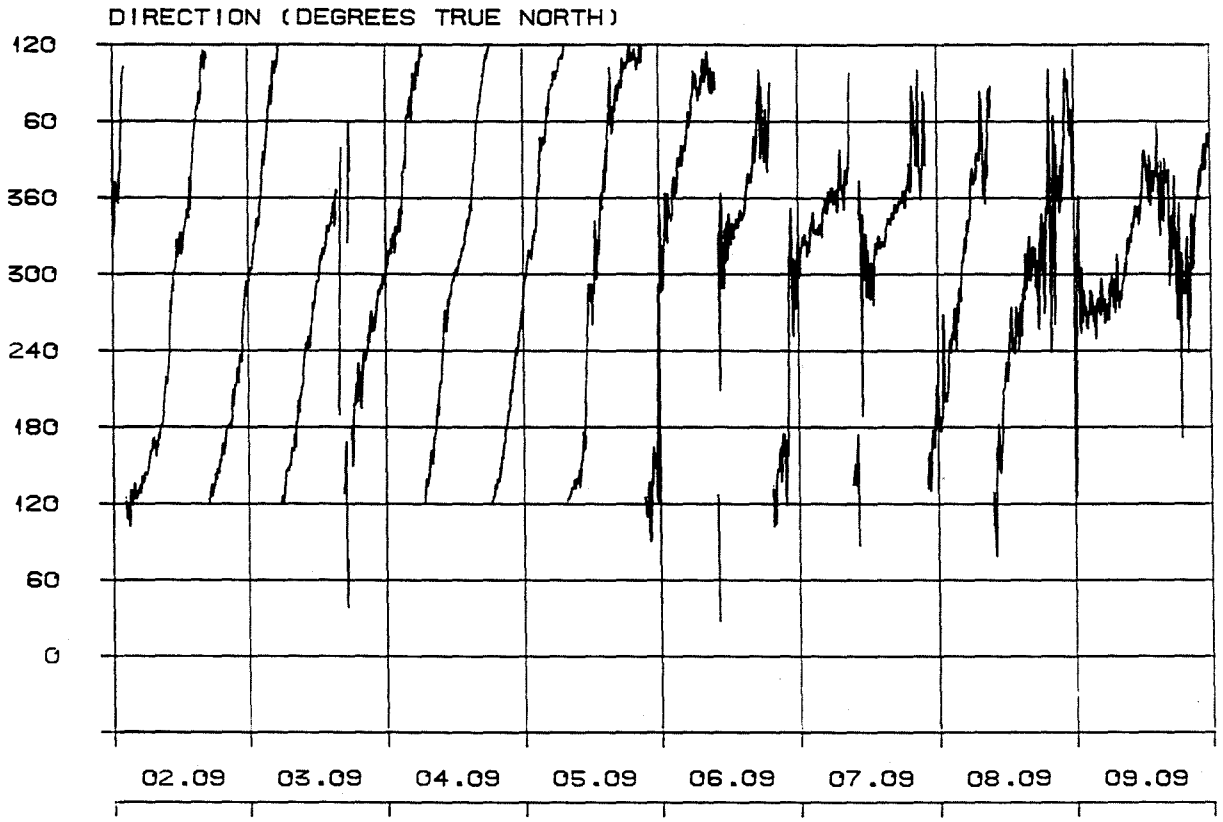
Instrument depth : 25.0 m Bottom depth : 315.0 m

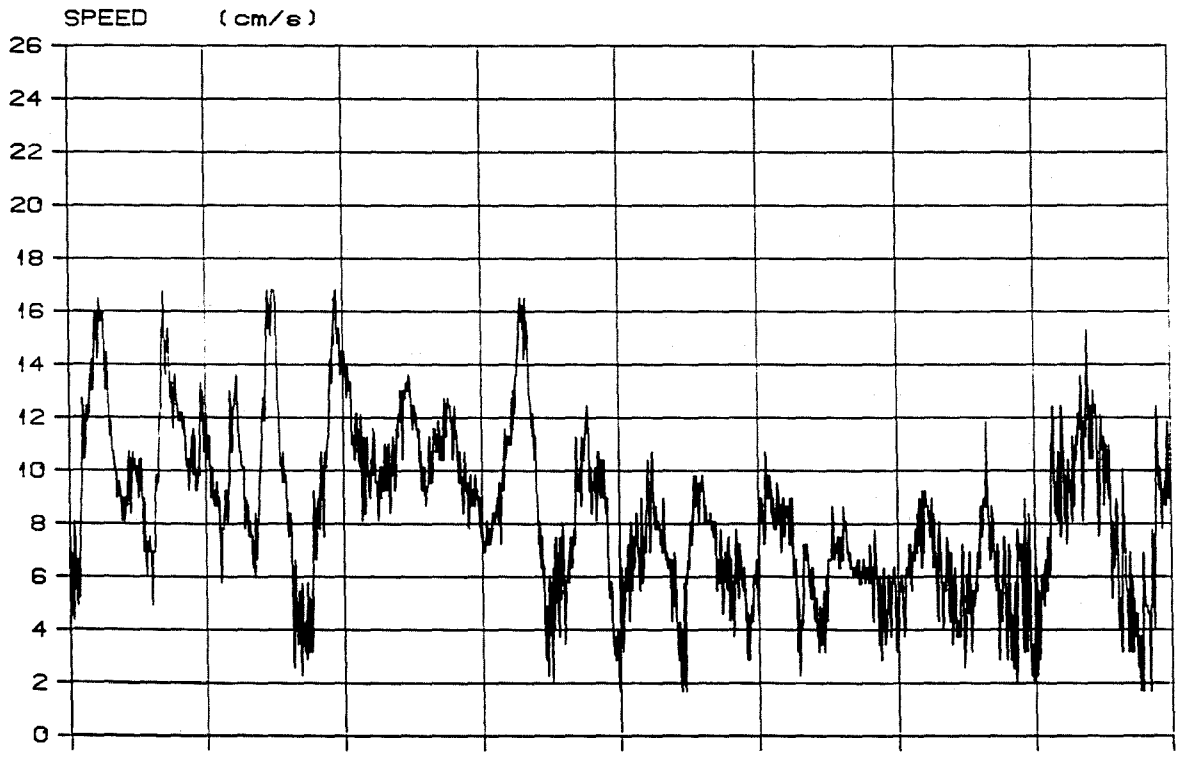
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

H 1

Fig. 1-1-7 Speed and direction of current.





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 25.0 m Bottom depth : 315.0 m

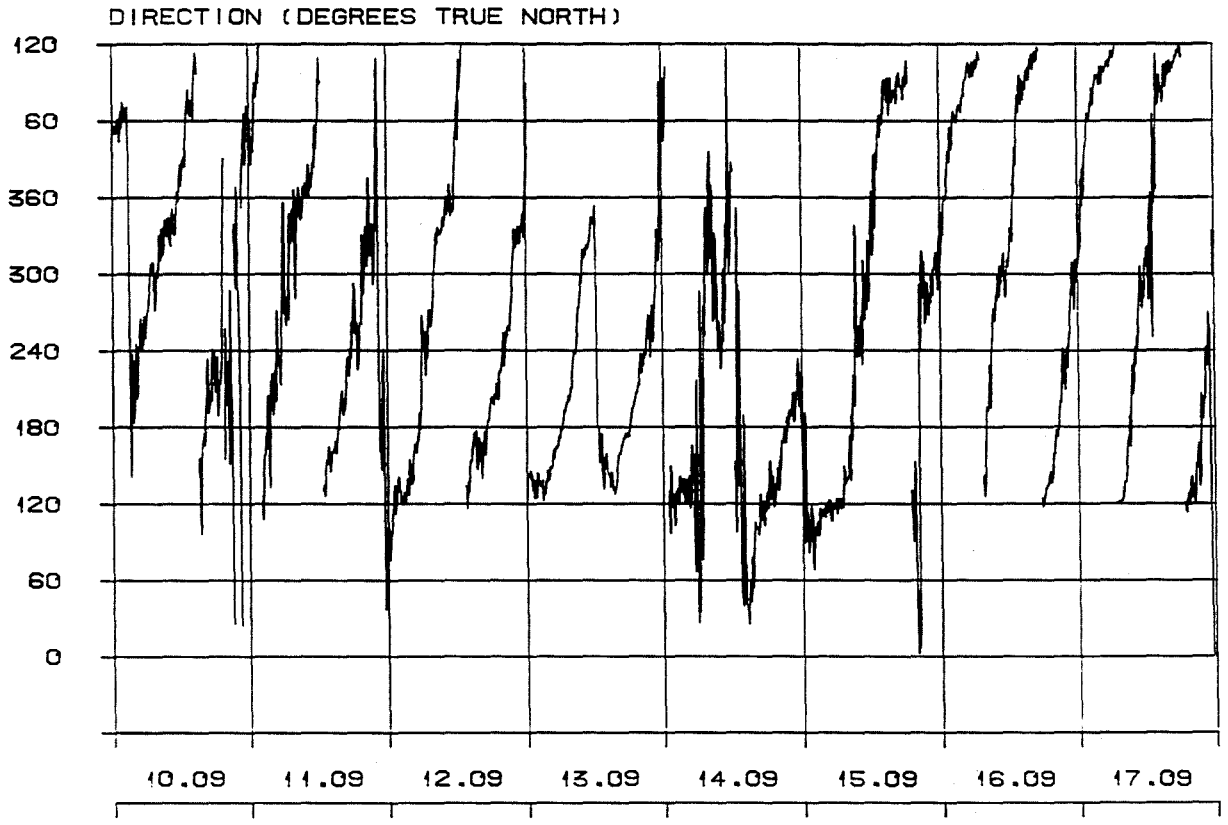
Time interval : 10.00 minutes.

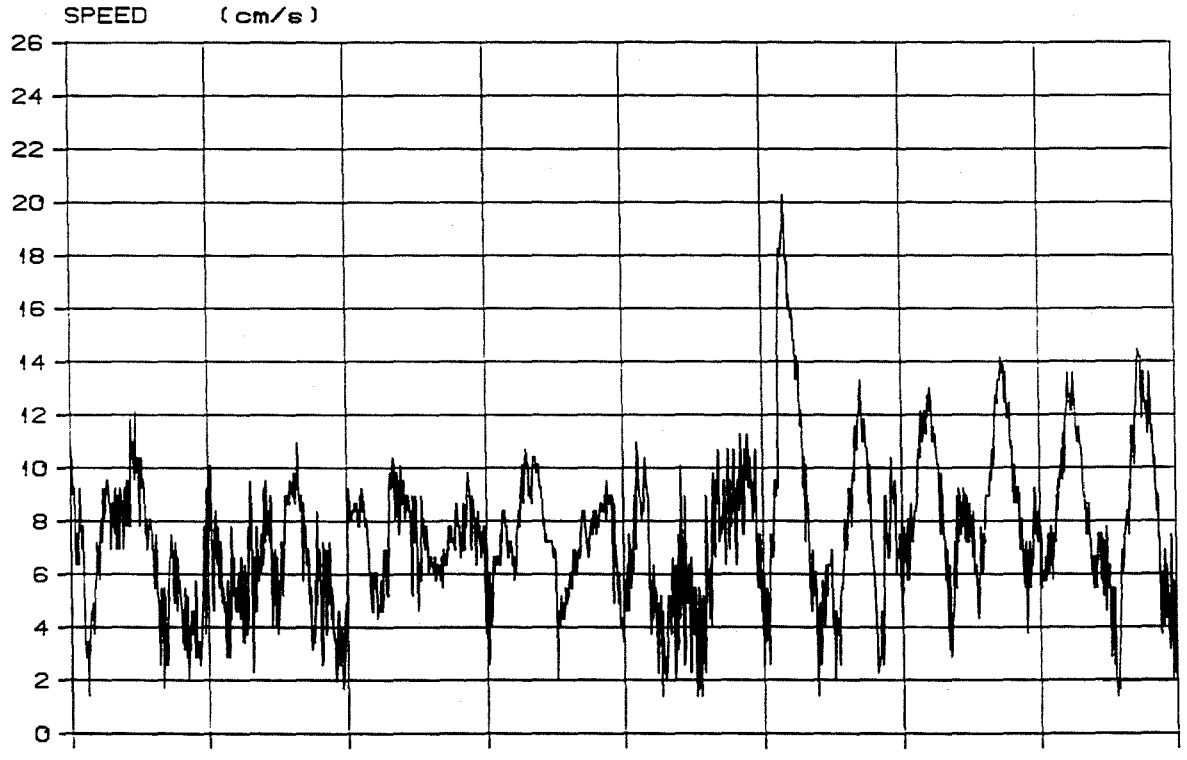
Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

H 1

Fig. 1-1-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

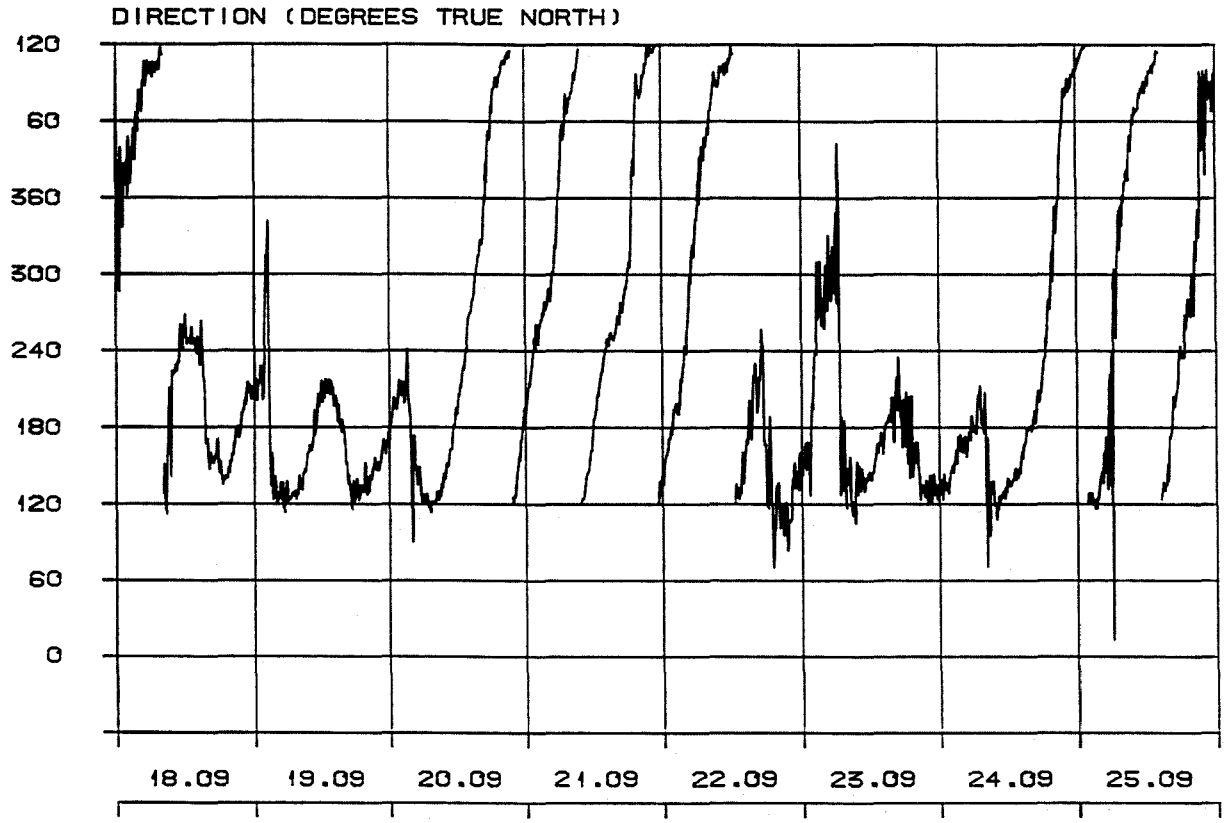
Instrument depth : 25.0 m Bottom depth : 315.0 m

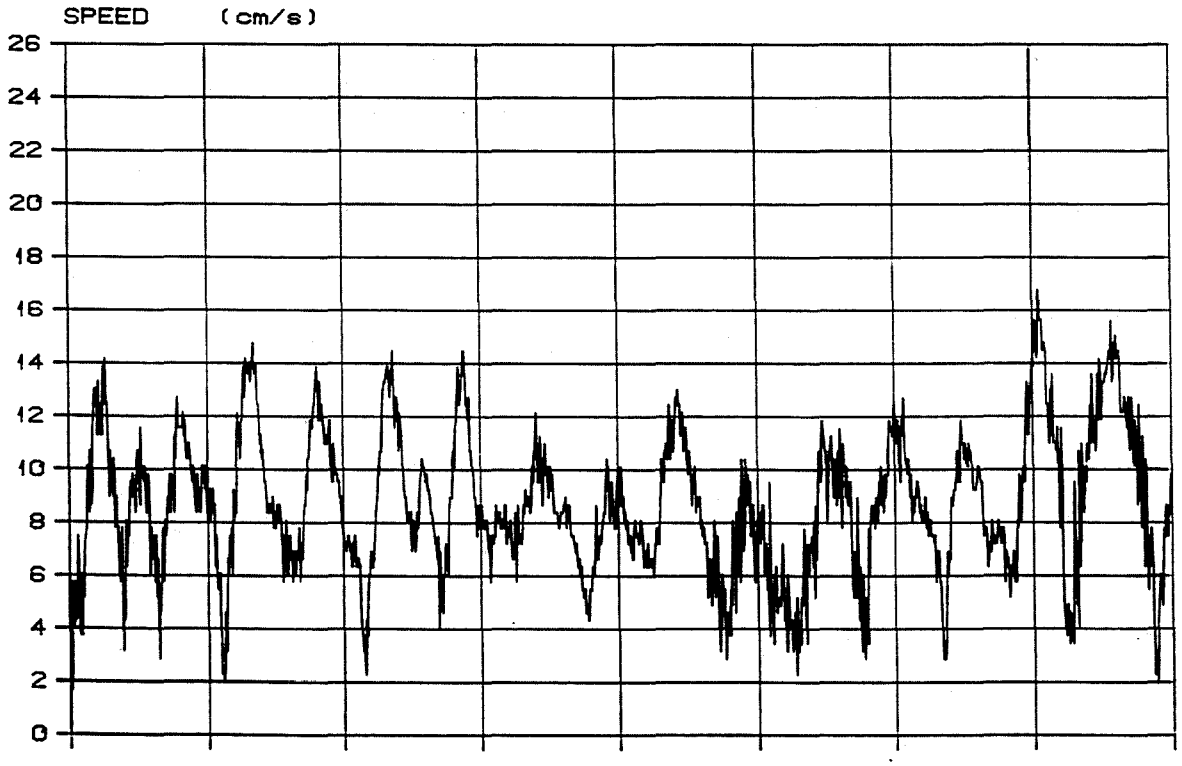
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

Fig. 1-1-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

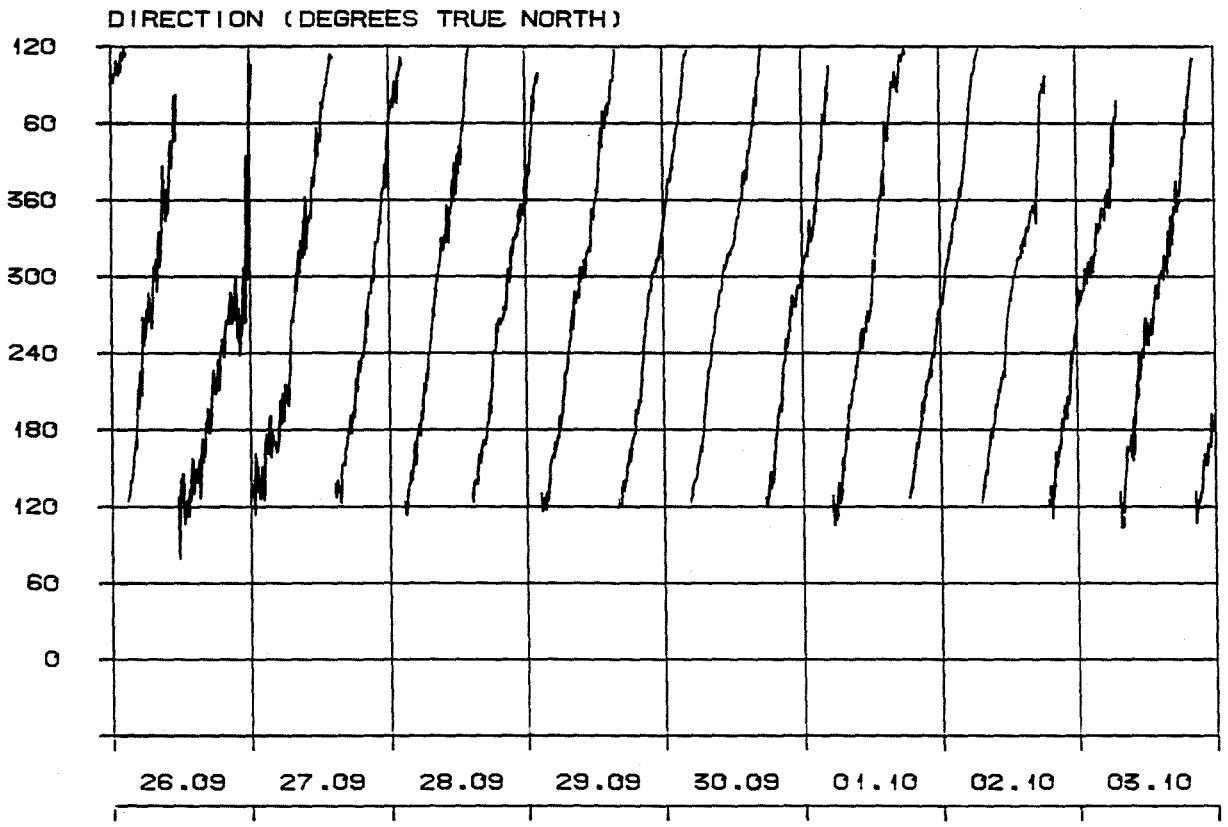
Instrument depth : 25.0 m Bottom depth : 315.0 m

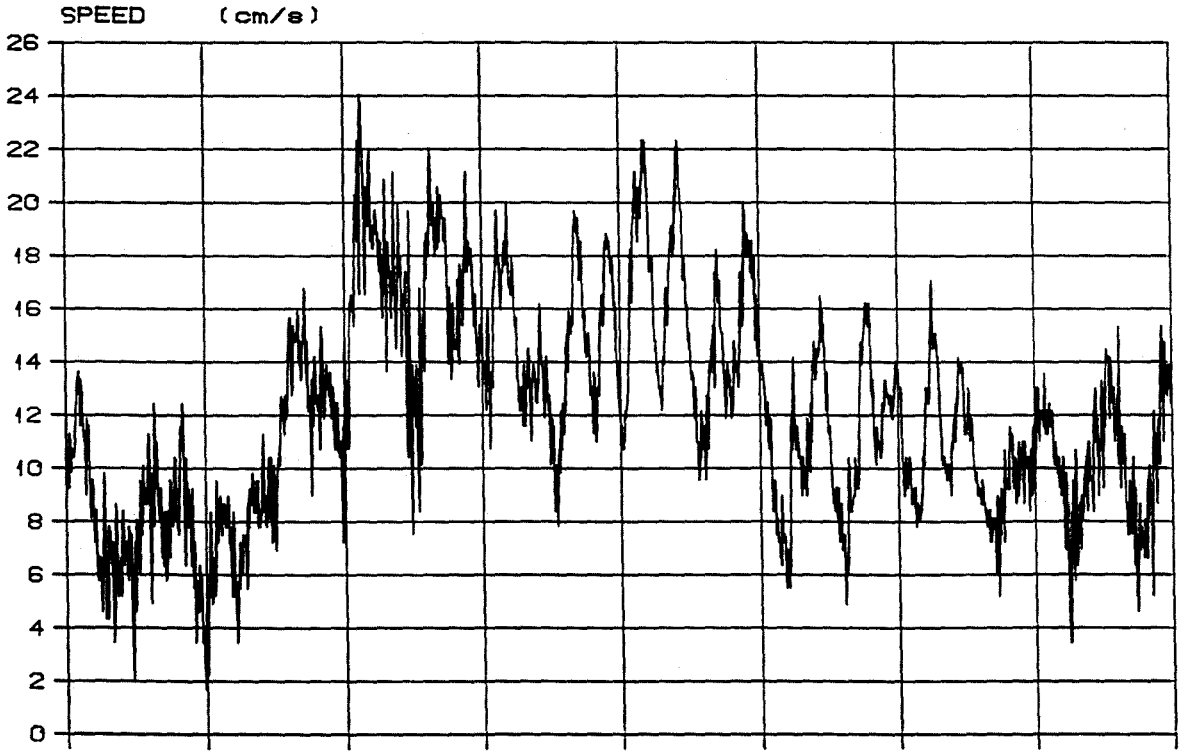
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

Fig. 1-1-7

Continues





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 25.0 m Bottom depth : 315.0 m

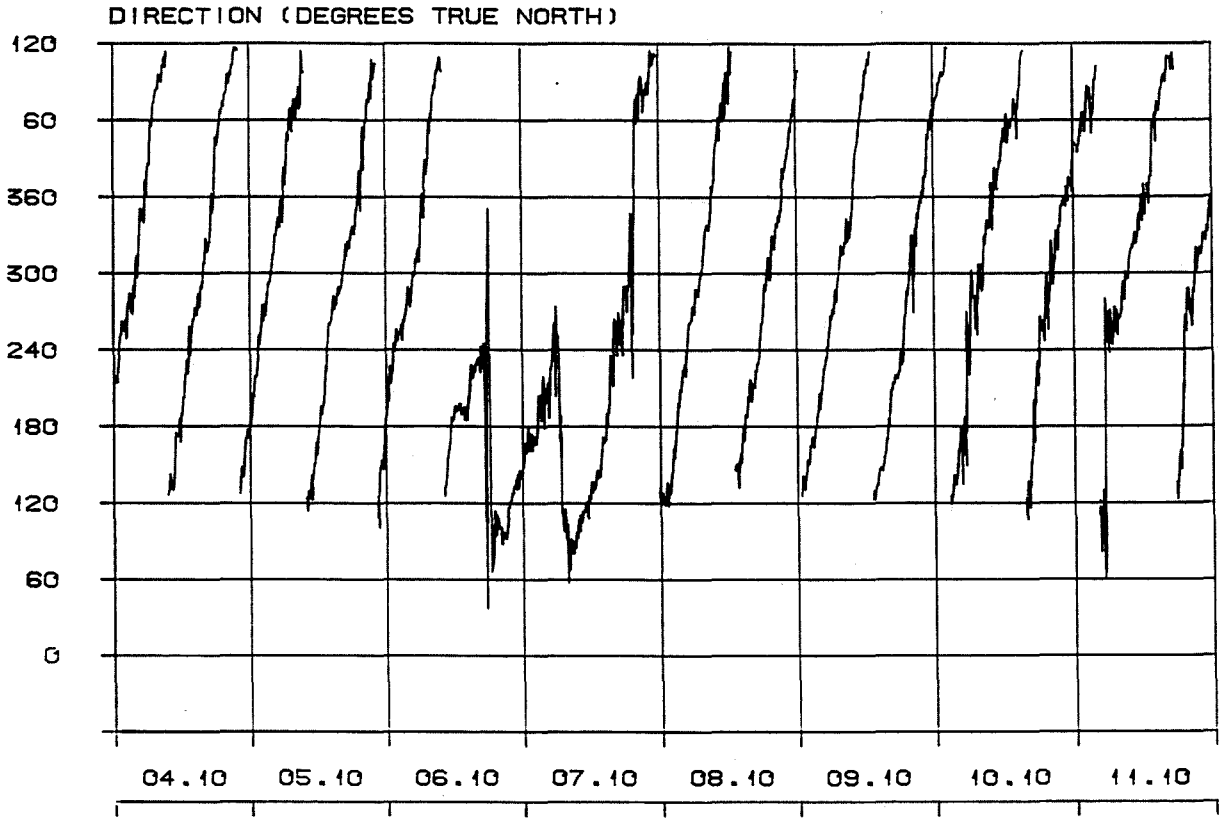
Time interval : 10.00 minutes.

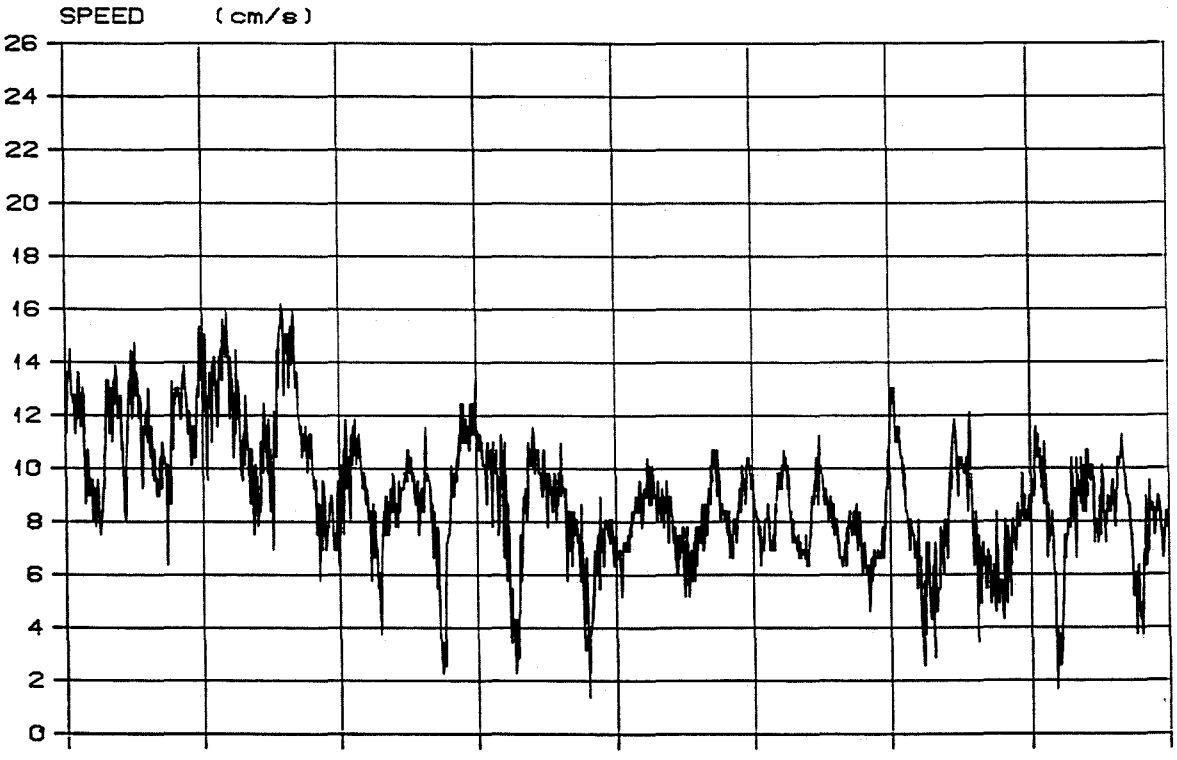
Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

H 1

Fig. 1-1-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

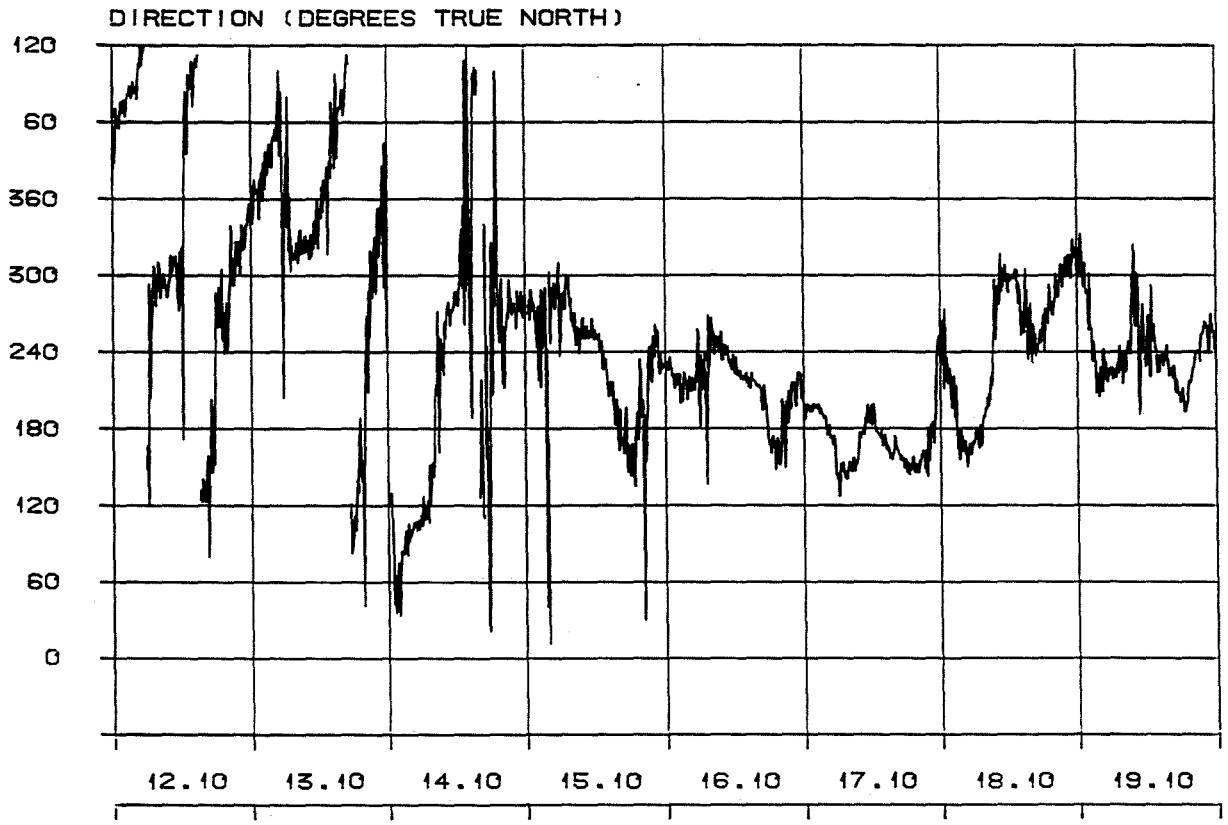
Instrument depth : 25.0 m Bottom depth : 315.0 m

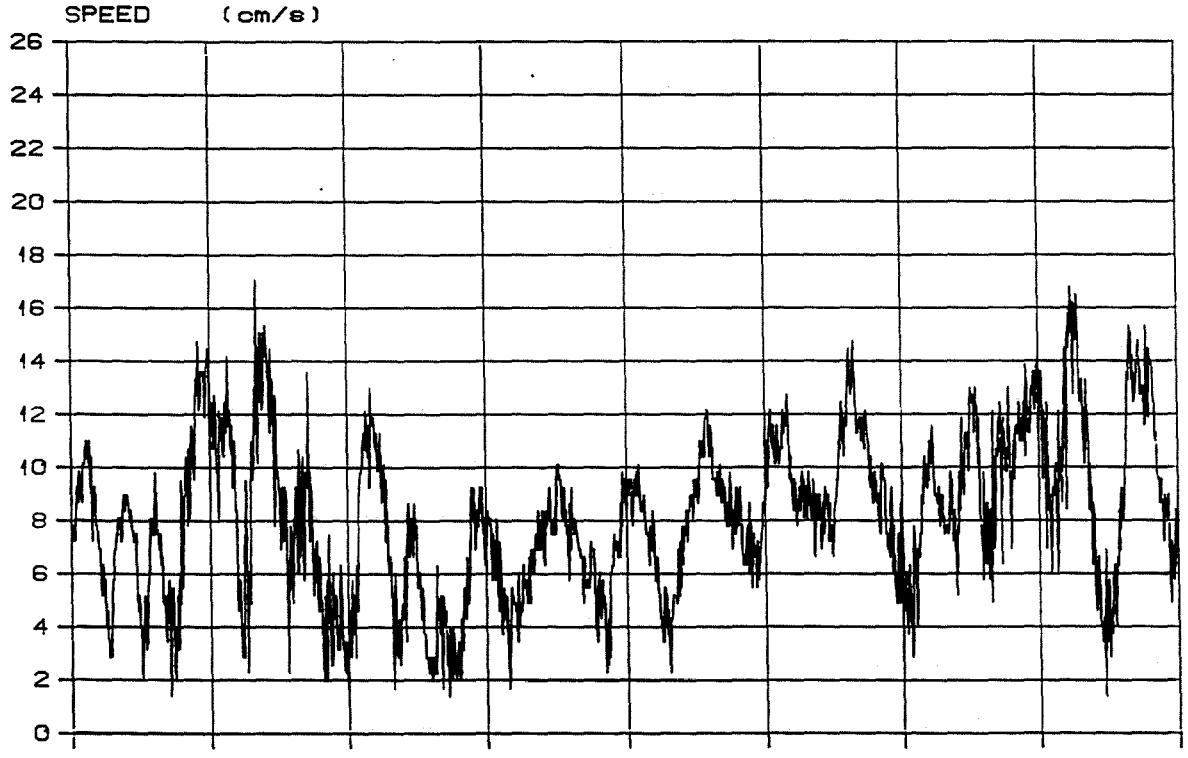
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

Fig. 1-1-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

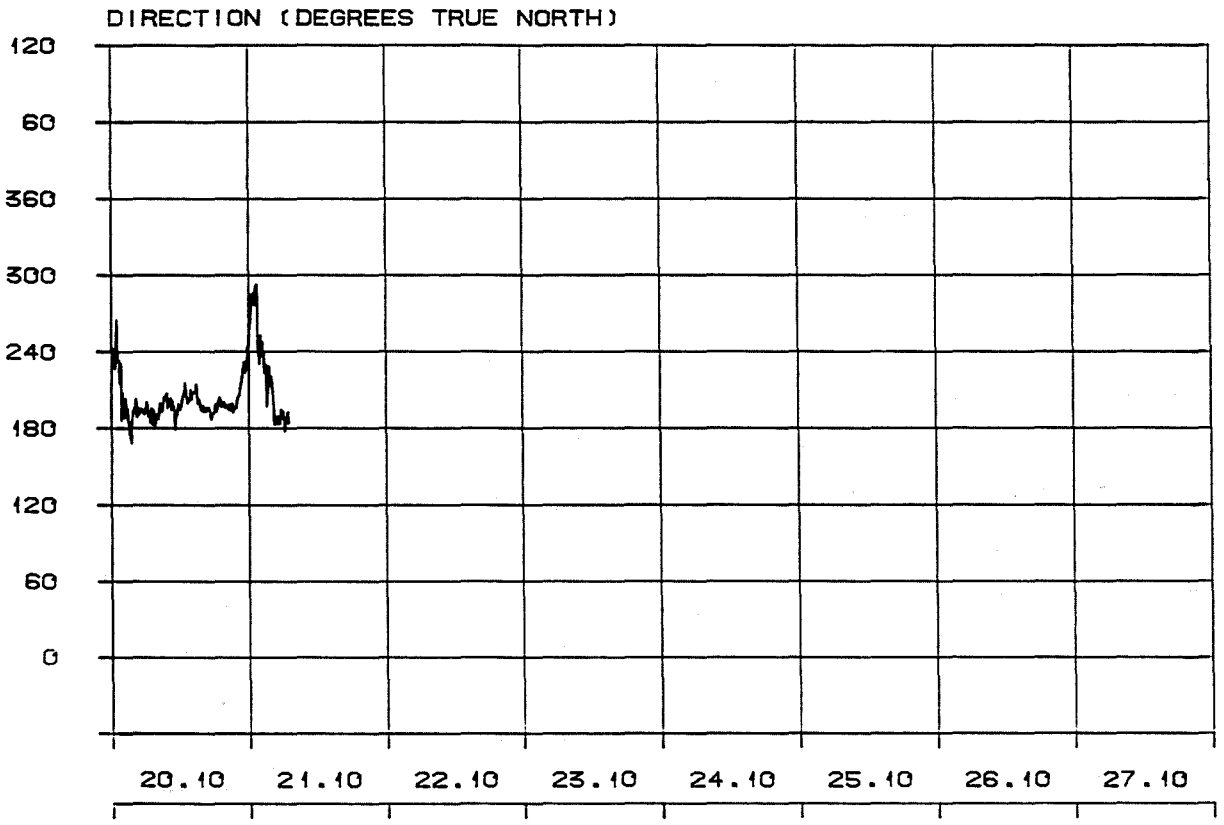
Instrument depth : 25.0 m Bottom depth : 315.0 m

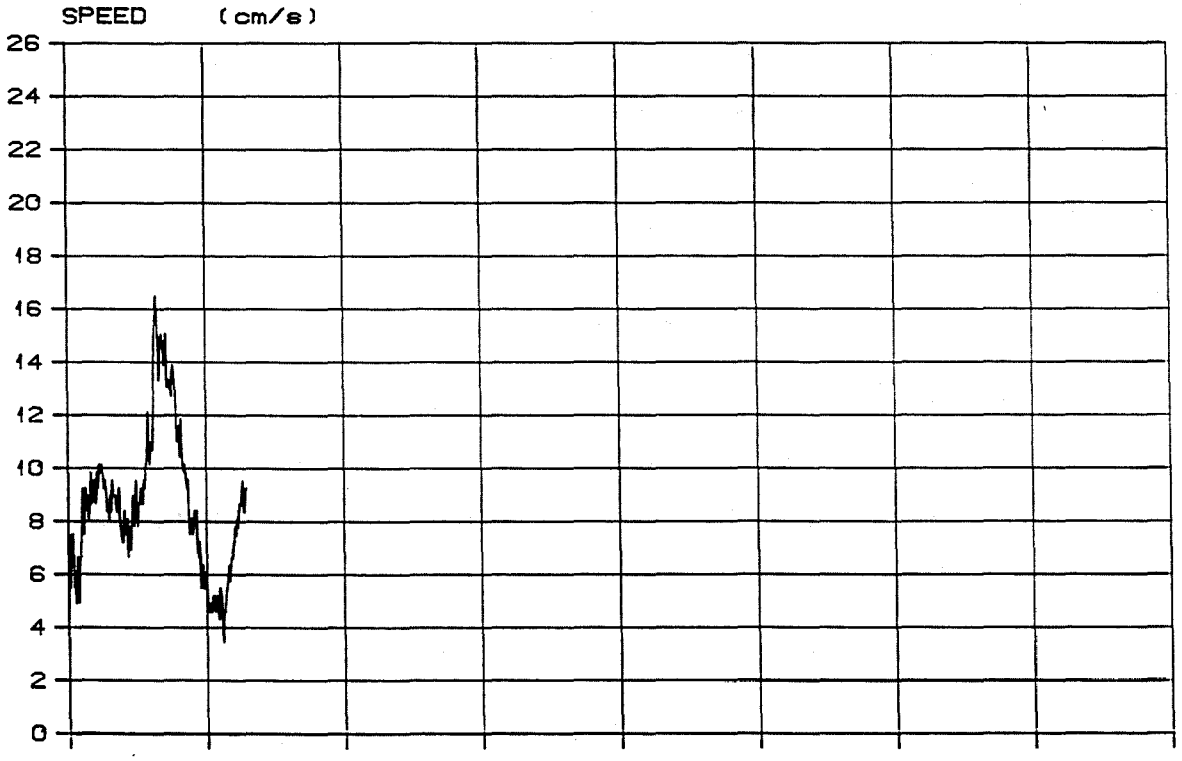
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

Fig. 1-1-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

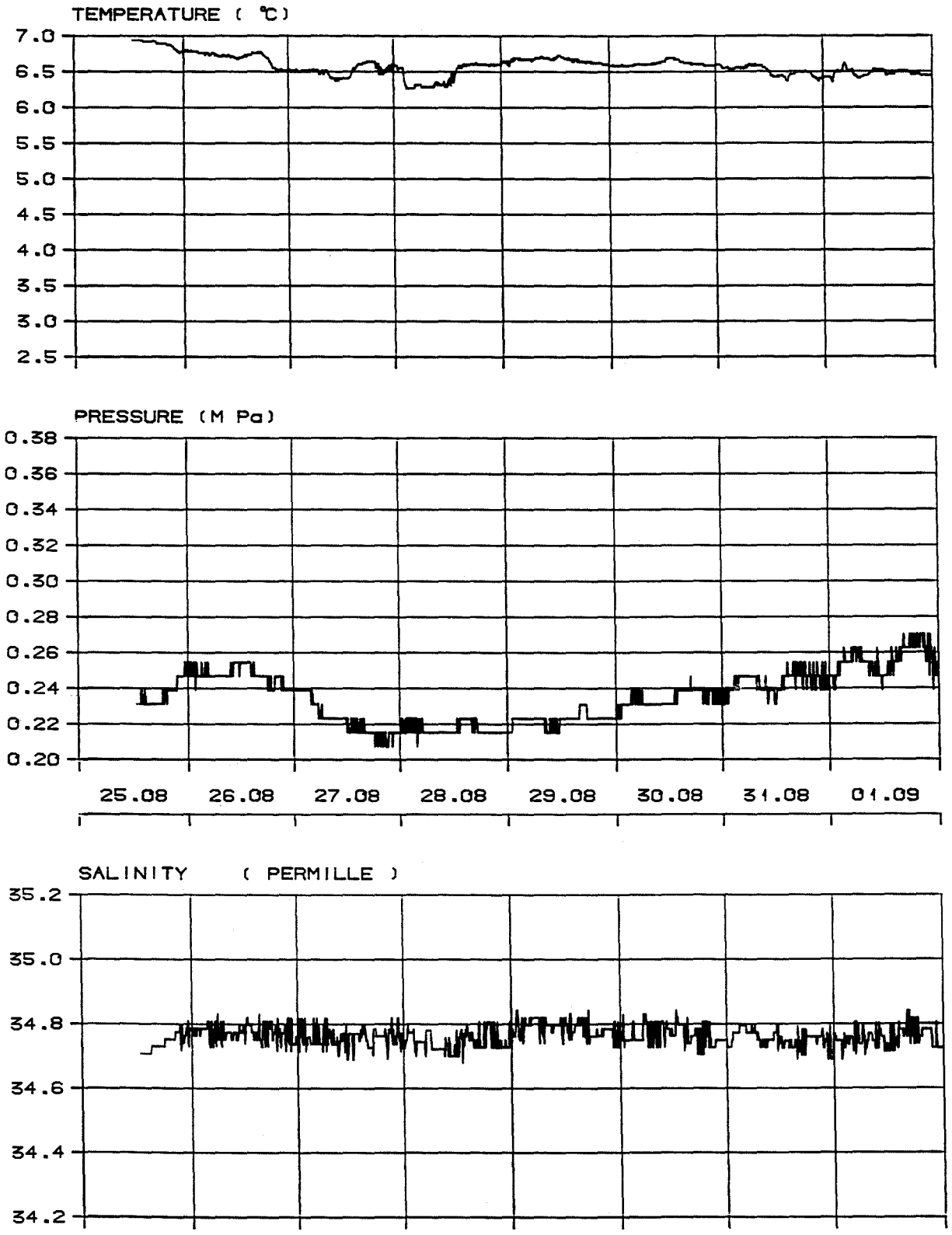
Instrument depth : 25.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

Fig. 1-1-7

Continues.....



The Barents Sea

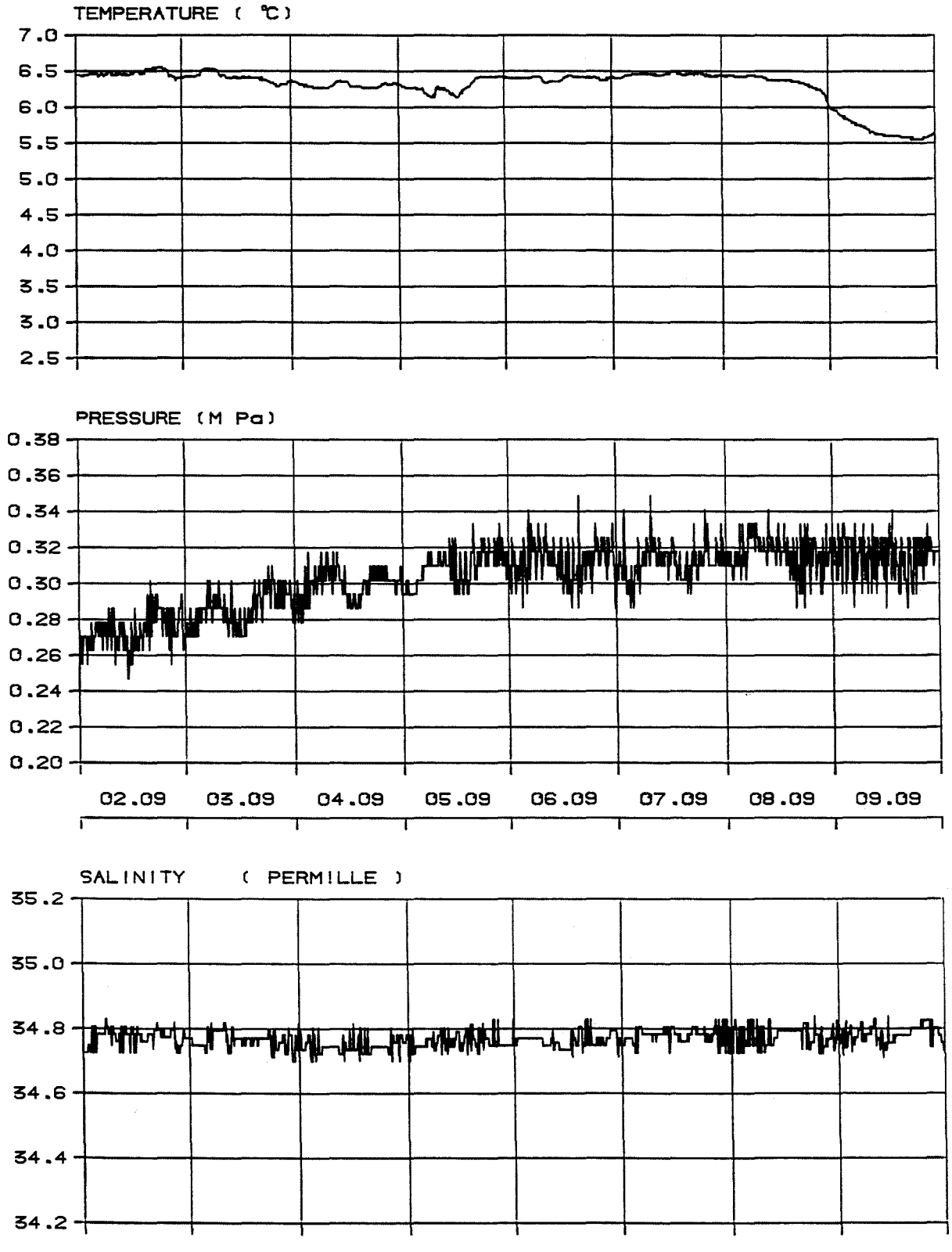
Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 25.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

Fig. 1-1-8 Temperature, pressure and salinity.



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

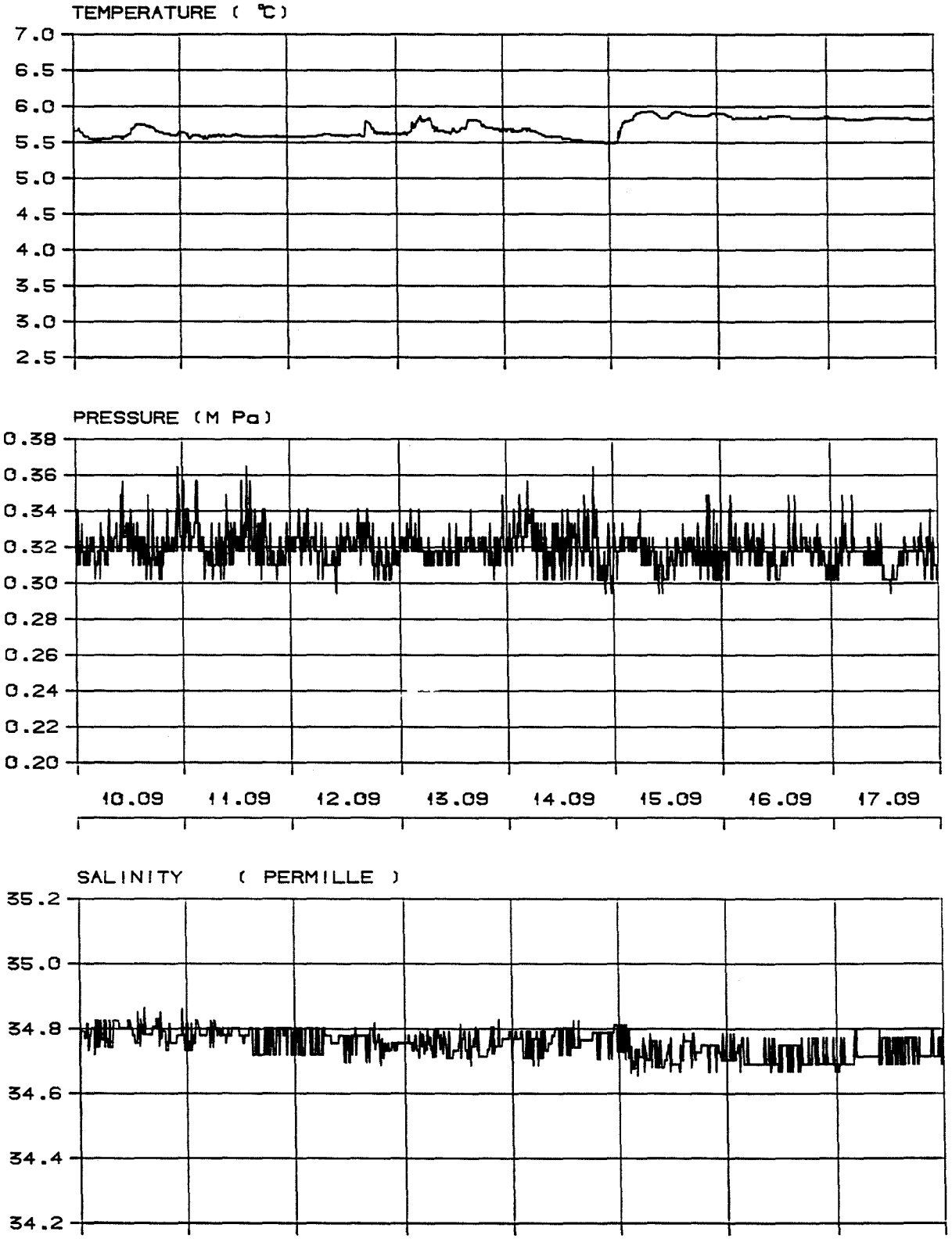
Instrument depth : 25.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

Fig. 1-1-8

Continues.....



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 25.0 m Bottom depth : 315.0 m

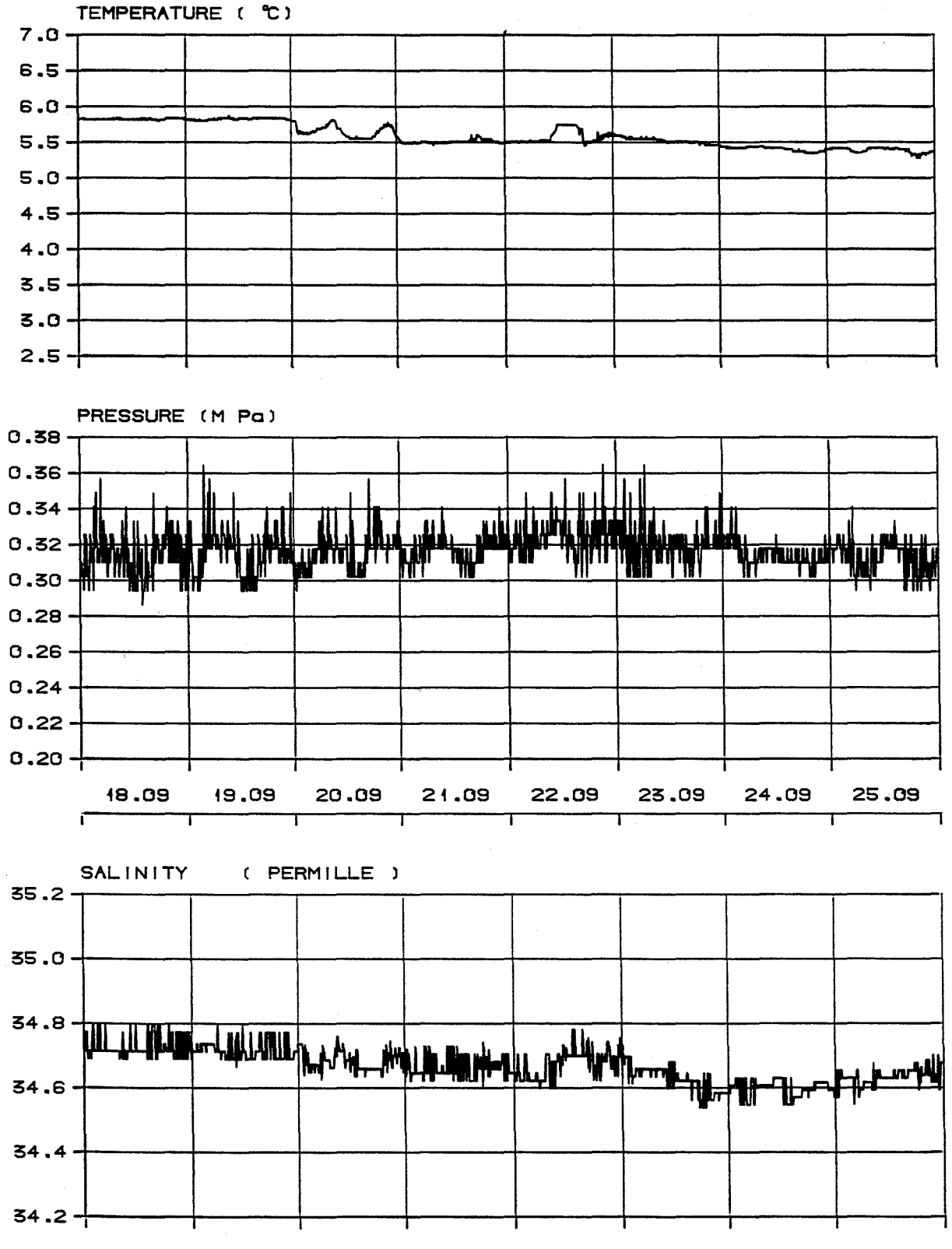
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

H I

Fig. 1-1-8

Continues.....



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

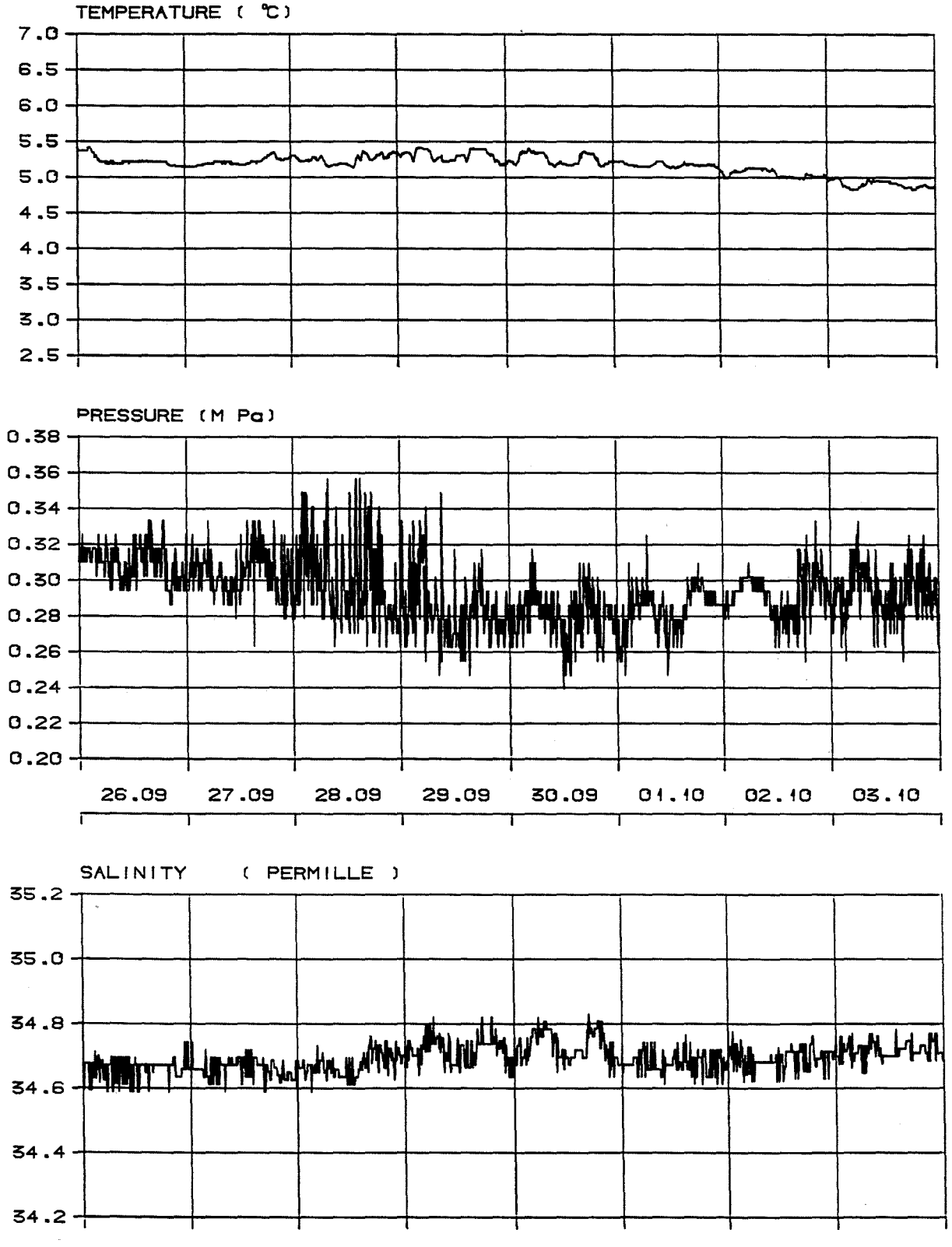
Instrument depth : 25.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

Fig. 1-1-8

Continues.....



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 25.0 m Bottom depth : 315.0 m

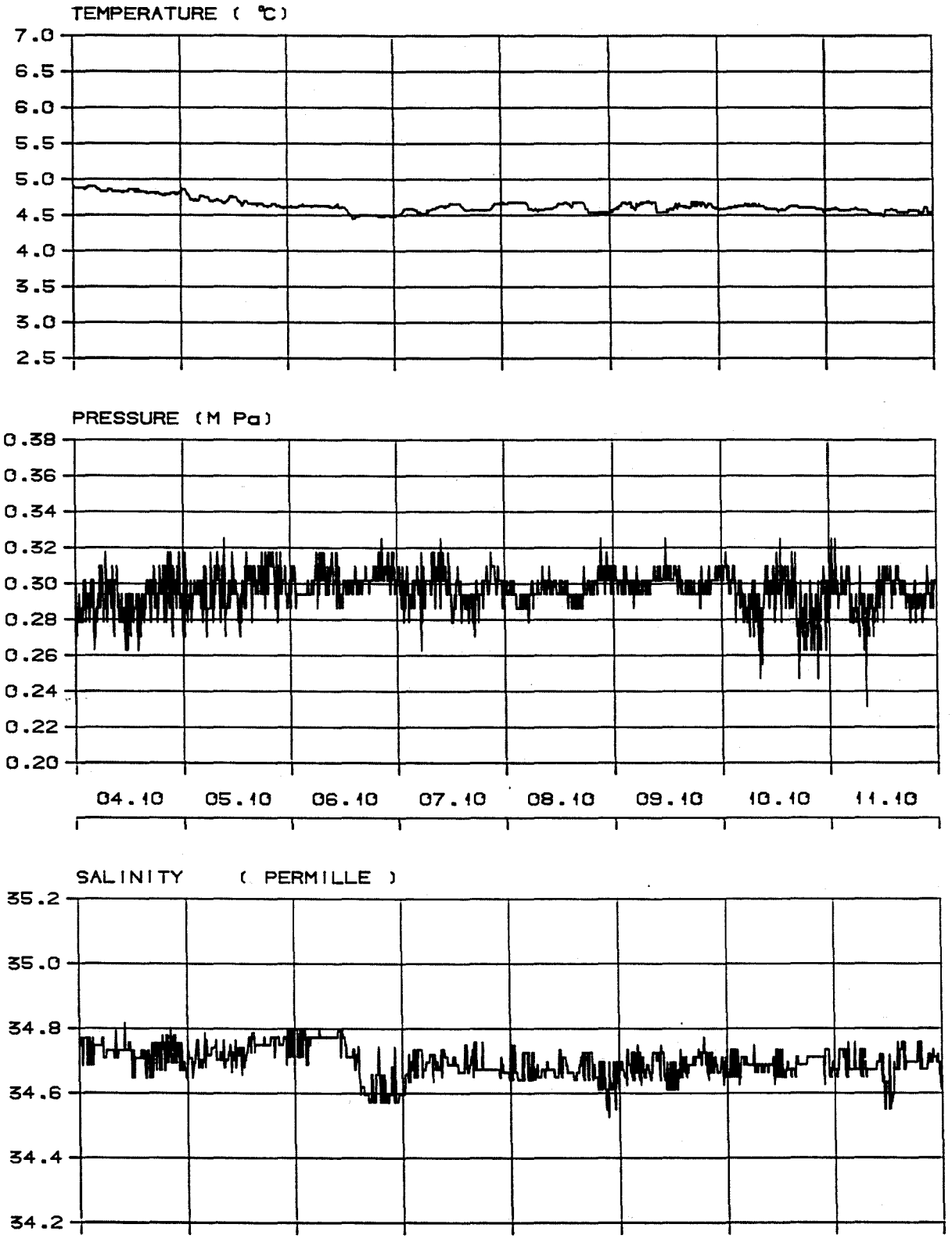
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

H 1

Fig. 1-1-8

Continues.....



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

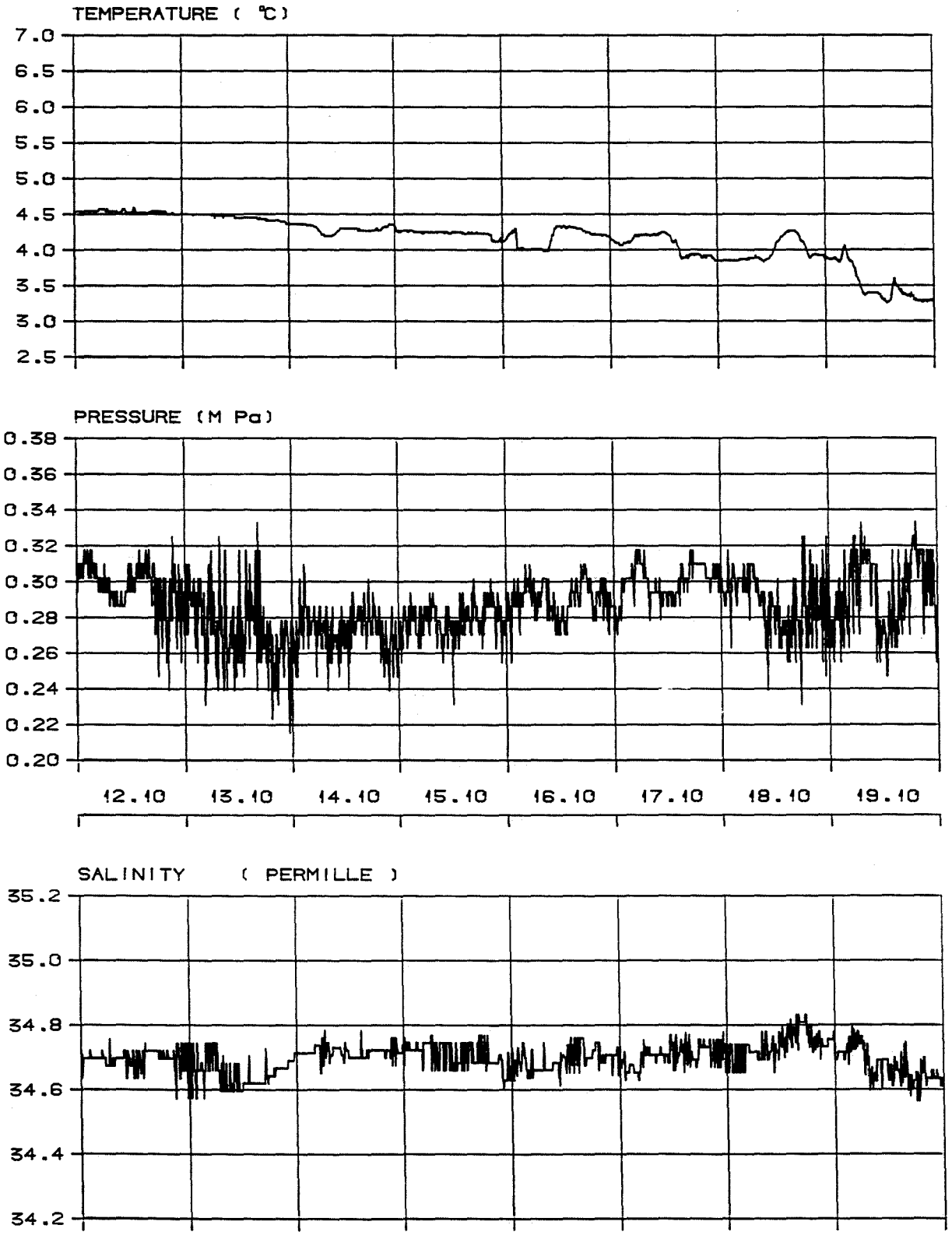
Instrument depth : 25.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

Fig. 1-1-8

Continues.....



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 25.0 m Bottom depth : 315.0 m

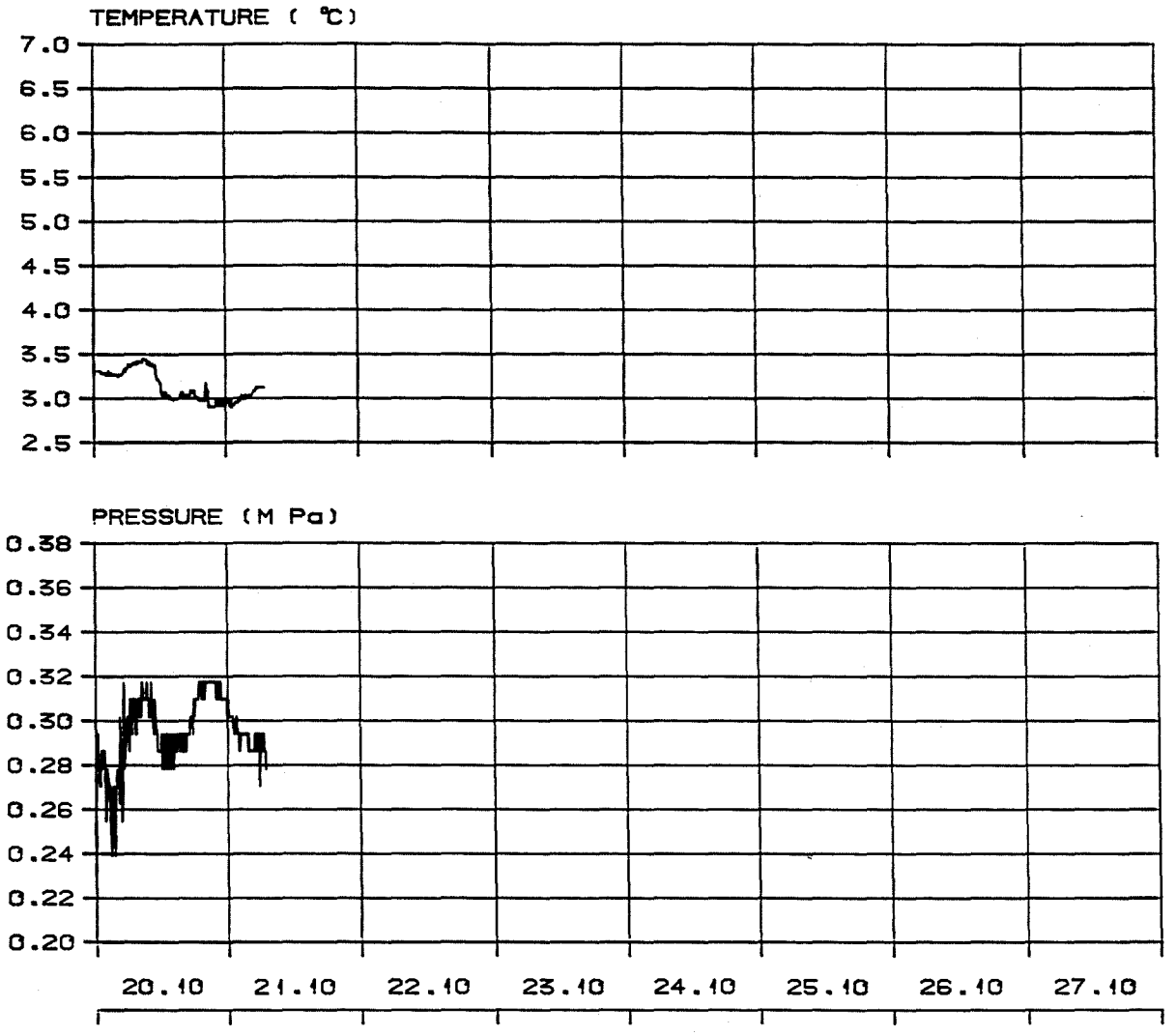
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

H 1

Fig. 1-1-8

Continues.....



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 25.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

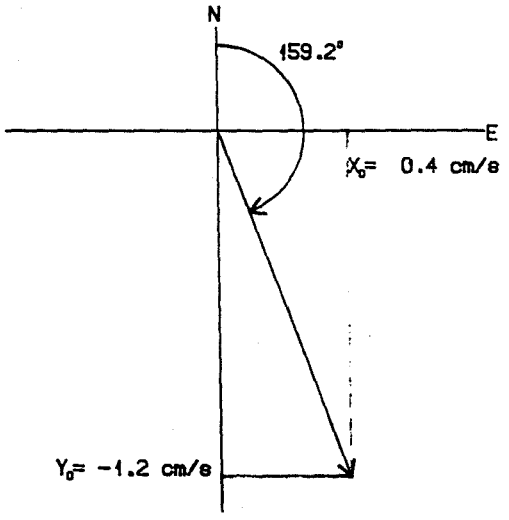
Fig. 1-1-8

Continues.....

HARMONIC ANALYSIS OF CURRENTS

CONSTITUENTS			DECOMPOSED CURRENT				TIDAL CURRENT ELLIPSE				
			E/W		N/S						
Symbol	Period houres	Frequense °/hour	X_j cm/s	g_{xj} °	Y_j cm/s	g_{yj} °	Major axis A_j cm/s	Minor axis B_j cm/s	θ_j °	g_j °	BETA. °
MM	661.31	0.5	0.6	108.3	2.1	231.1	2.1	0.5	171.3	53.1	165.6
MSF	354.37	1.0	0.9	284.3	1.6	285.9	1.8	0.0	29.0	285.6	103.5
N2	12.66	28.4	1.9	261.2	2.8	179.0	2.9	-1.9	189.4	5.3	133.4
M2	12.42	29.0	6.5	128.7	4.0	20.4	6.9	-3.8	106.0	137.7	18.7
L2	12.19	29.5	0.7	76.3	0.9	7.5	1.1	-0.7	25.8	24.3	38.6
S2	12.00	30.0	1.8	118.0	1.9	348.2	2.3	-1.1	317.0	324.7	24.8

MEAN CURRENT



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 25.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

H 1

Fig. 1-1-9 Harmonic analysis of current.

\ discription of the model and its definitions :

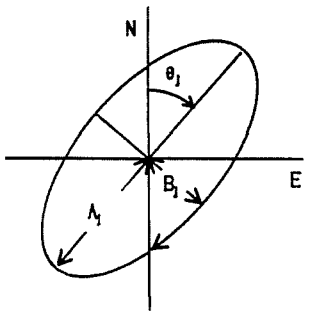
urrent-vector decomposed in E/W (real) - and N/S (imaginary) - direction :

$$Z(t)=X_0+\sum_{j=1}^{n}(X_j\cos(\sigma_j t+(V_0+u)_j-g_{xj})+i(Y_0+\sum_{j=1}^{n}Y_j\cos(\sigma_j t+(V_0+u)_j-g_{yj}))$$

g_{xj} , g_{yj} : Greenwich-phase for E/W- and N/S-components of each constituent.

lith ellipseparameters :

$$Z(t)=\sum_{j=1}^{n}\exp(i(90^\circ-\theta_j))(A_j\cos(\sigma_j t+(V_0+u)_j-g_j)+iB_j\sin(\sigma_j t+(V_0+u)_j-g_j))$$



g_j : Greenwich phase of the current-vector for each constituent.

Rotationdirection : anticlockwise when $B_j > 0$, clockwise when $B_j < 0$

BETA : The angle between t=0 and major halv axis in the ellipse.

Common for both modles :

σ_j : Frequence in degrees/hour.

$(V_0+u)_j$: Astronomic argument relative to Greenwich-meridian.

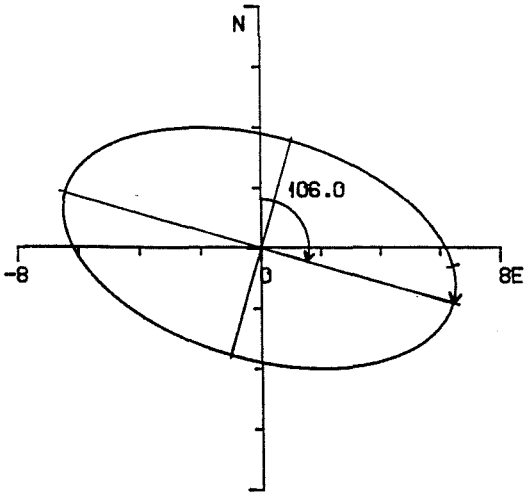
During the calculation of Z(t) will V_0+u be put into the formulas at the time t=0.

The time t is in houres; the same timezone as the analysed data.

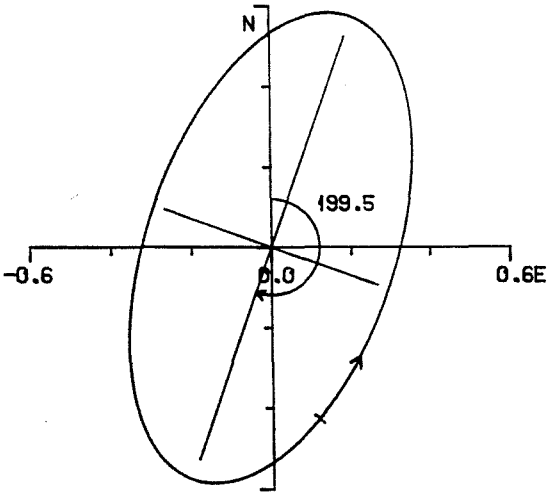
t=0 in the midle of the measurement series : 1989 22.09 H. 2200 ,

marked with a line on the ellipse.

M2-ellipse



K1-ellipse



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

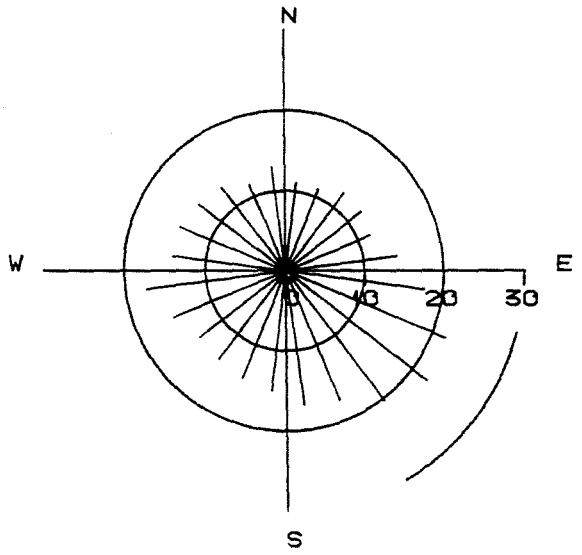
Instrument depth : 25.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

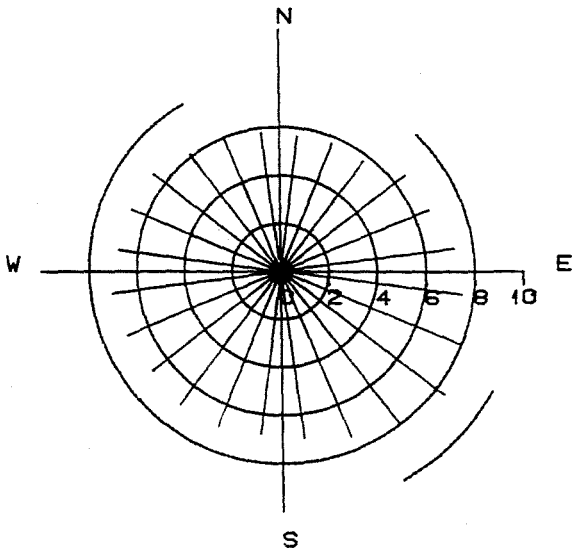
Observation period: 1989 25.08 H. 1240 - 1989 21.10 H. 0700

Fig. 1-1-10 M2 and K1 ellipse.

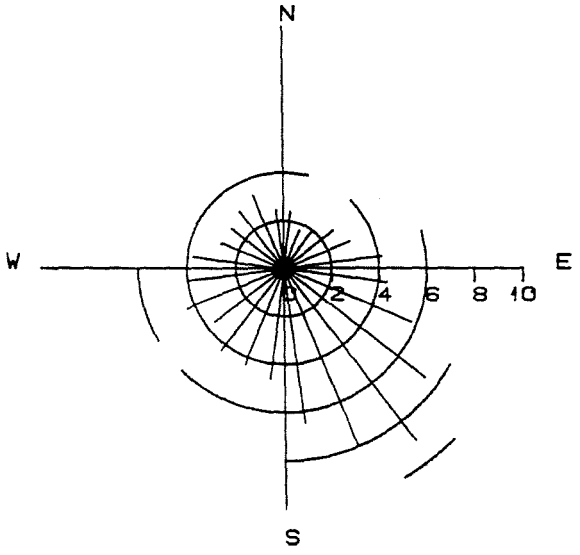
CURRENT VELOCITY DISTRIBUTION



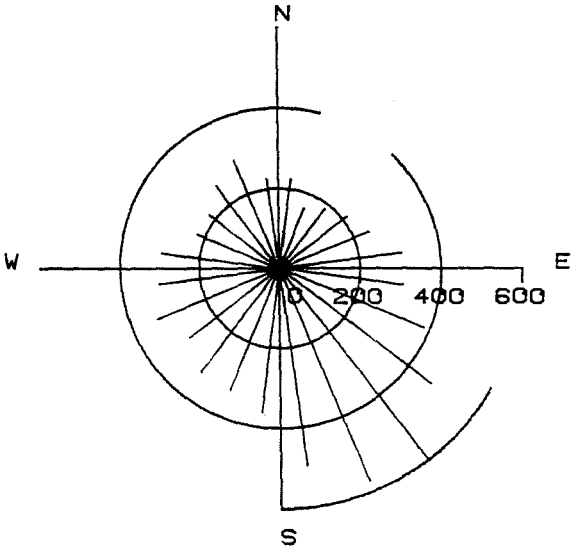
Maksimum velocity (cm/s)



Mean velocity (cm/s)



Relative flux in %



Number measured

Number of obeervations : 7611

The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 50.0 m Bottom depth : 315.0 m

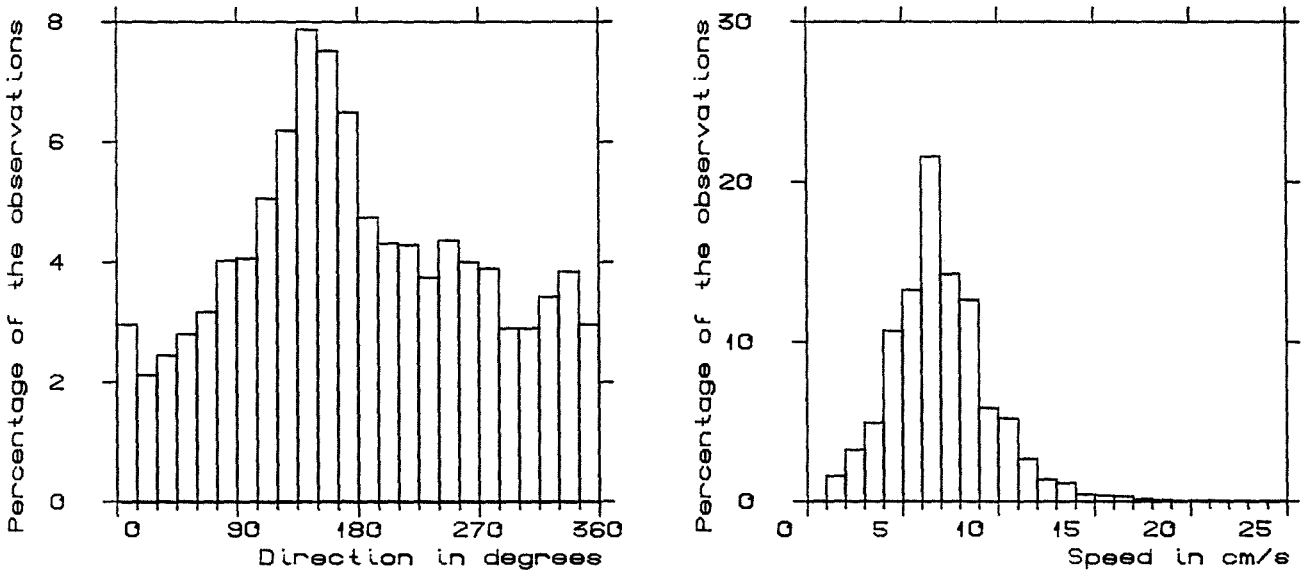
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

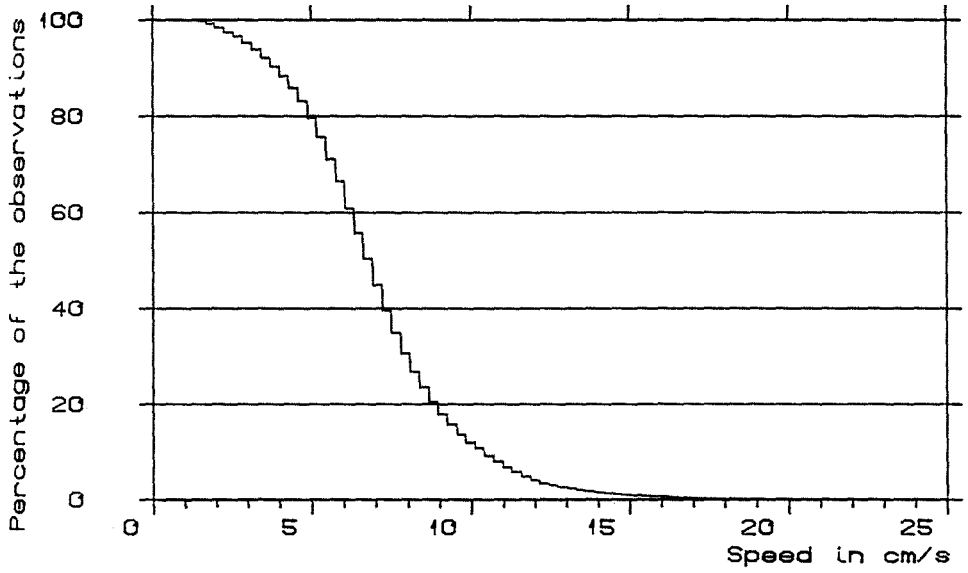
H 1

Fig. 1-2-1 Current velocity distribution.

HISTOGRAM



CURRENT SPEED DISTRIBUTION



Number of observations : 7611

The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 50.0 m Bottom depth : 315.0 m

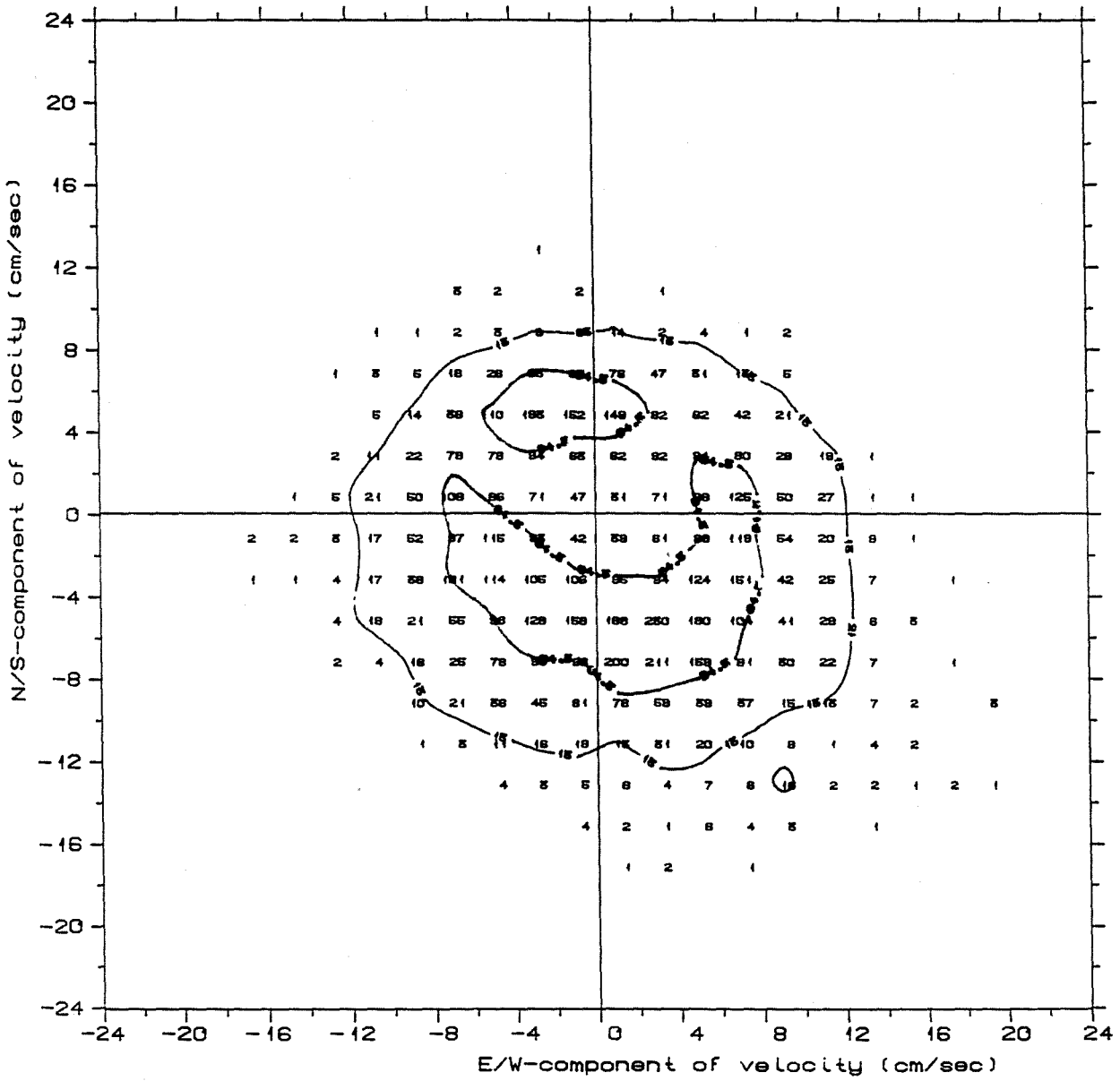
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

H I

Fig. 1-2-2 Histogram of speed and direction. Current speed distribution.

VELOCITY DISTRIBUTION DIAGRAM



Number of observations : 7611

Isoline for 50% and 96%

Number of observations : 7611

The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 50.0 m Bottom depth : 315.0 m

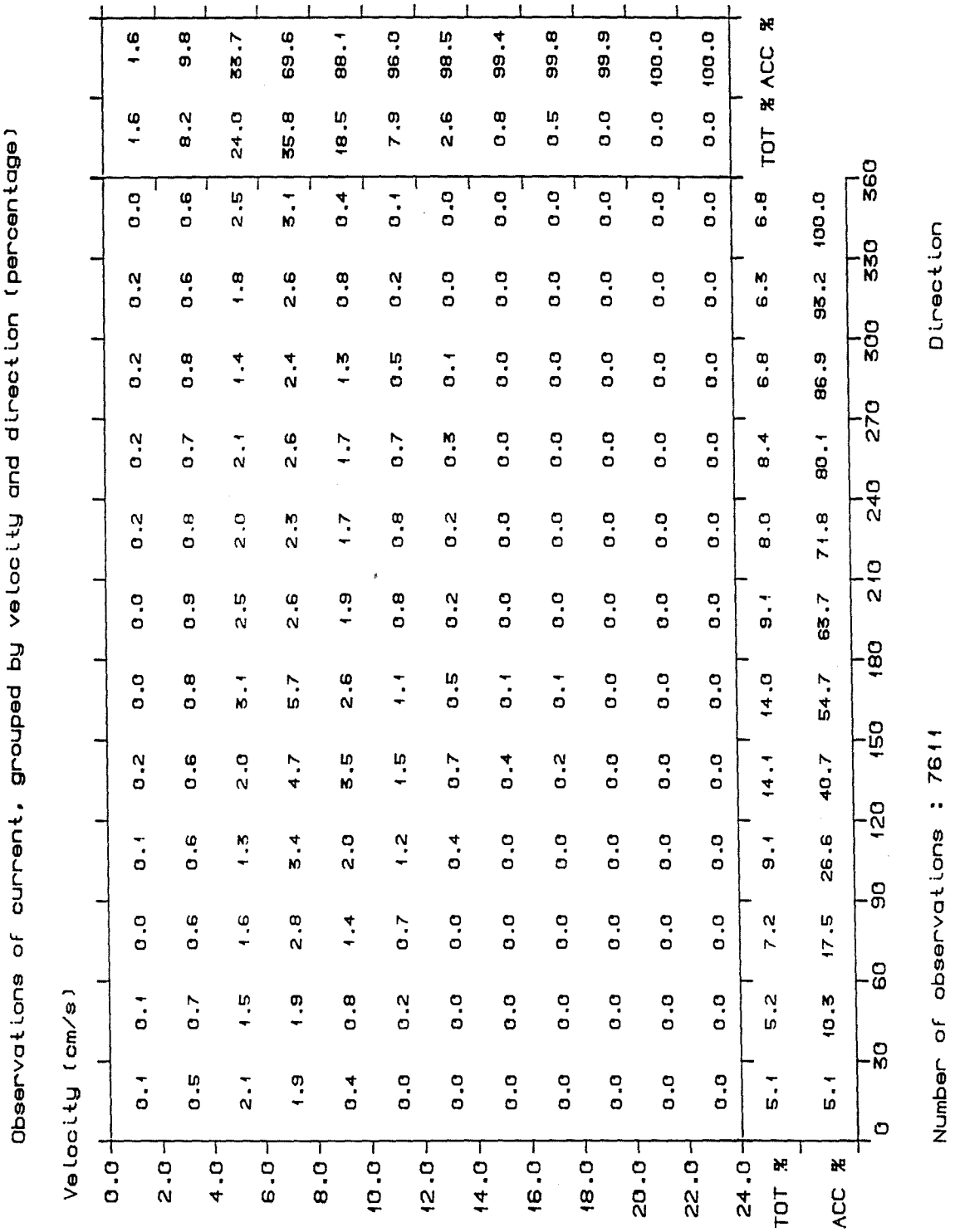
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

H 1

Fig. 1-2-3 Velocity distribution diagram.

DIRECTION DISTRIBUTION OF CURRENT VELOCITY



Number of observations : 7611

The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

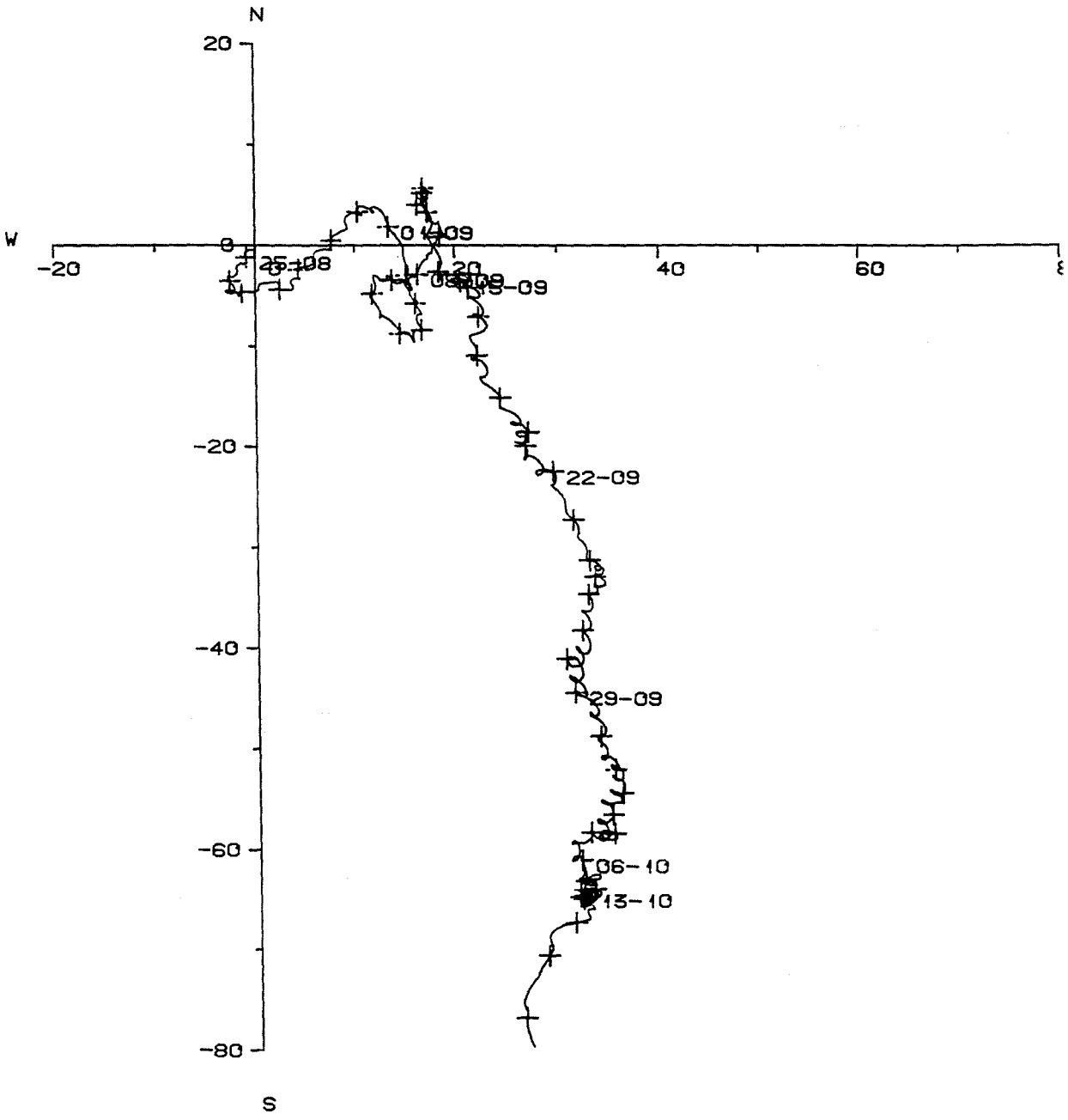
Instrument depth : 50.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

Fig. 1-2-4 Velocity distribution table.

PROGRESSIVE VECTOR DIAGRAM



Units in km

Number of obeervations : 7611

The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

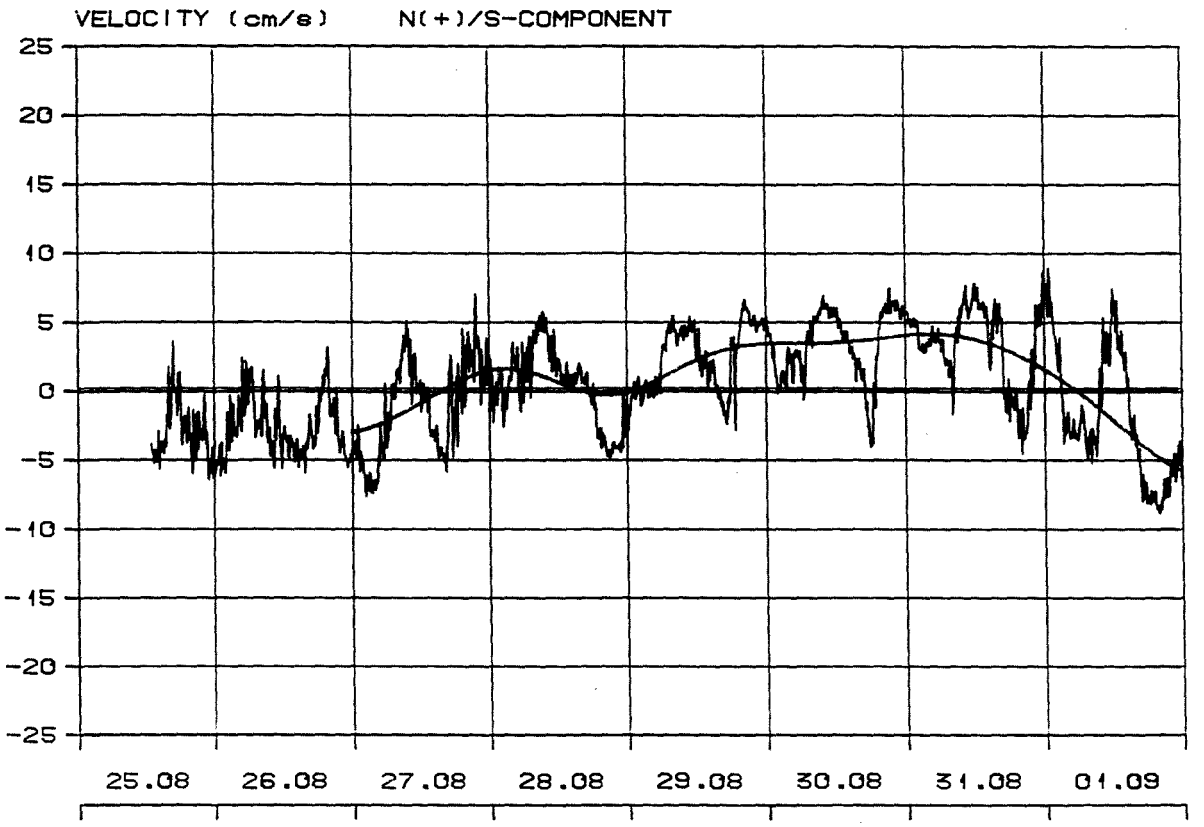
Instrument depth : 50.0 m Bottom depth : 315.0 m

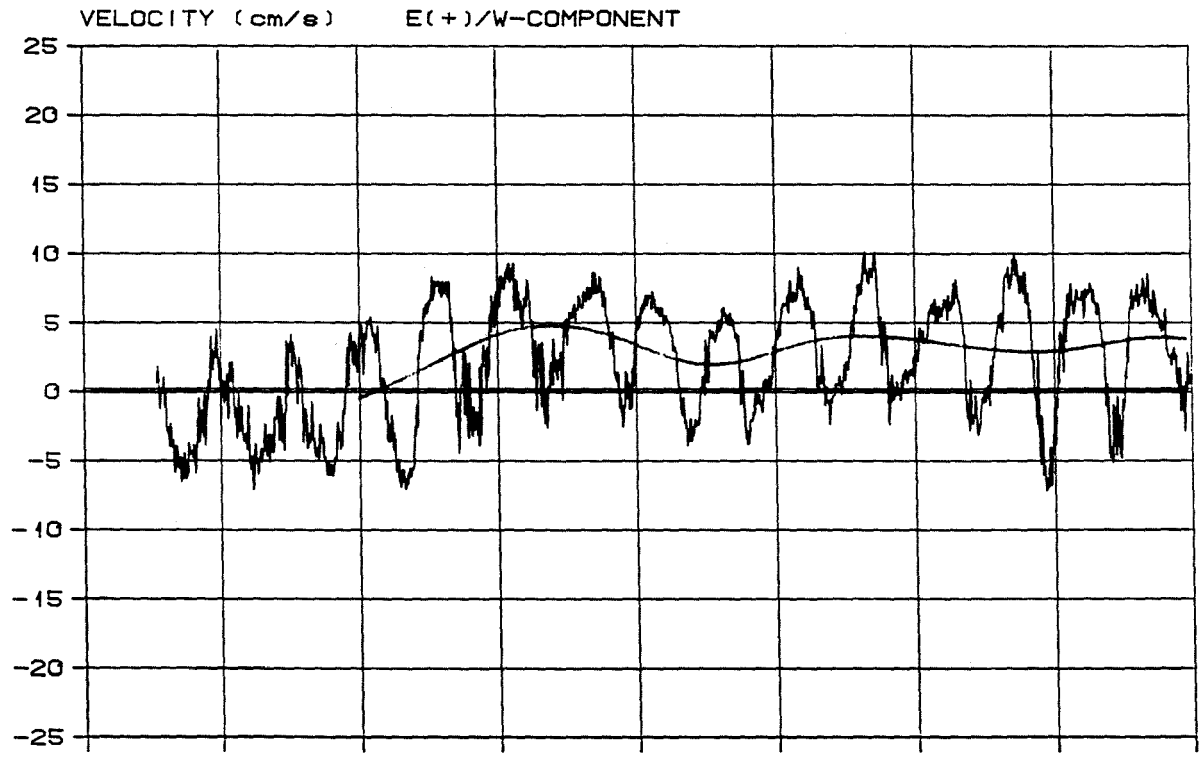
Time interval : 10.00 minutes.

Obeervation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

H 1

Fig. 1-2-5 Progressive vector diagram.





The Barents Sea

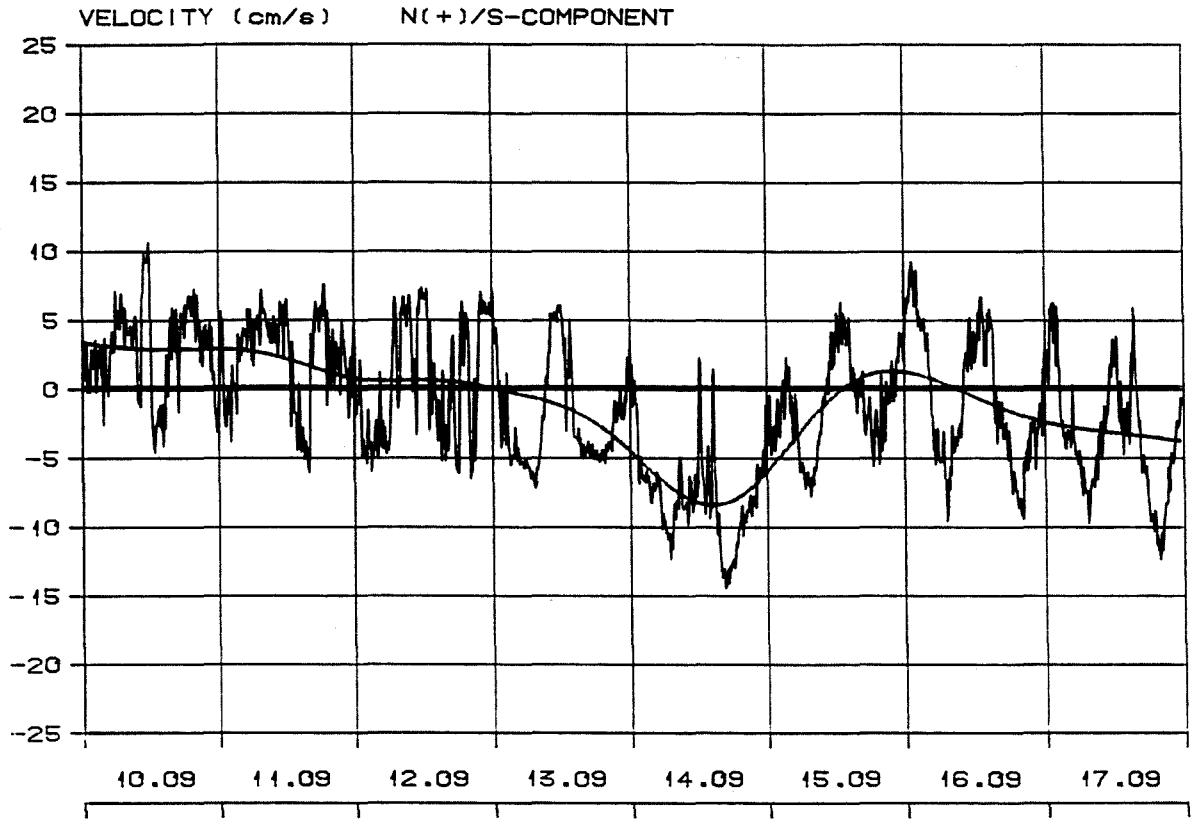
Position : N 73° 4.80' E 40° 0.00'

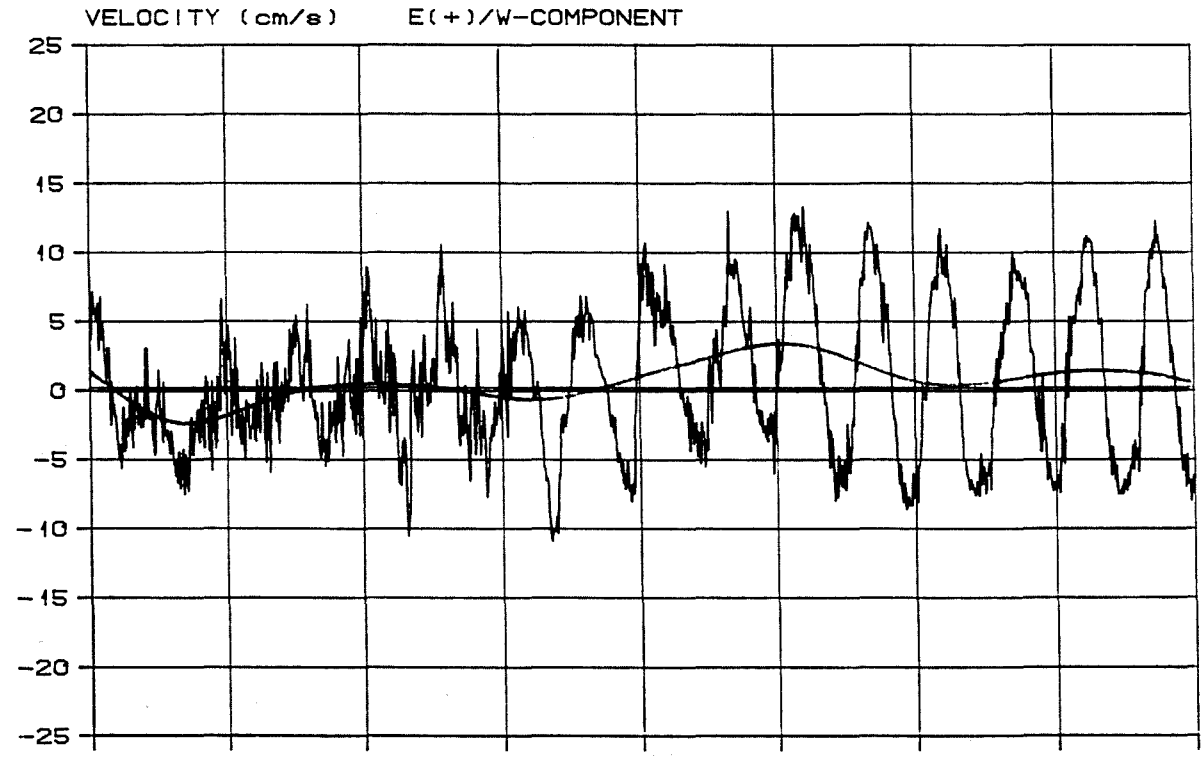
Instrument depth : 50.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

Fig. 1-2-6 Current velocity distribution.





The Barents Sea

Position : N 73° 4.80' E [illegible] 0.00'

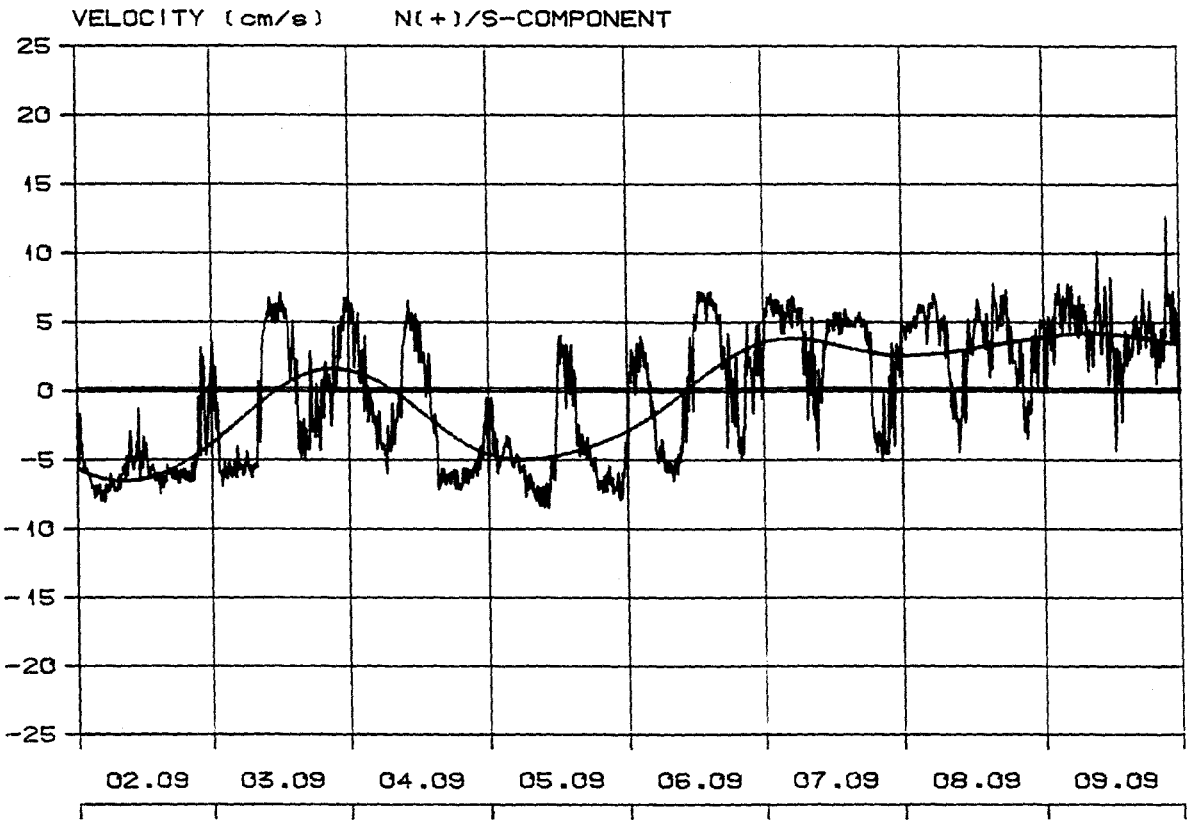
Instrument depth : 50.0 m Bottom depth : 315.0 m

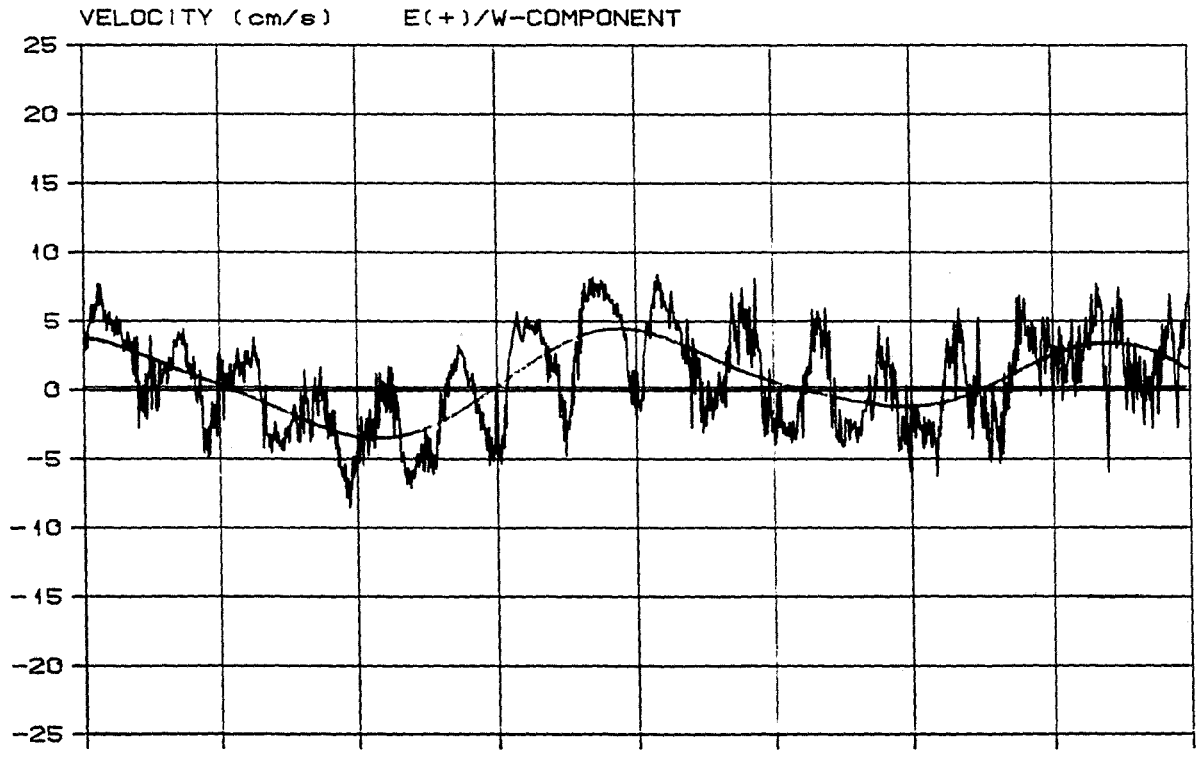
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

Fig. 1-2-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 50.0 m Bottom depth : 315.0 m

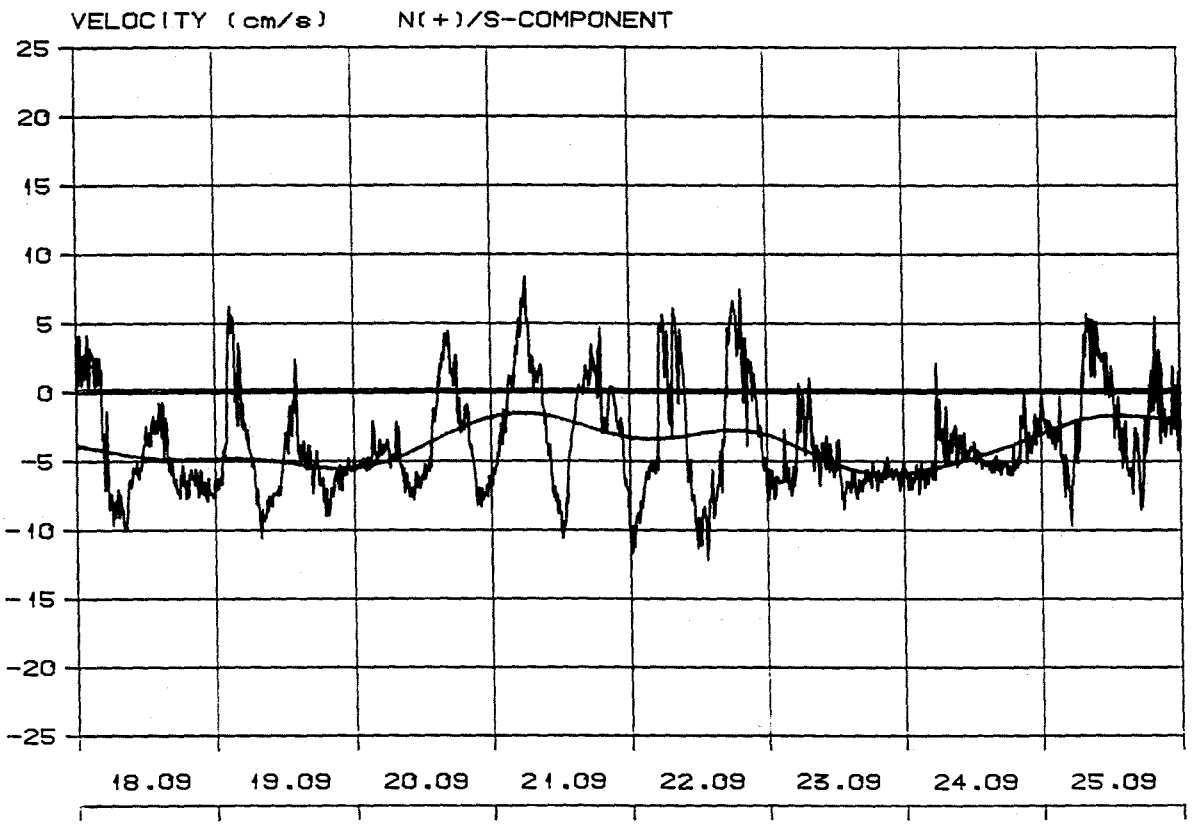
Time interval : 10.00 minutes.

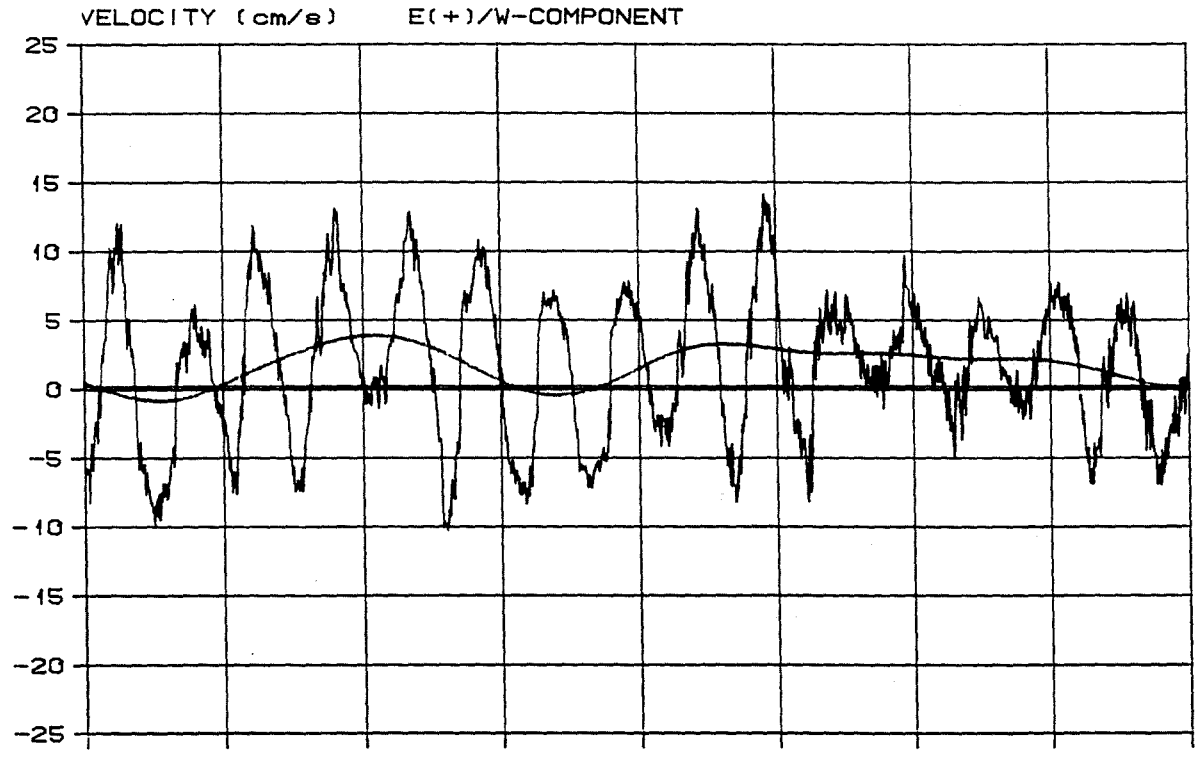
Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

H 1

Fig. 1-2-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 50.0 m Bottom depth : 315.0 m

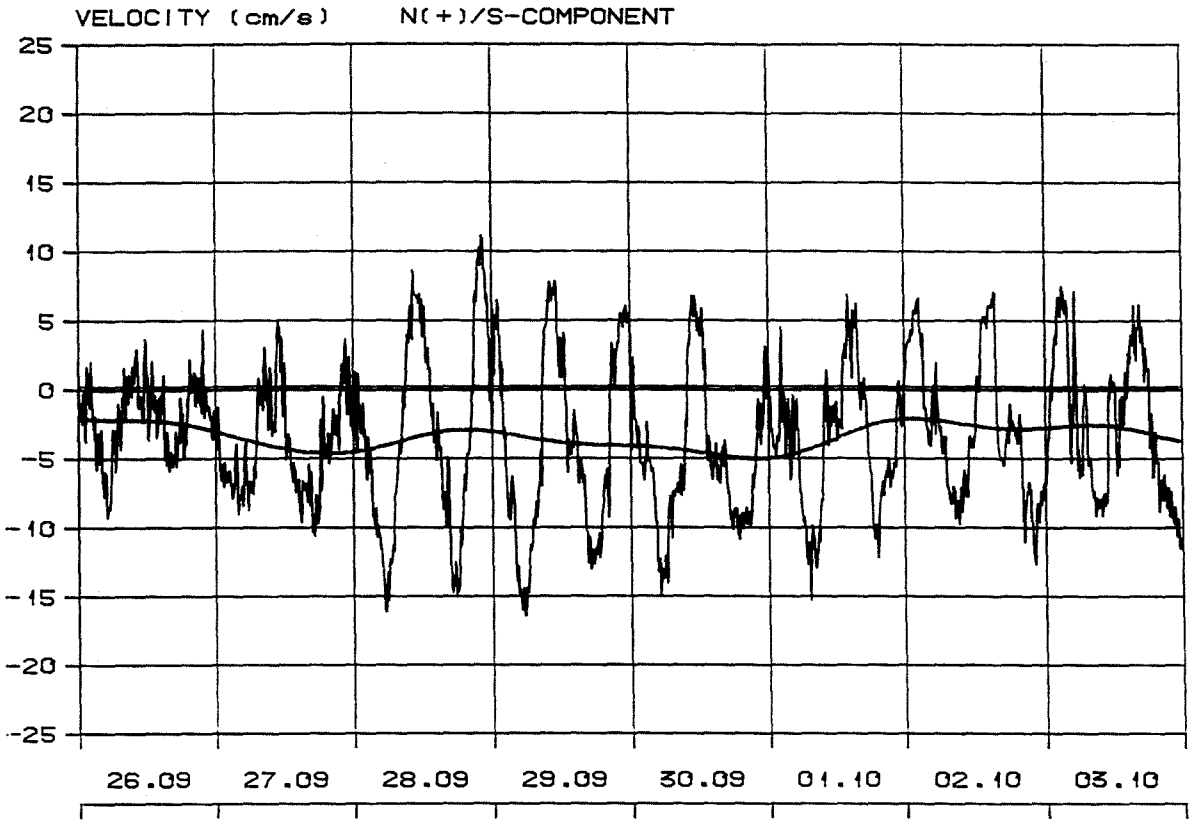
Time interval : 10.00 minutes.

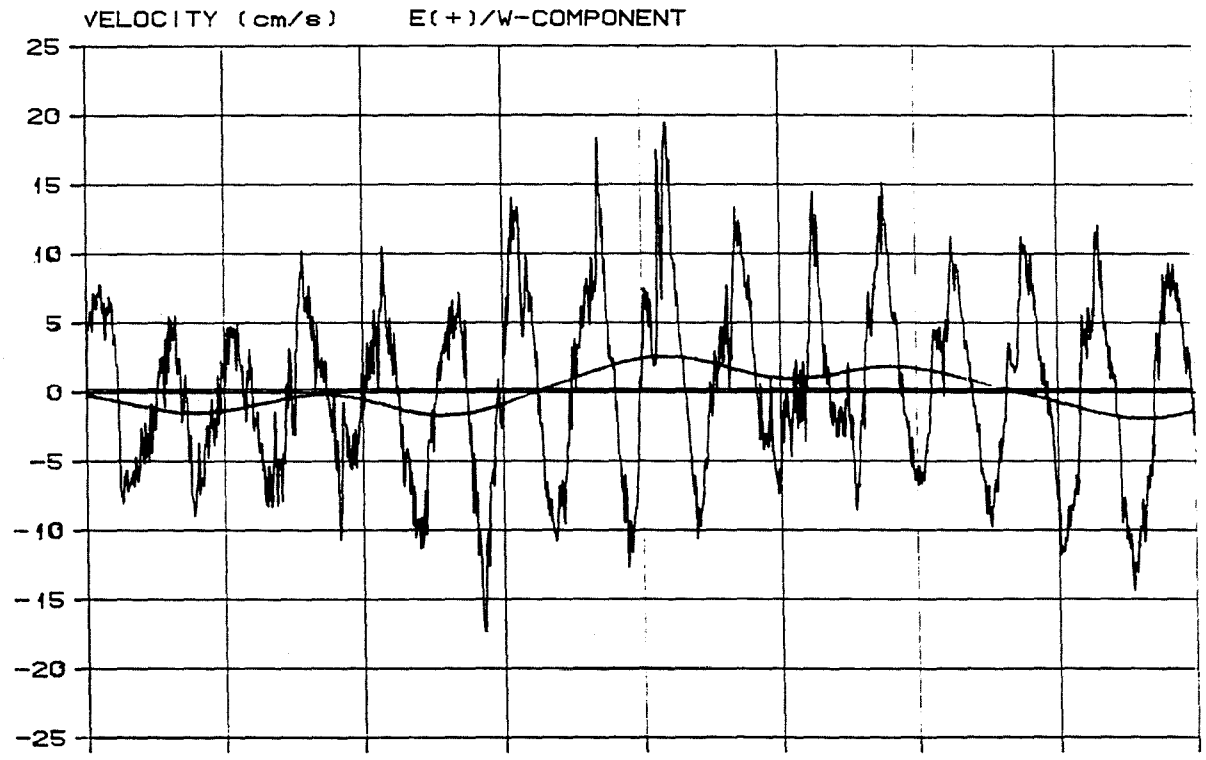
Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

H 1

Fig. 1-2-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

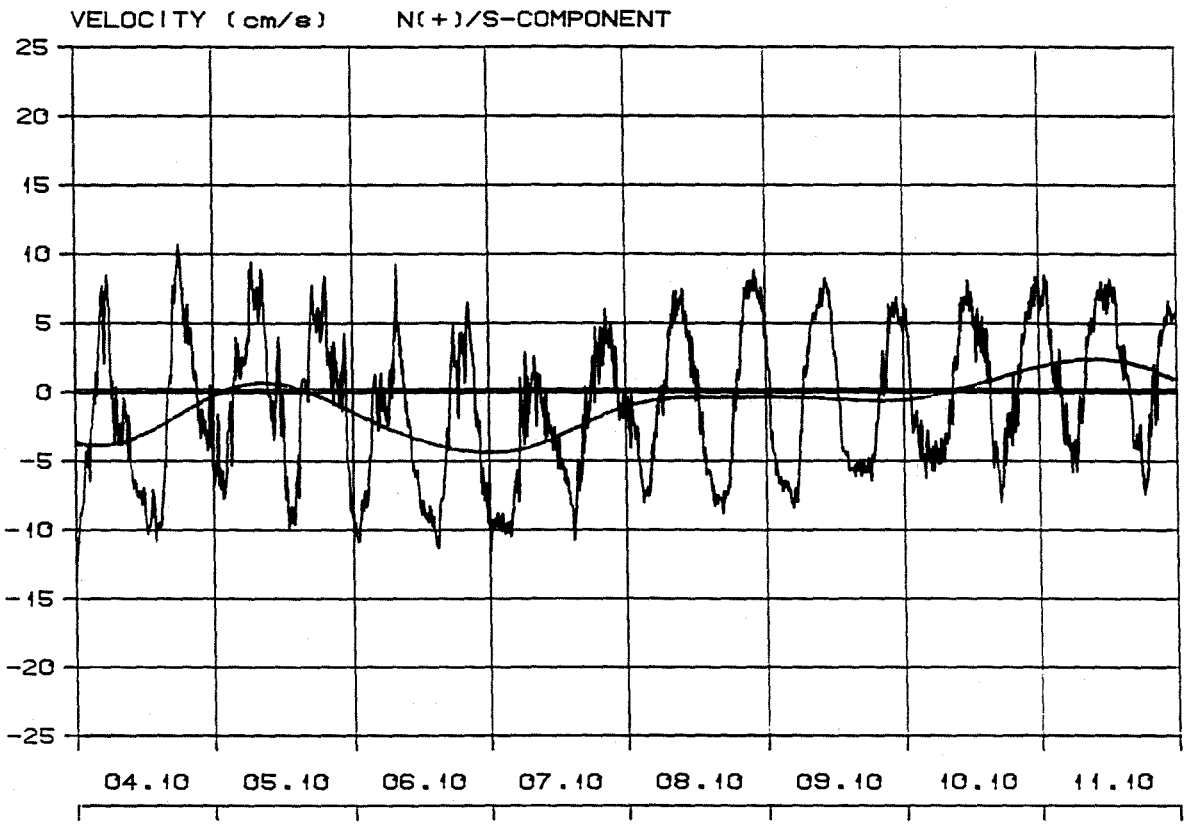
Instrument depth : 50.0 m Bottom depth : 315.0 m

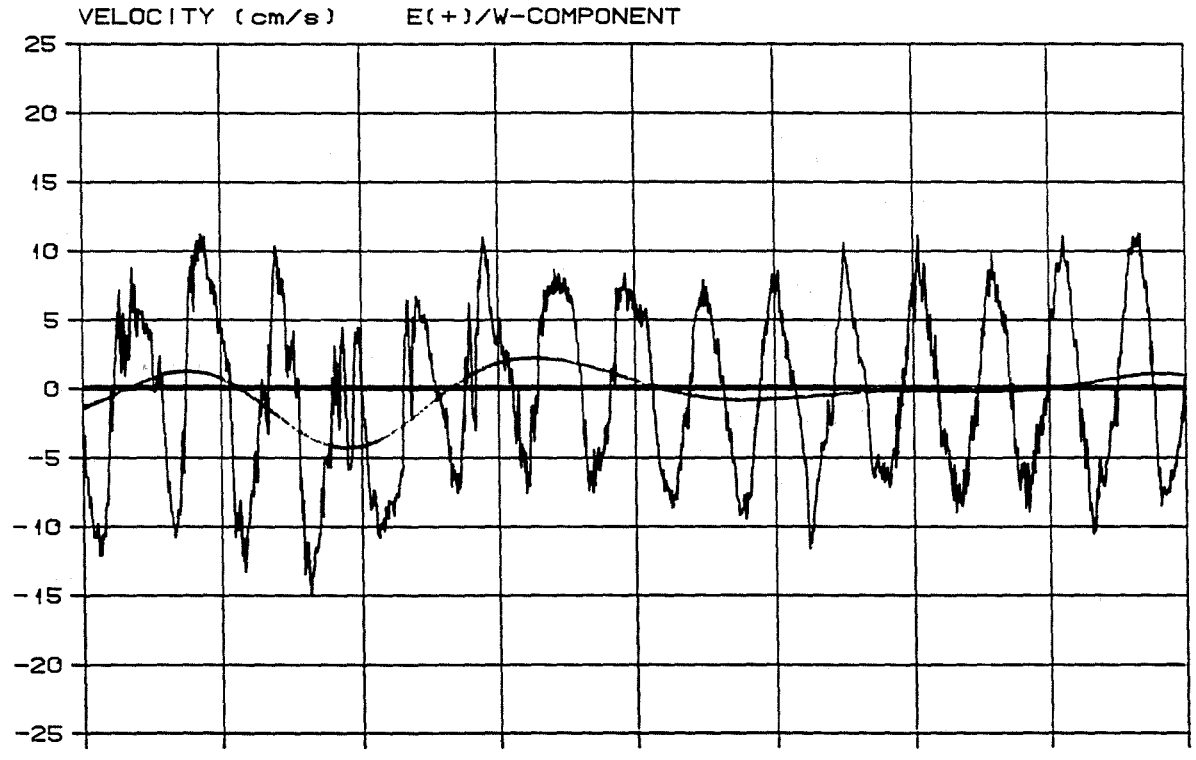
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

Fig. 1-2-6

Continues.....





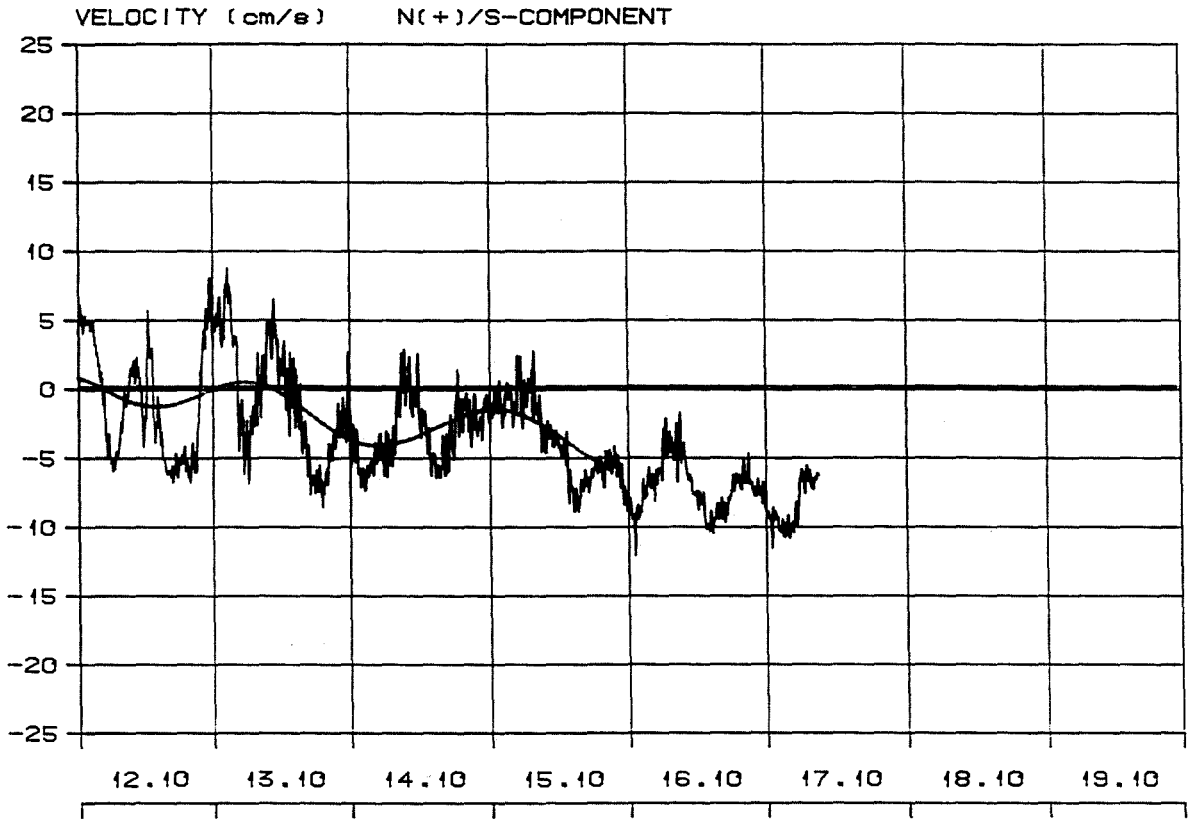
The Barents Sea

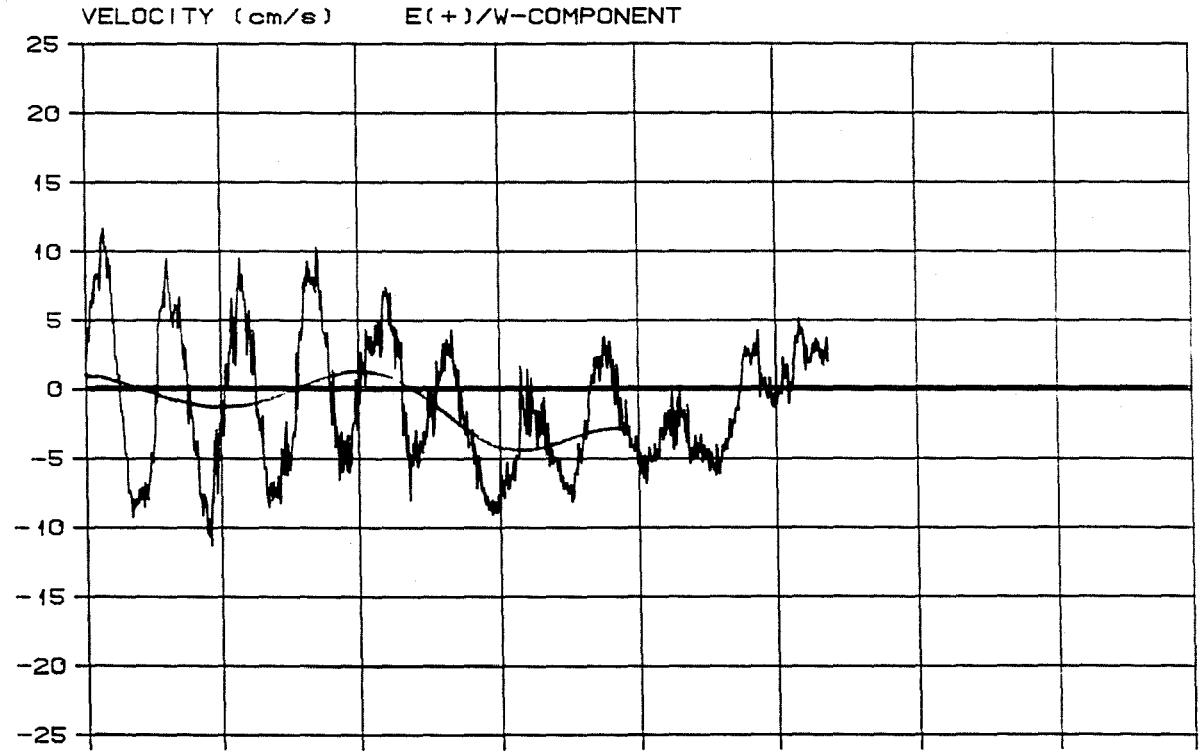
Position : N 73° 4.80' E 40° 0.00'
Instrument depth : 50.0 m Bottom depth : 315.0 m
Time interval : 10.00 minutes.
Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

H 1

Fig. 1-2-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 50.0 m Bottom depth : 315.0 m

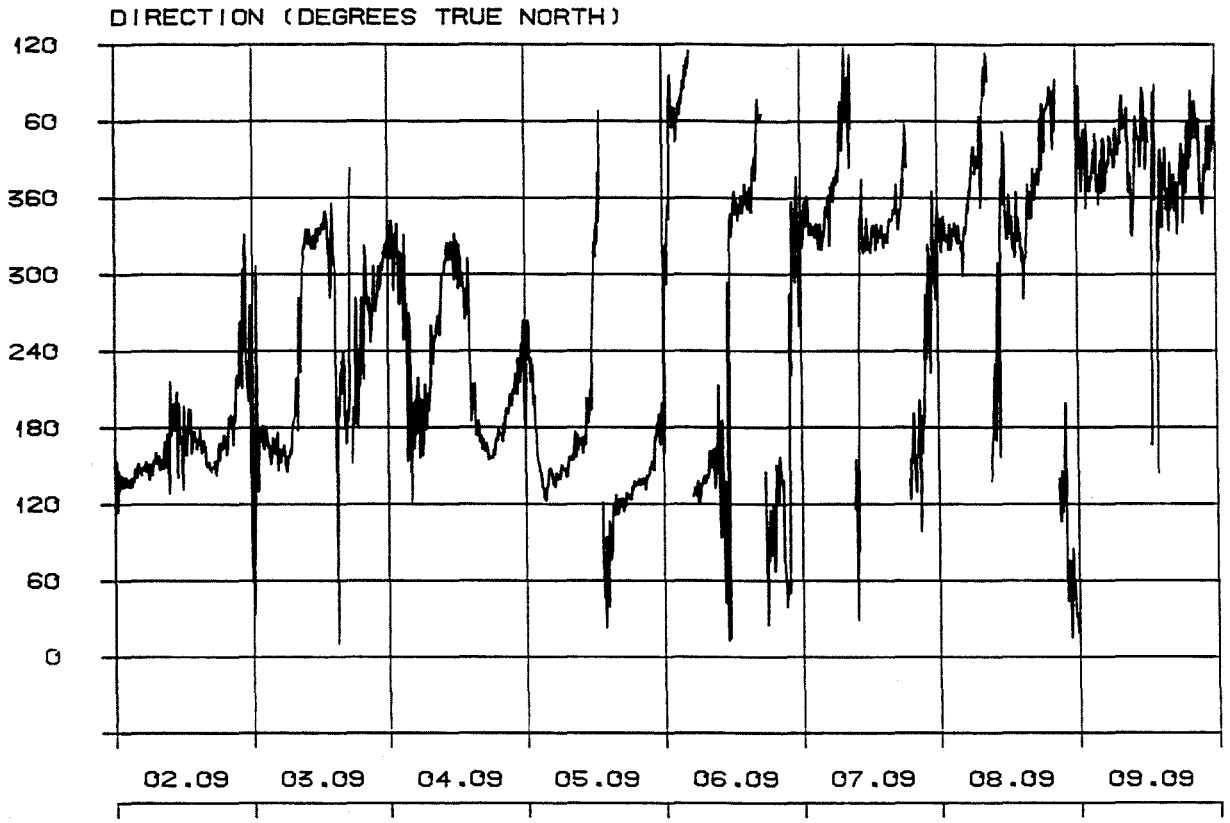
Time interval : 10.00 minutes.

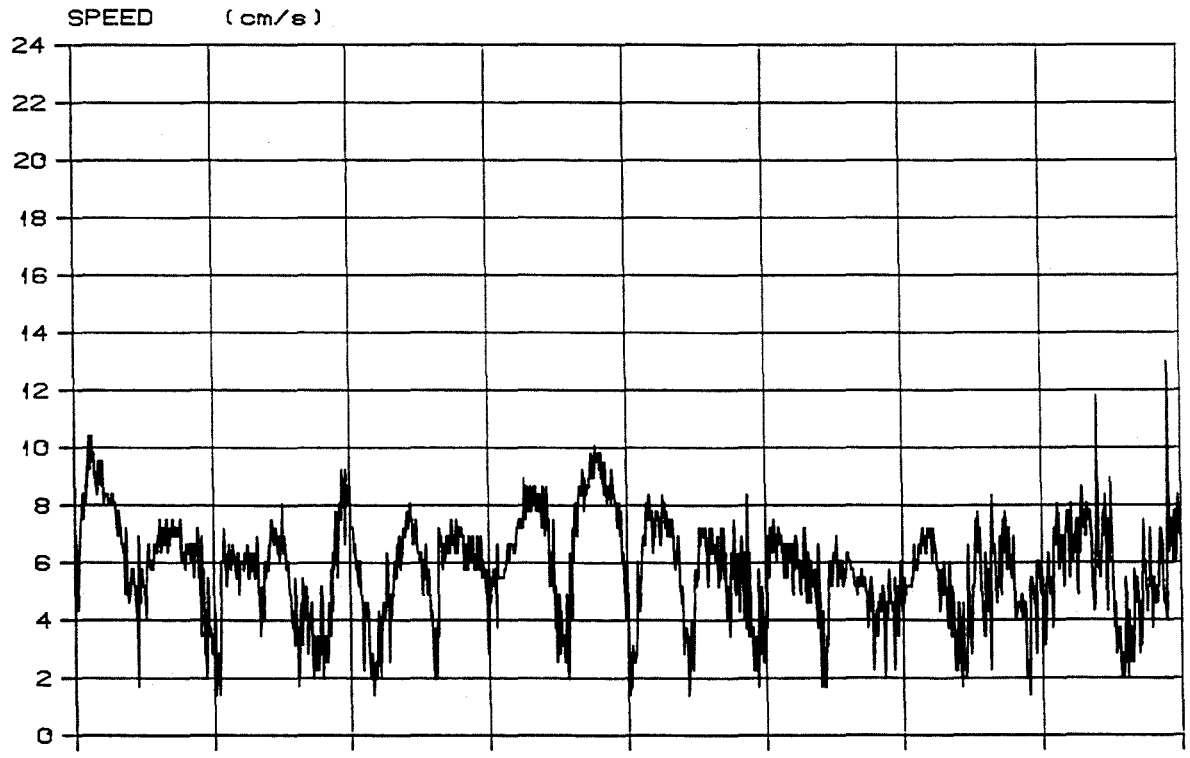
Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

H 1

Fig. 1-2-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 50.0 m Bottom depth : 315.0 m

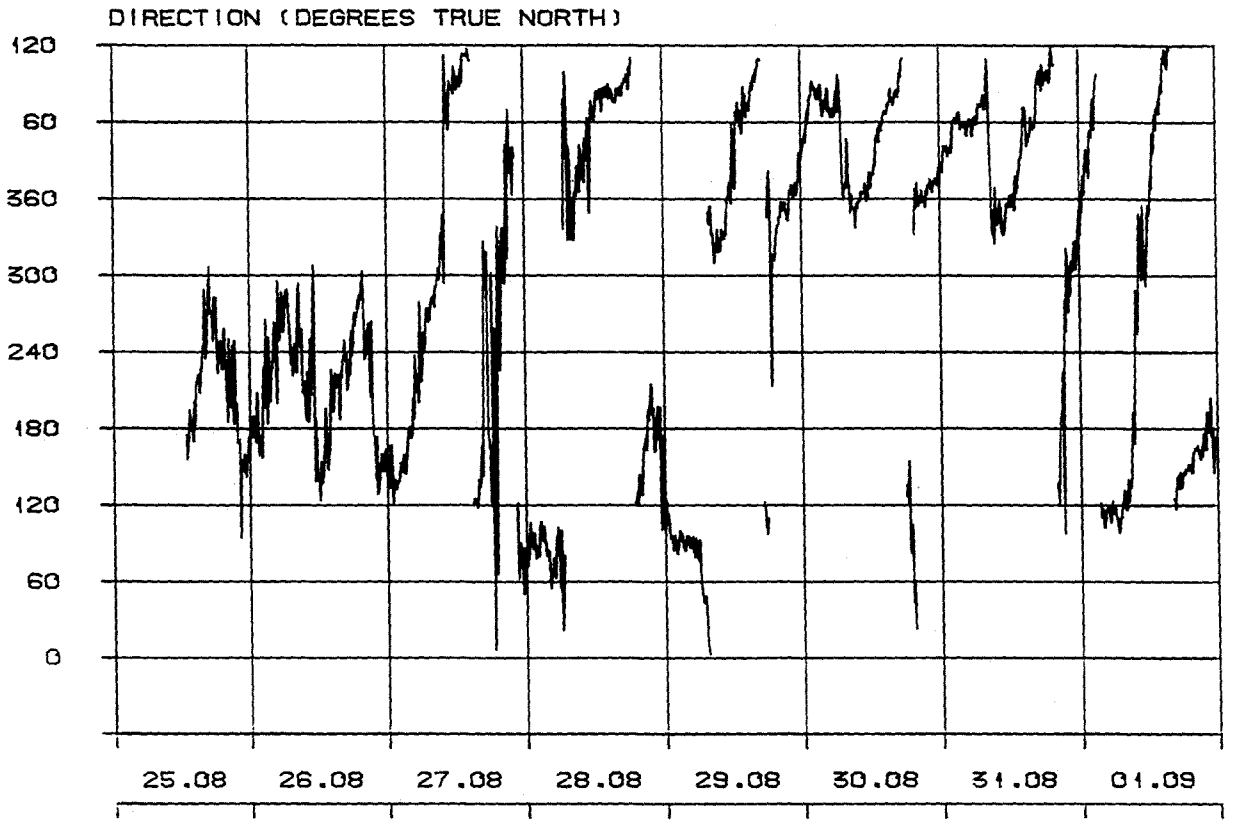
Time interval : 10.00 minutes.

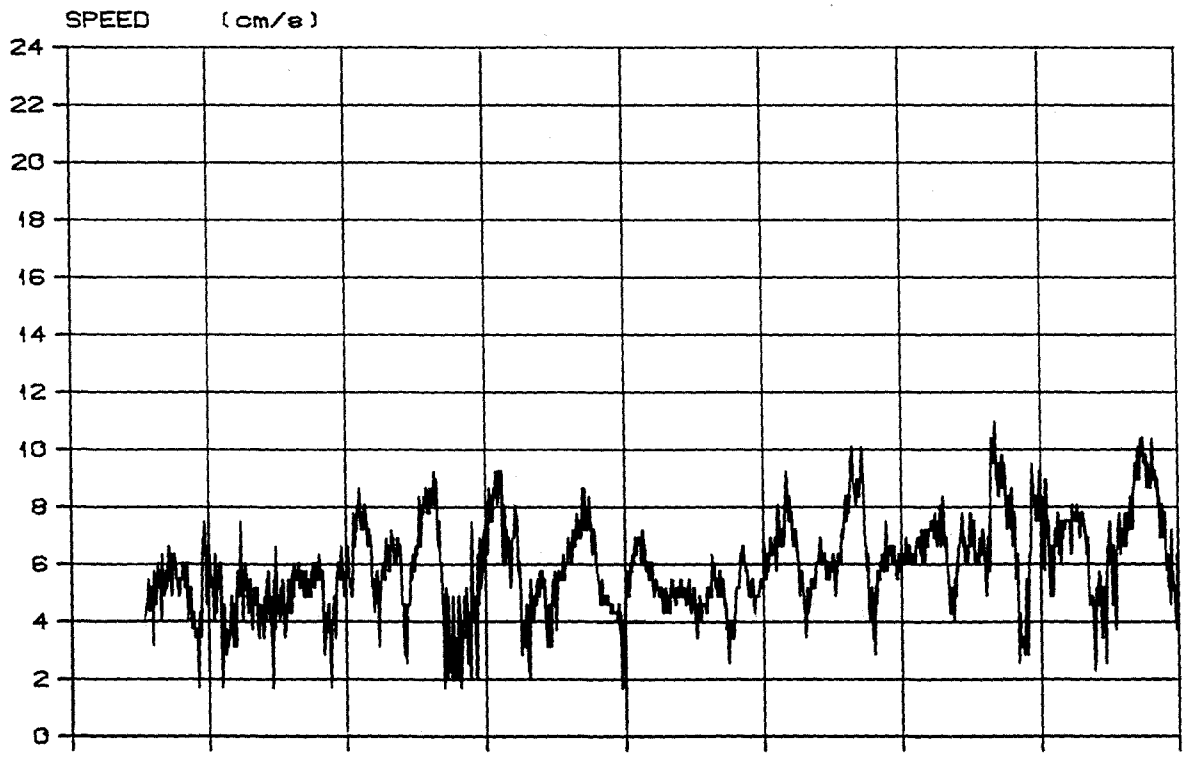
Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

H I

Fig. 1-2-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

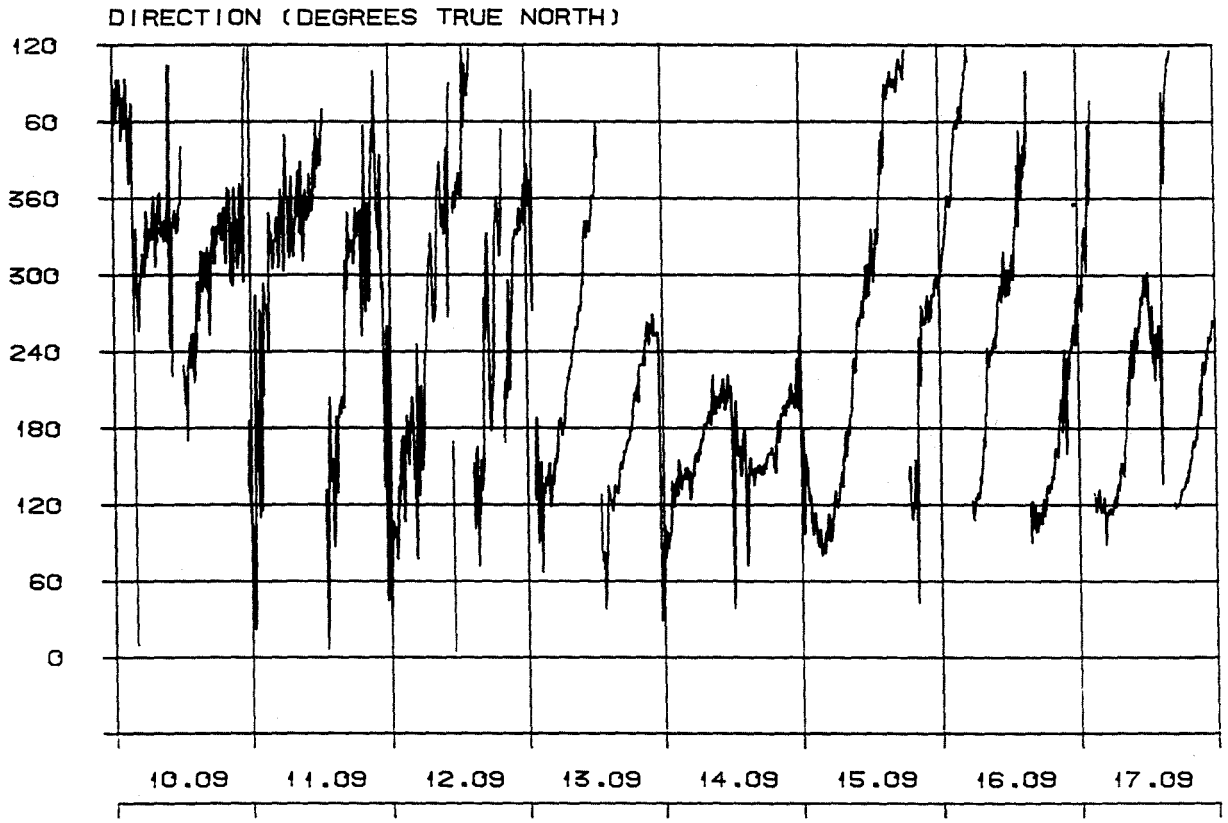
Instrument depth : 50.0 m Bottom depth : 315.0 m

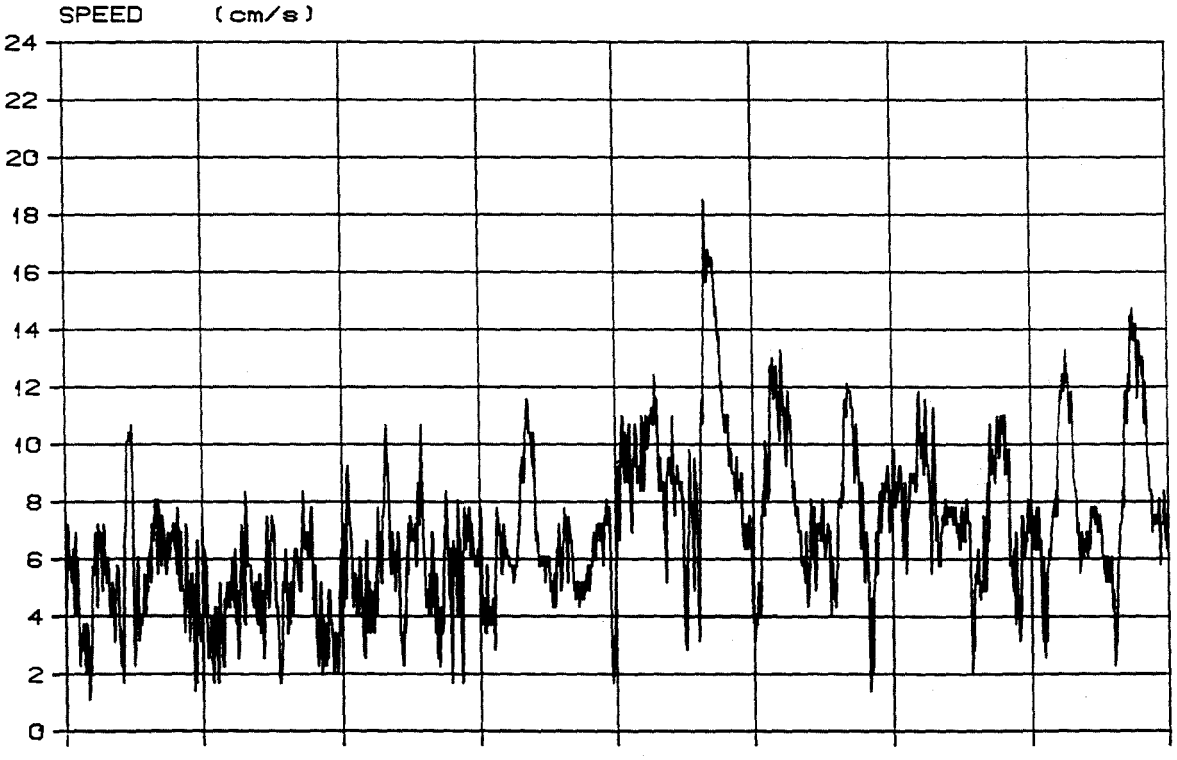
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

H I

Fig. 1-2-7 Speed and direction of current.





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 50.0 m Bottom depth : 315.0 m

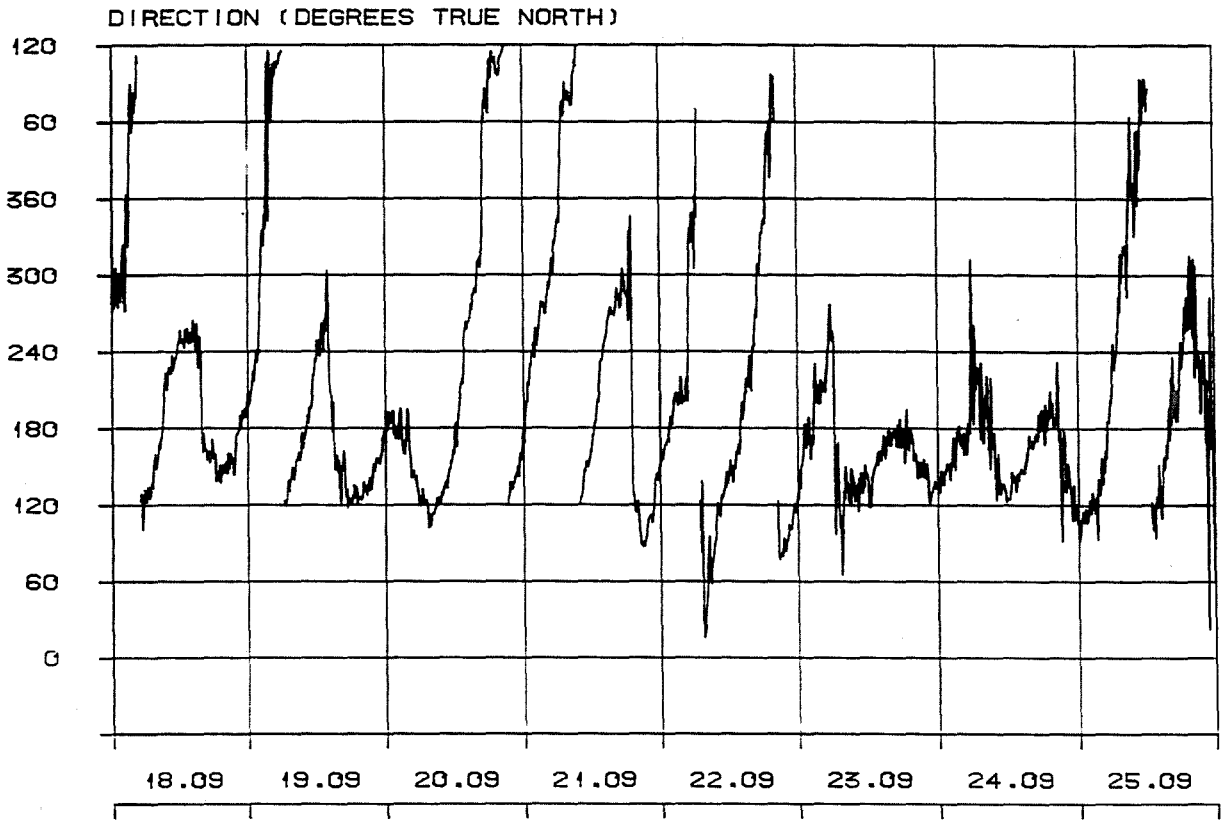
Time interval : 10.00 minutes.

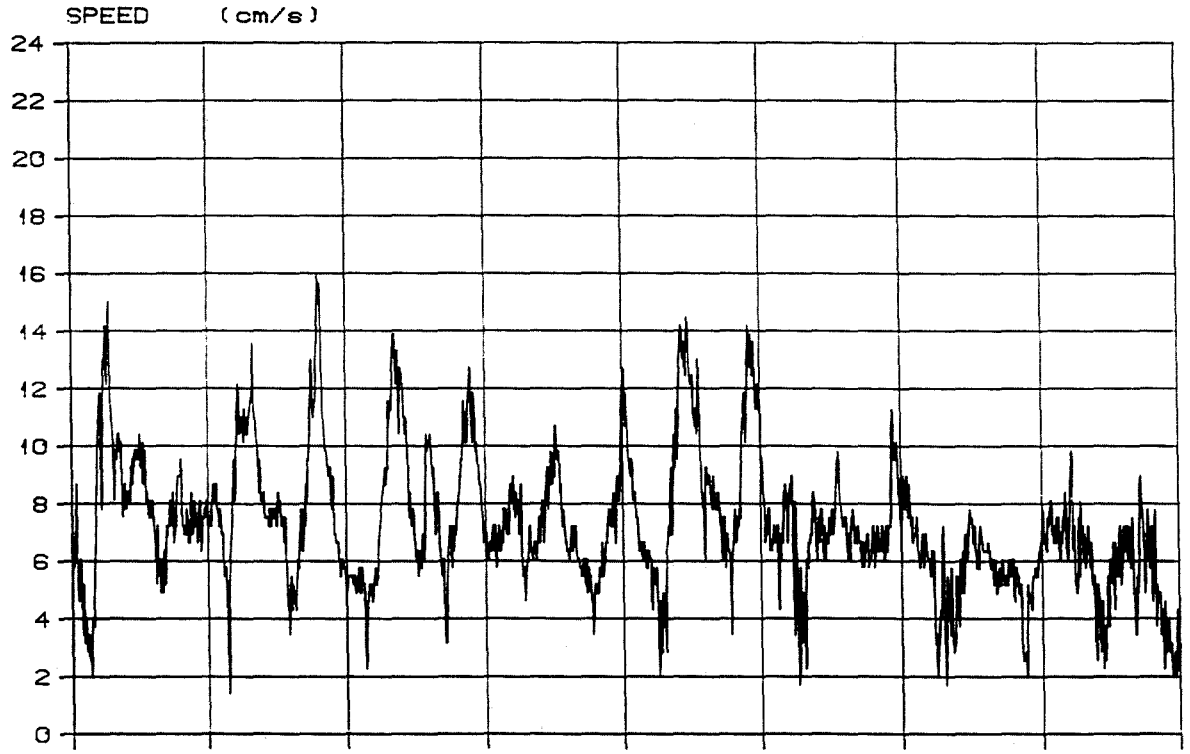
Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

H 1

Fig. 1-2-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

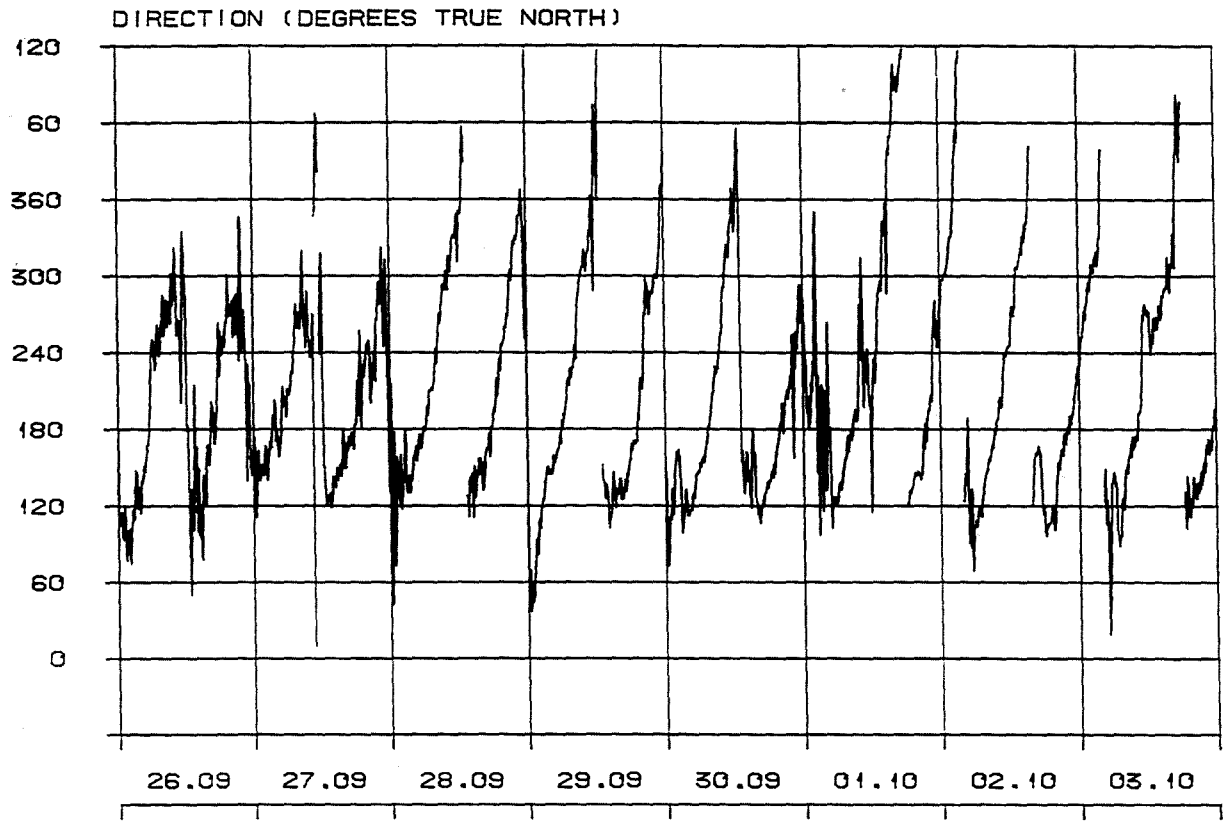
Instrument depth : 50.0 m Bottom depth : 315.0 m

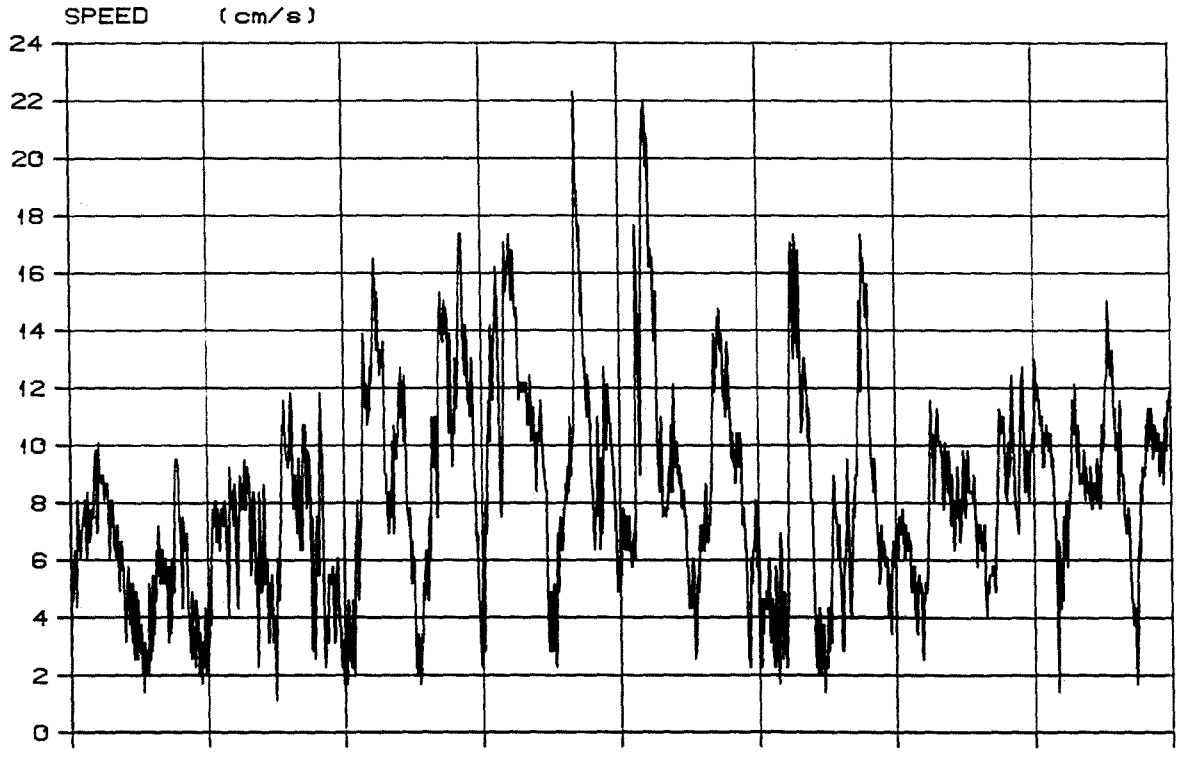
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

Fig. 1-2-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

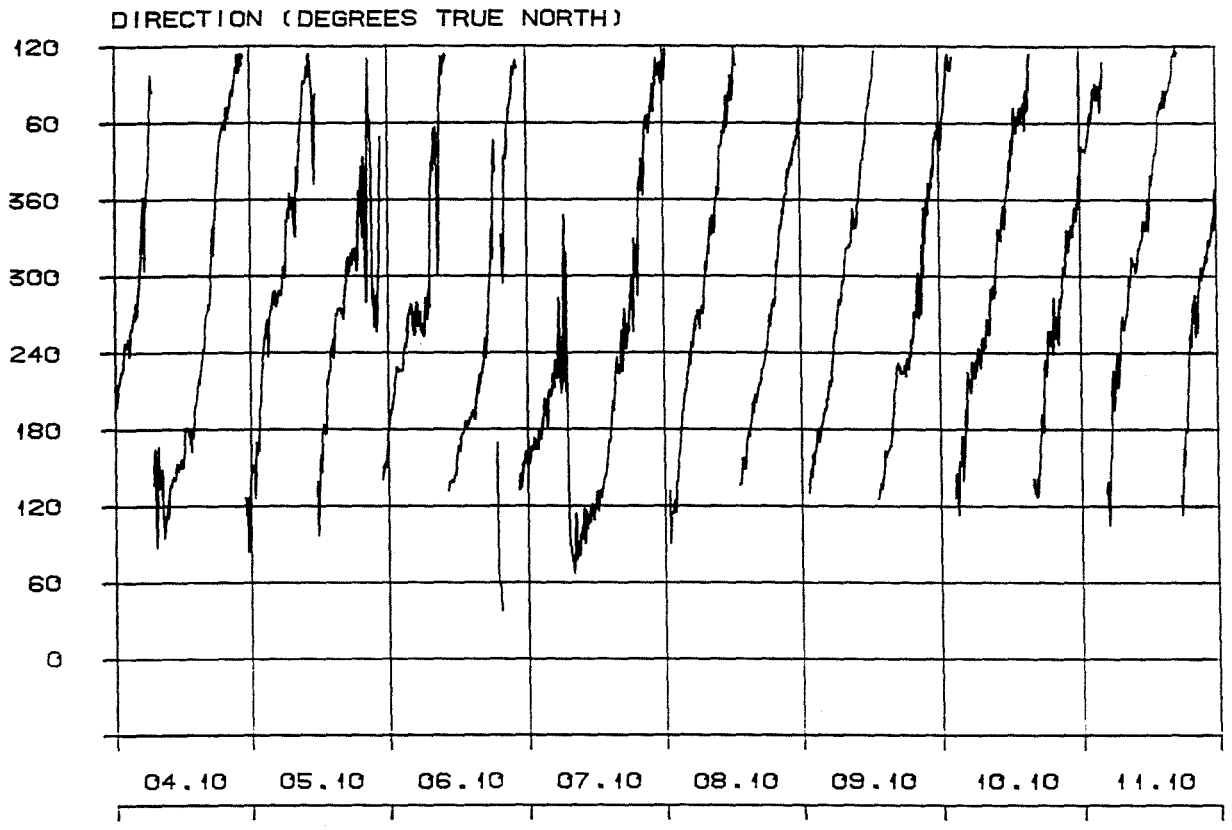
Instrument depth : 50.0 m Bottom depth : 315.0 m

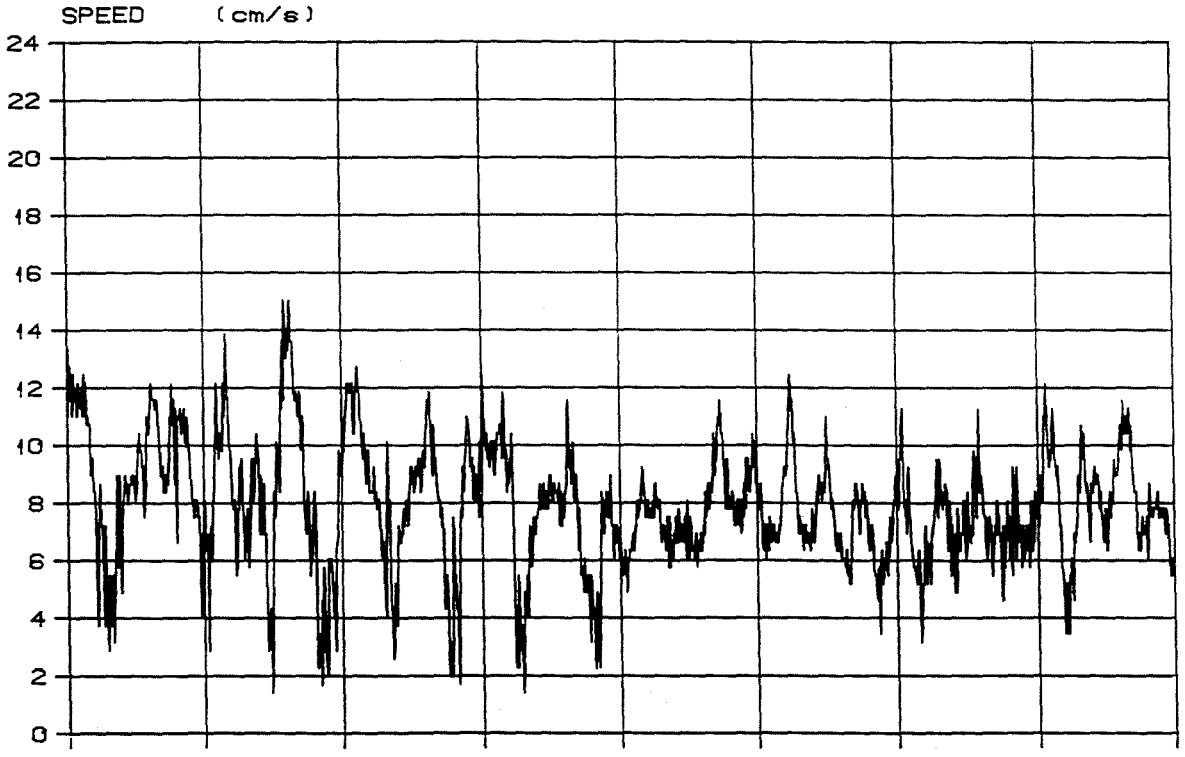
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

Fig. 1-2-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 50.0 m Bottom depth : 315.0 m

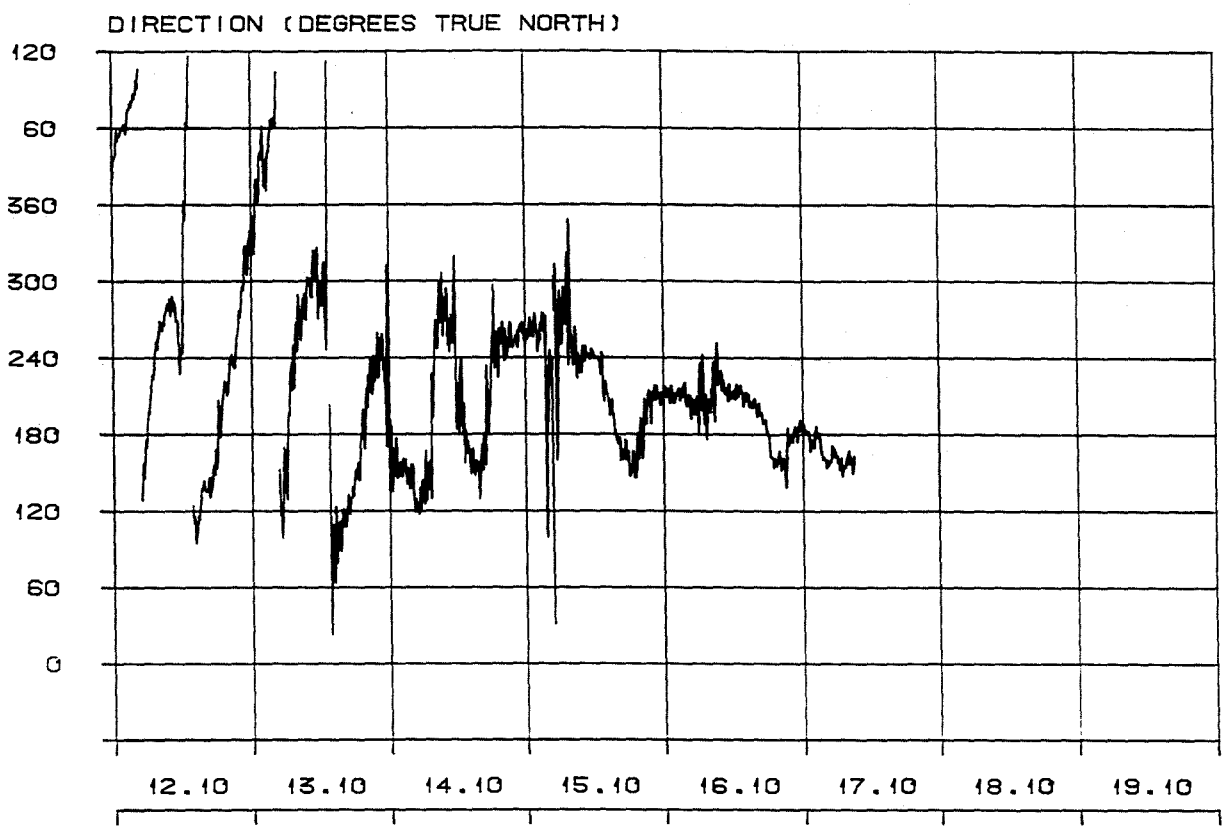
Time interval : 10.00 minutes.

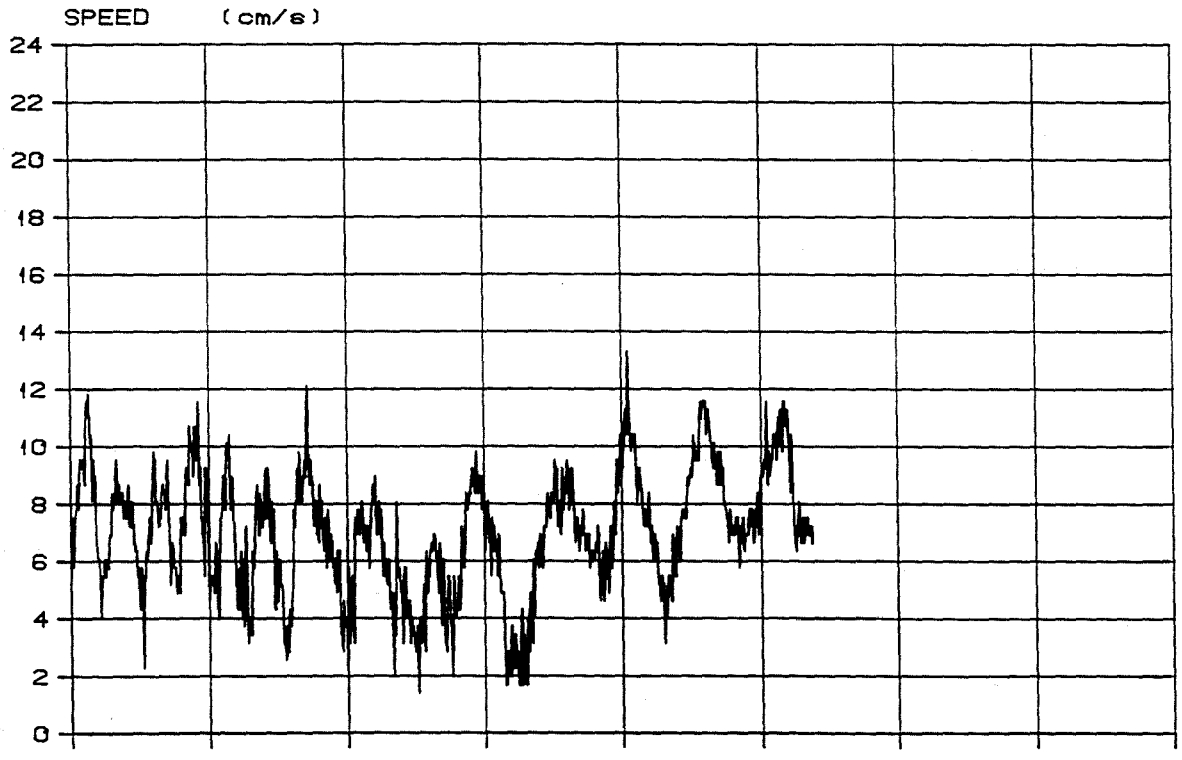
Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

H 1

Fig. 1-2-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 50.0 m Bottom depth : 315.0 m

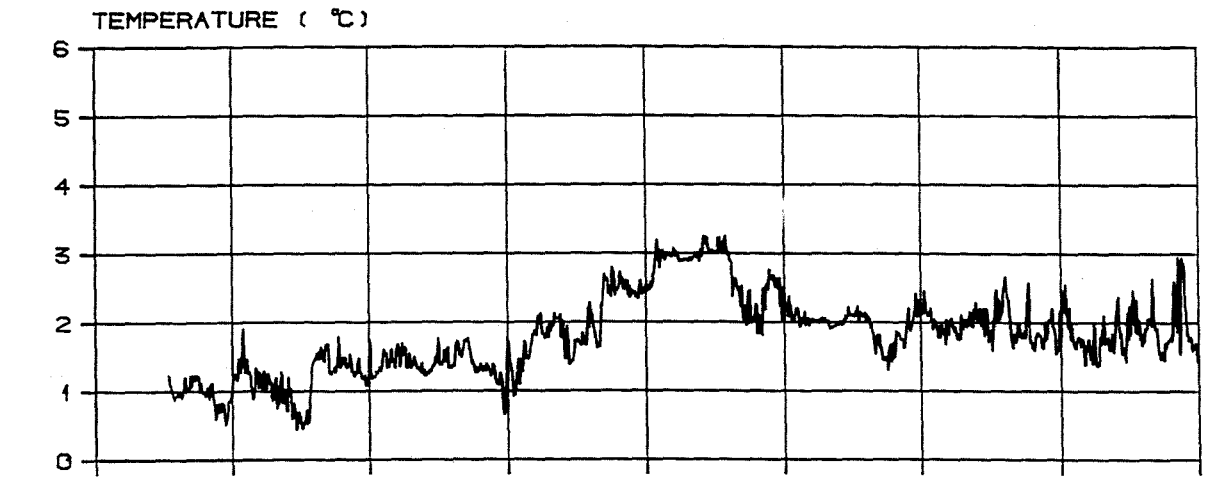
Time interval : 10.00 minutes.

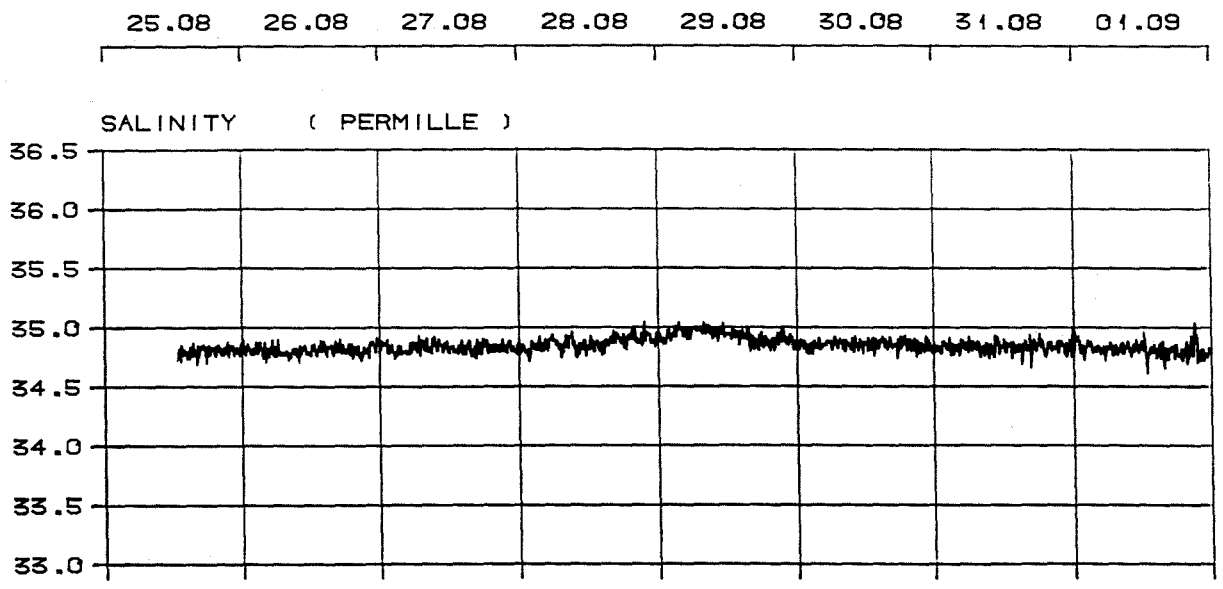
Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

H 1

Fig. 1-2-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

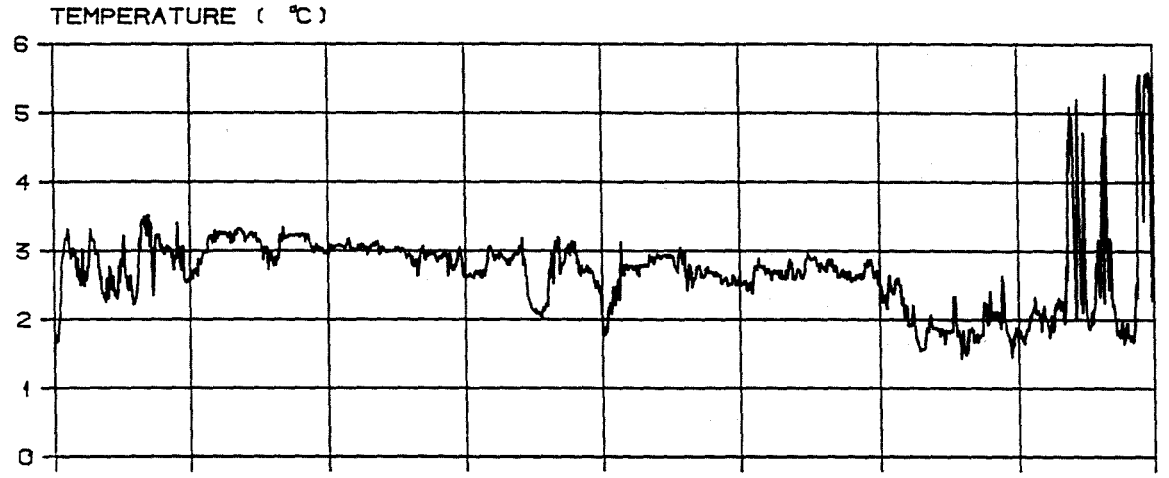
Instrument depth : 50.0 m Bottom depth : 315.0 m

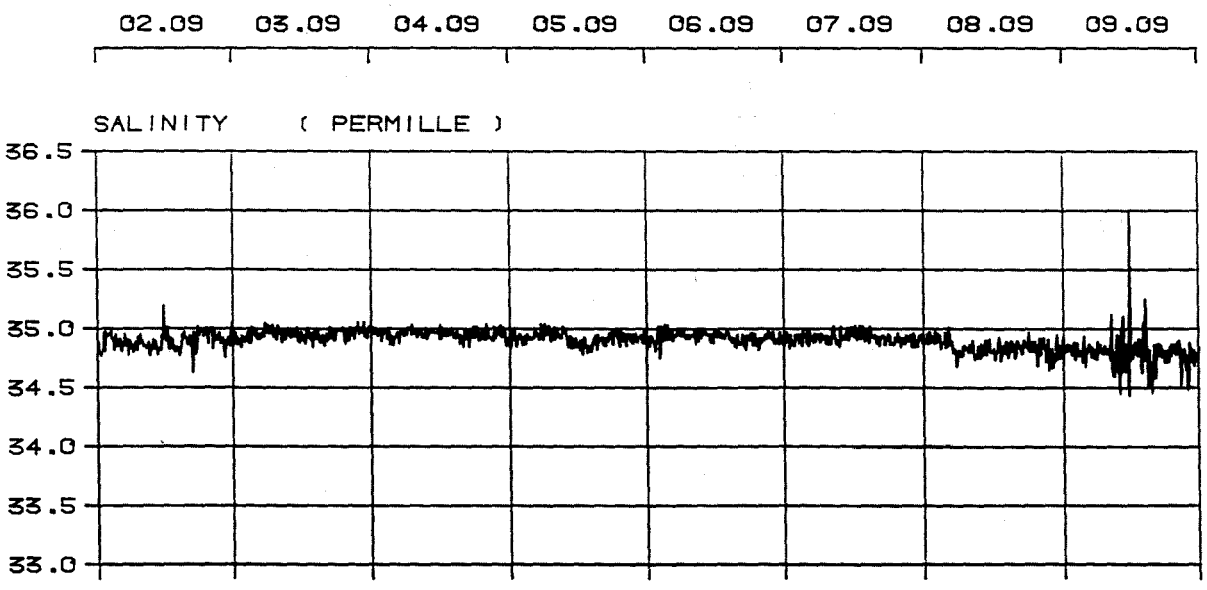
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

H I

Fig. 1-2-8 Temperature and salinity.





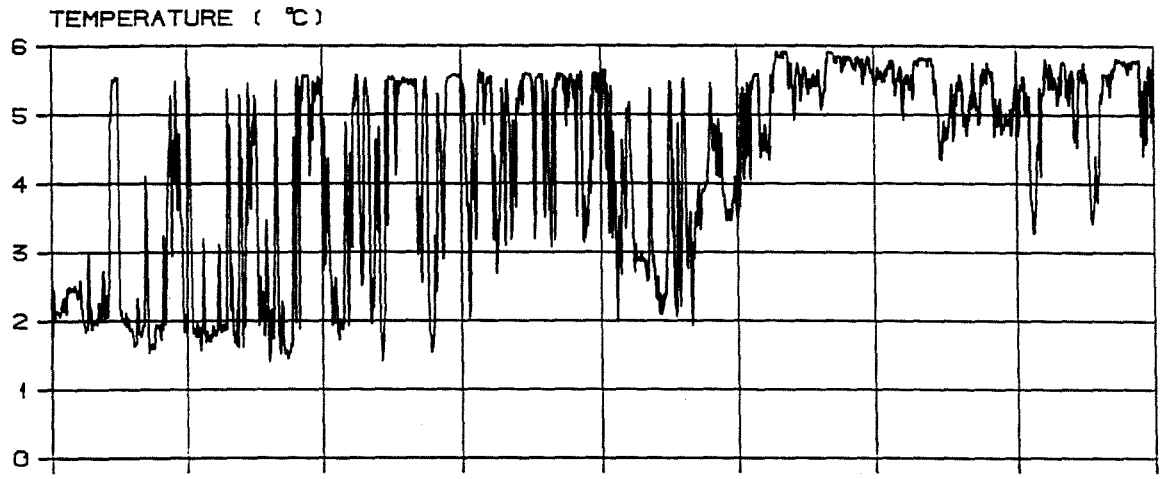
The Barents Sea

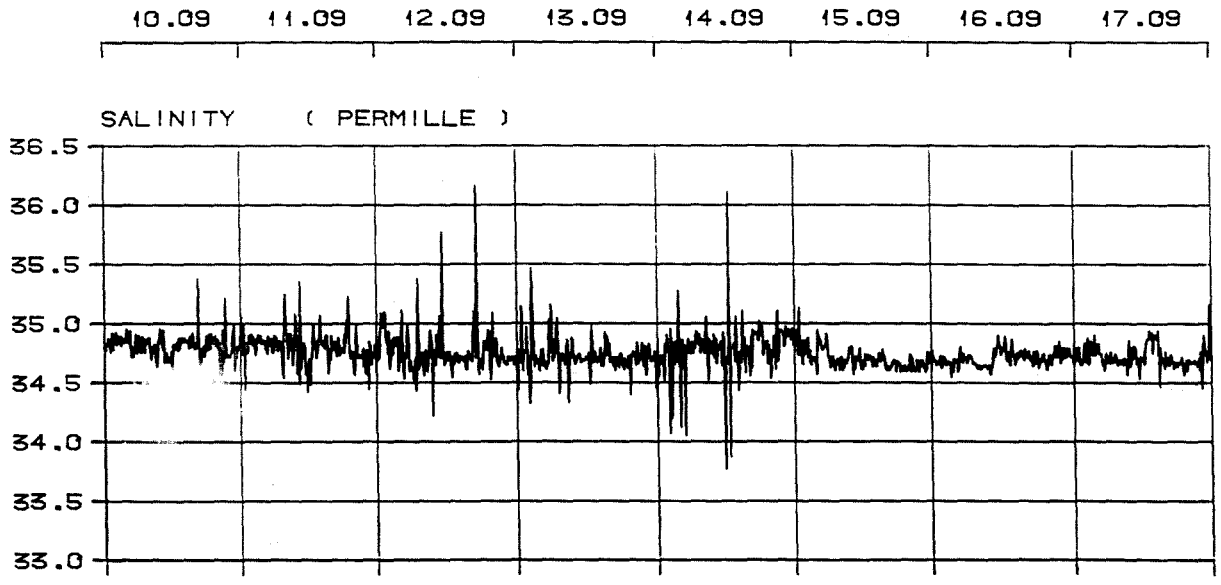
Position : N 73° 4.80' E 40° 0.00'
Instrument depth : 50.0 m Bottom depth : 315.0 m
Time interval : 10.00 minutes.
Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

H 1

Fig. 1-2-8

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

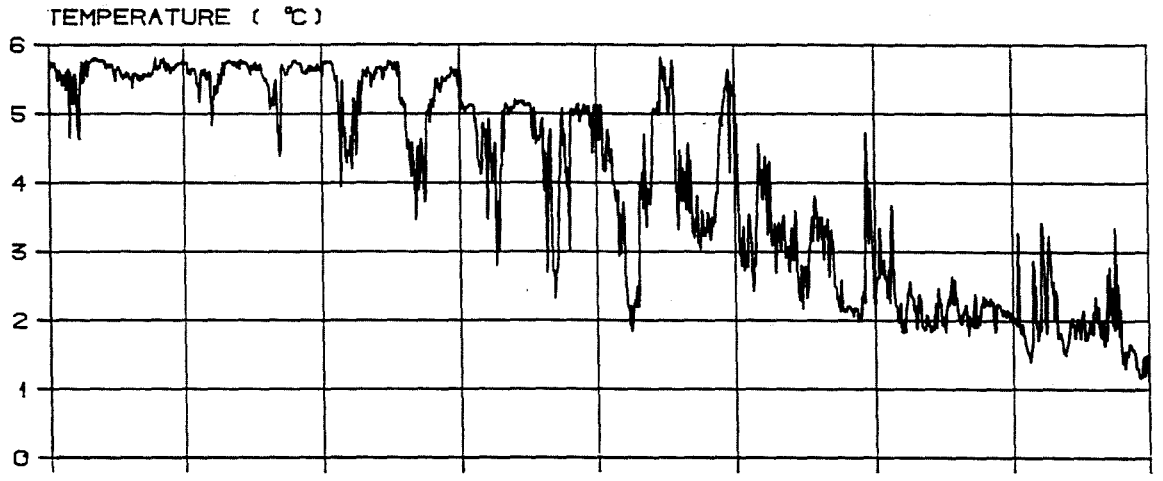
Instrument depth : 50.0 m Bottom depth : 315.0 m

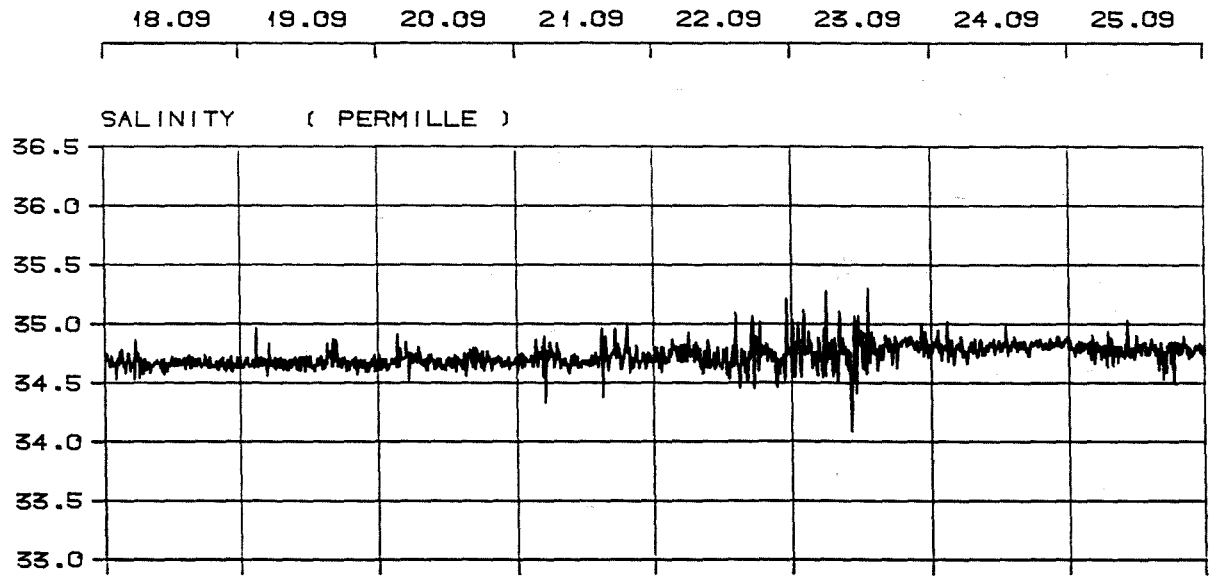
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

Fig. 1-2-8

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 50.0 m Bottom depth : 315.0 m

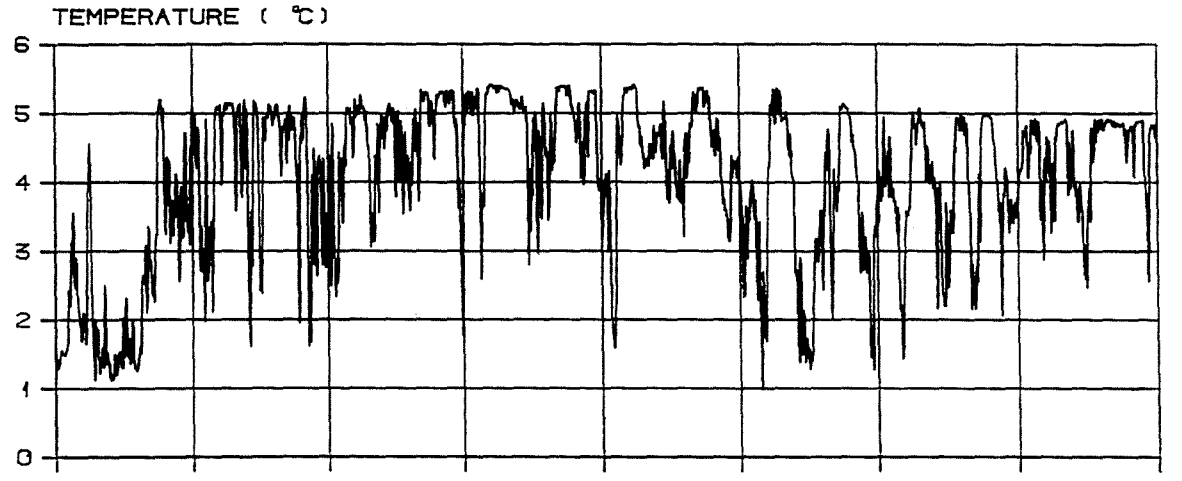
Time interval : 10.00 minutes.

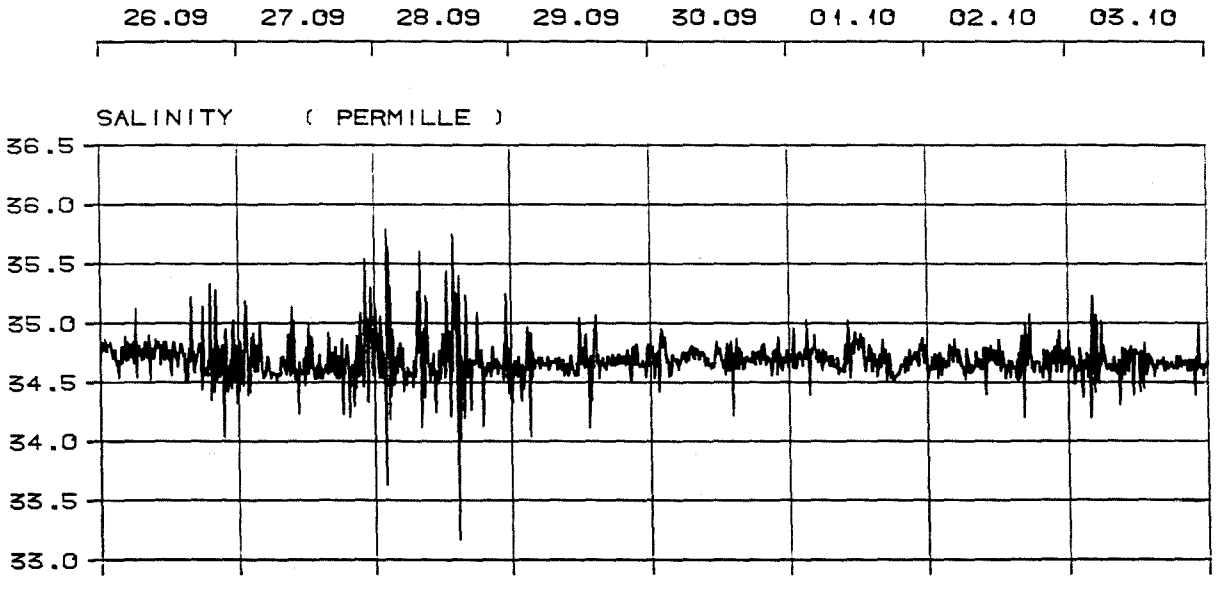
Obeervation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

H 1

Fig. 1-2-8

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 50.0 m Bottom depth : 315.0 m

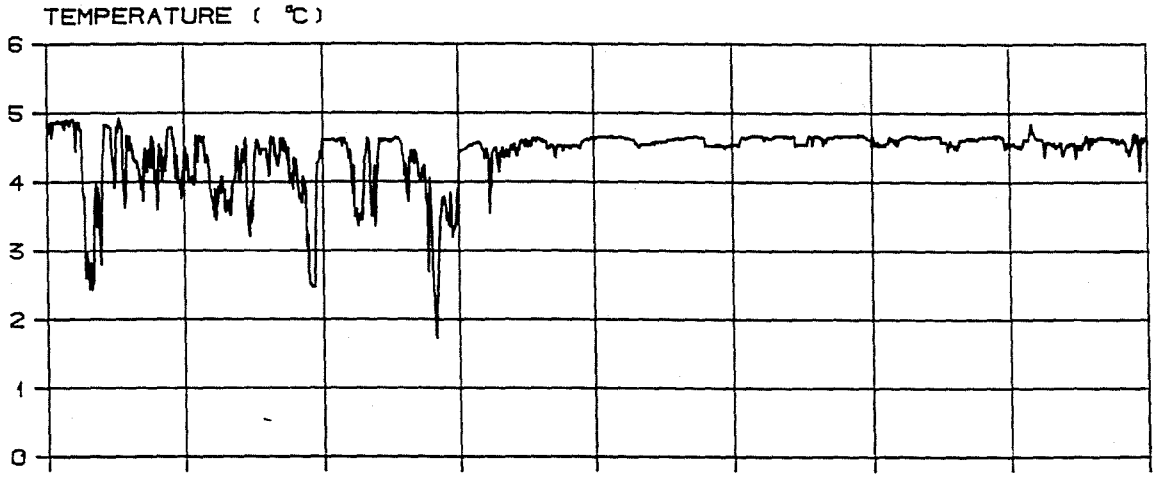
Time interval : 10.00 minutes.

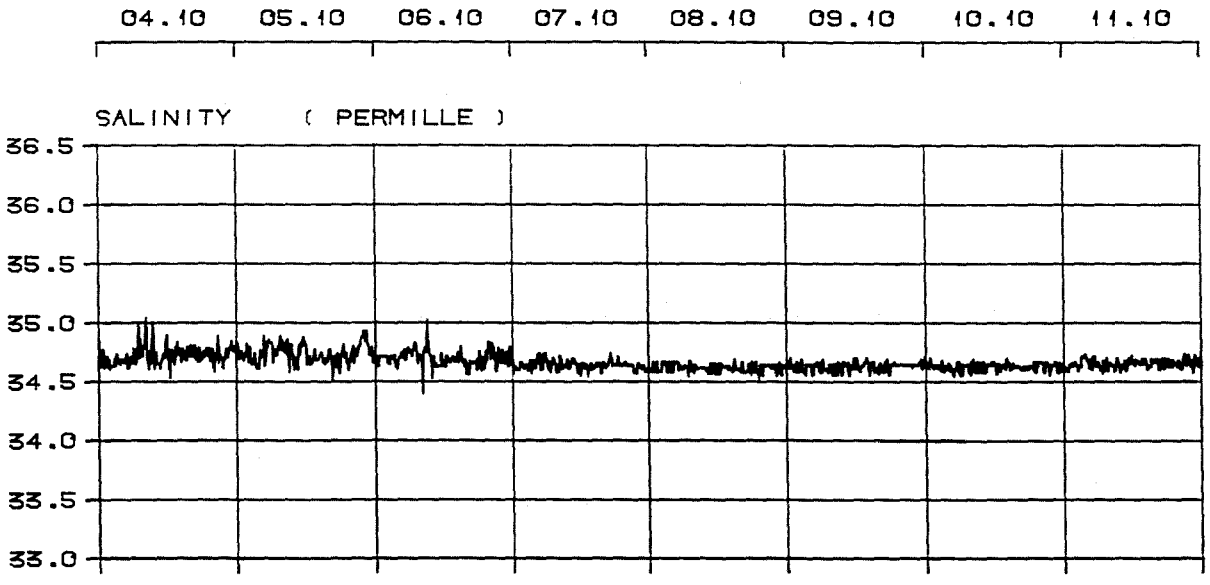
Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

H I

Fig. 1-2-8

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 50.0 m Bottom depth : 315.0 m

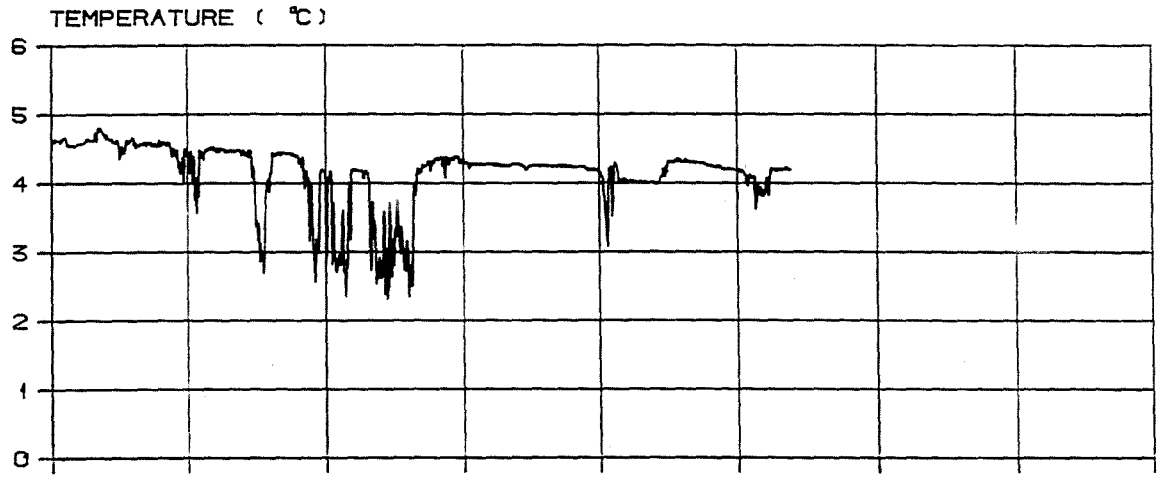
Time interval : 10.00 minutes.

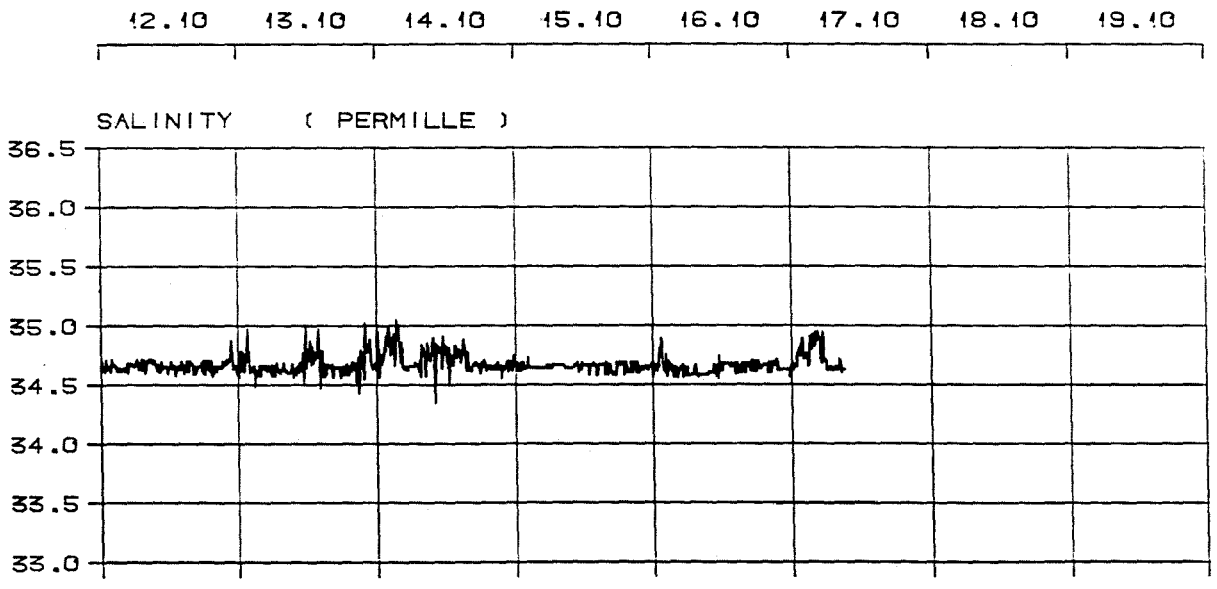
Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

H 1

Fig. 1-2-8

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 50.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

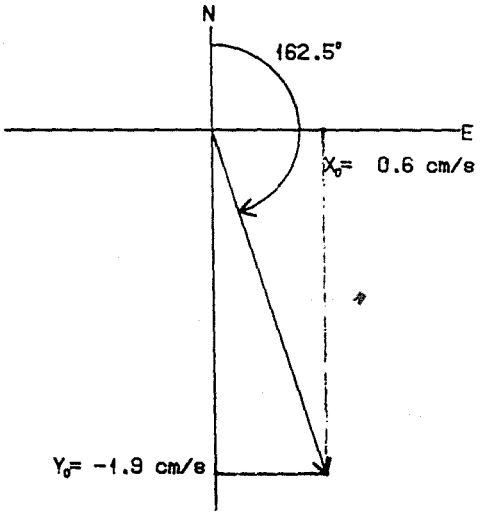
Fig. 1-2-8

Continues.....

HARMONIC ANALYSIS OF CURRENTS

CONSTITUENTS			DECOMPOSED CURRENT				TIDAL CURRENT ELLIPSE				
			E/W		N/S						
Symbol	Period hours	Frequense °/hour	X_j cm/s	g_{xj} °	Y_j cm/s	g_{yj} °	Major axis A_j cm/s	Minor axis B_j cm/s	θ_j °	g_j °	BETA. °
MM	661.31	0.5	0.8	109.8	1.6	230.9	1.7	0.7	163.5	57.3	15.4
MSF	354.37	1.0	0.1	247.8	1.8	255.7	1.8	0.0	184.1	75.6	121.3
M2	12.42	29.0	5.2	136.8	2.7	24.2	5.5	-2.5	104.0	143.3	126.5
S2	12.00	30.0	0.9	141.9	1.0	337.4	1.4	-0.2	319.0	330.7	0.8

MEAN CURRENT



The Barents Sea
Position : N 73° 4.80' E 40° 0.00'
Instrument depth : 50.0 m Bottom depth : 315.0 m
Time interval : 10.00 minutes.
Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

H 1

Fig. 1-2-9 Harmonic analysis of current.

A discription of the model and its definitions :

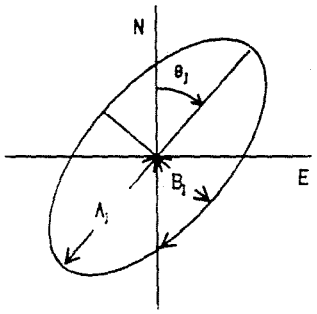
Current-vector decomposed in E/W (real) - and N/S (imaginary) - direction :

$$Z(t)=X_0+\sum_{j=1}^{n}(X_j\cos(\sigma_j t+(V_0+u)_j-g_{xj})+i(Y_0+\sum_{j=1}^{n}Y_j\cos(\sigma_j t+(V_0+u)_j-g_{yj}))$$

g_{xj} , g_{yj} : Greenwich-phase for E/W- and N/S-components of each constituent.

With ellipseparameters :

$$Z(t)=\sum_{j=1}^{n}\exp(i(90^\circ-\theta_j))(A_j\cos(\sigma_j t+(V_0+u)_j-g_j)+iB_j\sin(\sigma_j t+(V_0+u)_j-g_j))$$



g_j : Greenwich phase of the current-vector for each constituent.

Rotationdirection : anticlockwise when $B_j > 0$, clockwise when $B_j < 0$

BETA : The angle between t=0 and major halv axis in the ellipse.

Common for both modles :

σ_j : Frequence in degrees/hour.

$(V_0+u)_j$: Astronomic argument relative to Greenwich-meridian.

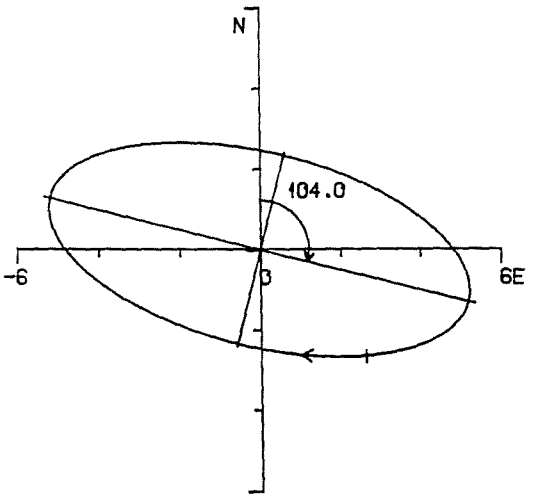
During the calculation of Z(t) will V_0+u be put into the formulas at the time t=0.

The time t is in houres; the same timezone as the analysed data.

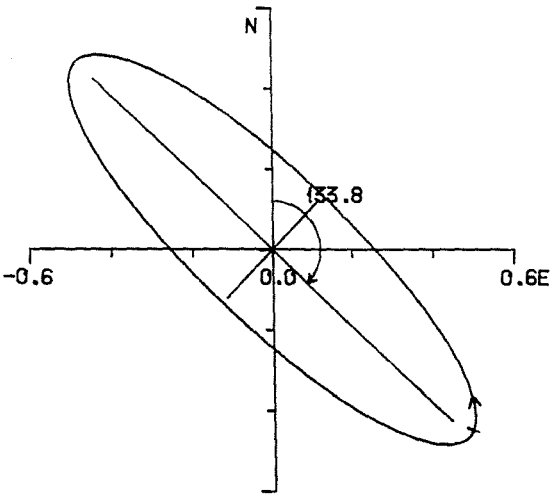
t=0 in the midle of the measurement series : 1989 20.09 H. 2300 ,

marked with a line on the ellipse.

M2-ellipse



K1-ellipse



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 50.0 m Bottom depth : 315.0 m

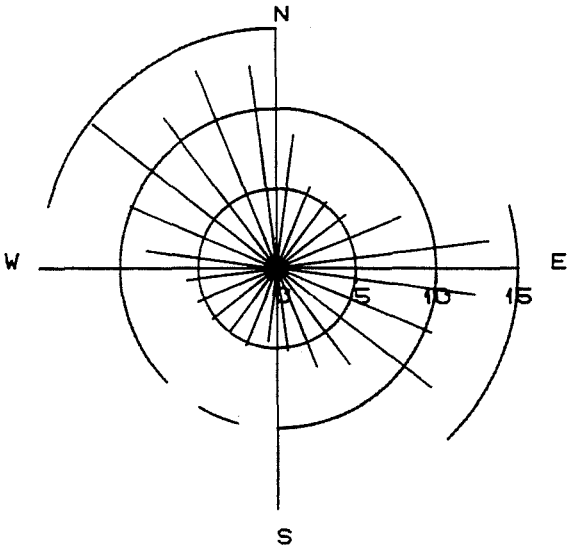
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 17.10 H. 0900

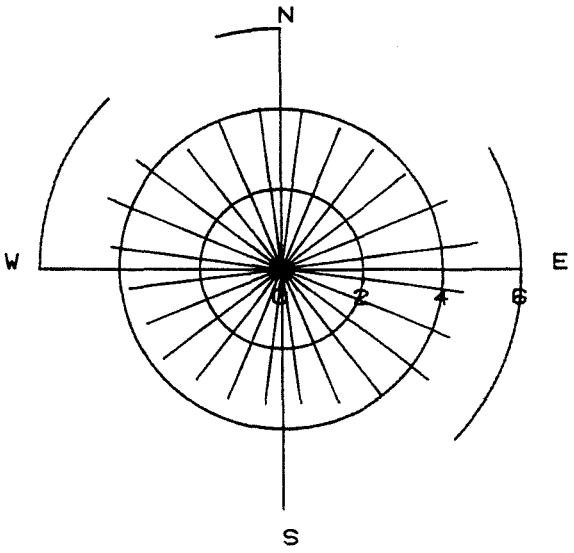
H 1

Fig. 1-2-10 M2 and K1 ellipse.

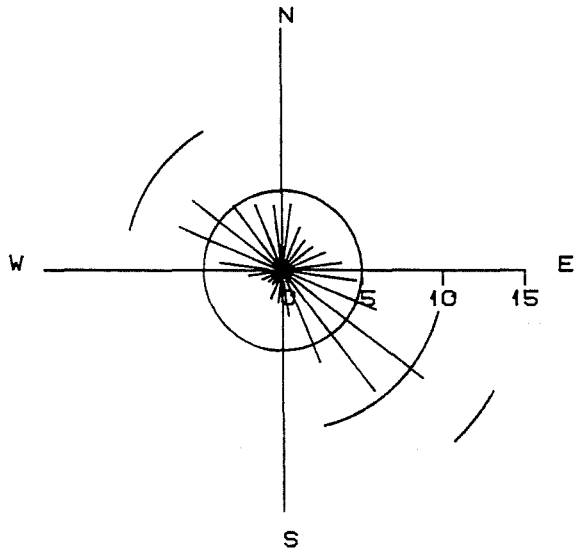
CURRENT VELOCITY DISTRIBUTION



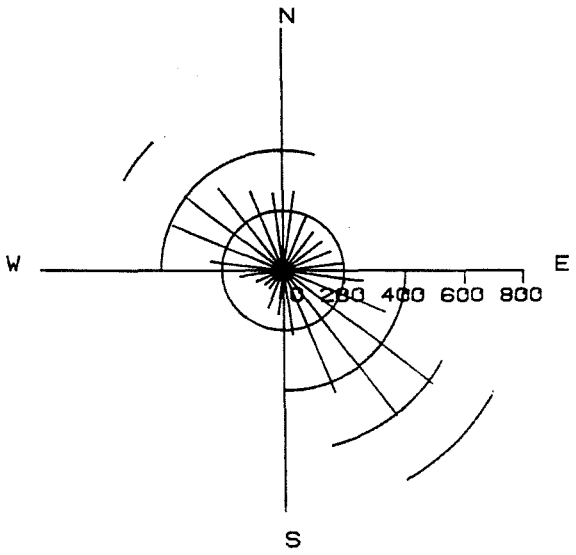
Maksimum velocity (cm/s)



Mean velocity (cm/s)



Relative flux in %



Number measured

Number of obeervations : 6200

The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 150.0 m Bottom depth : 315.0 m

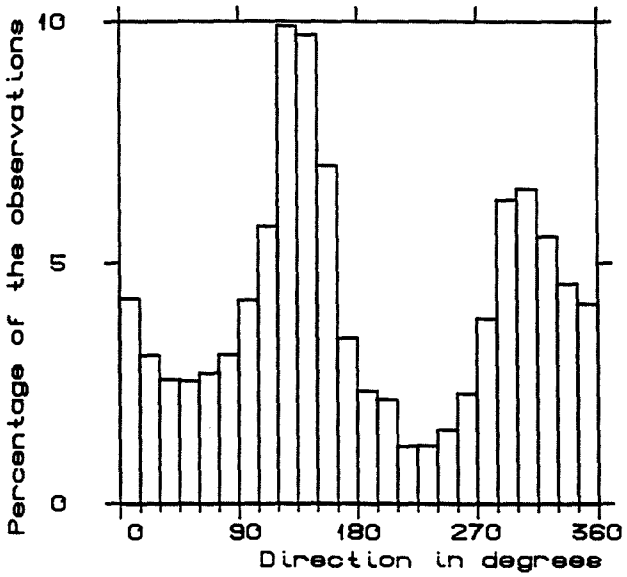
Time interval : 10.00 minutes.

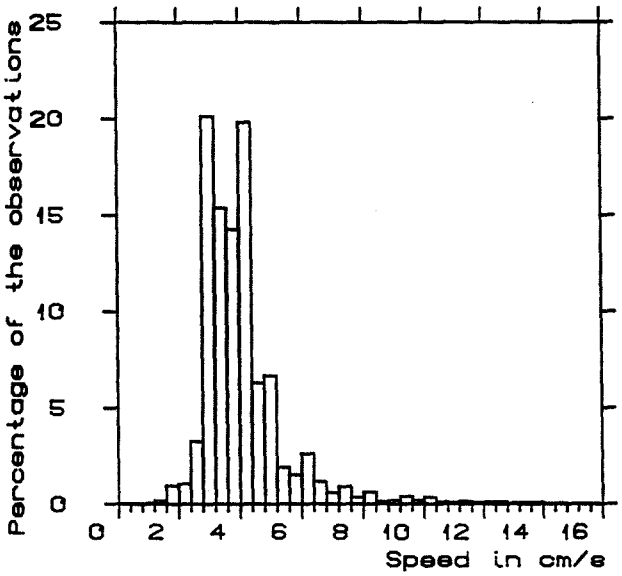
Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

H I

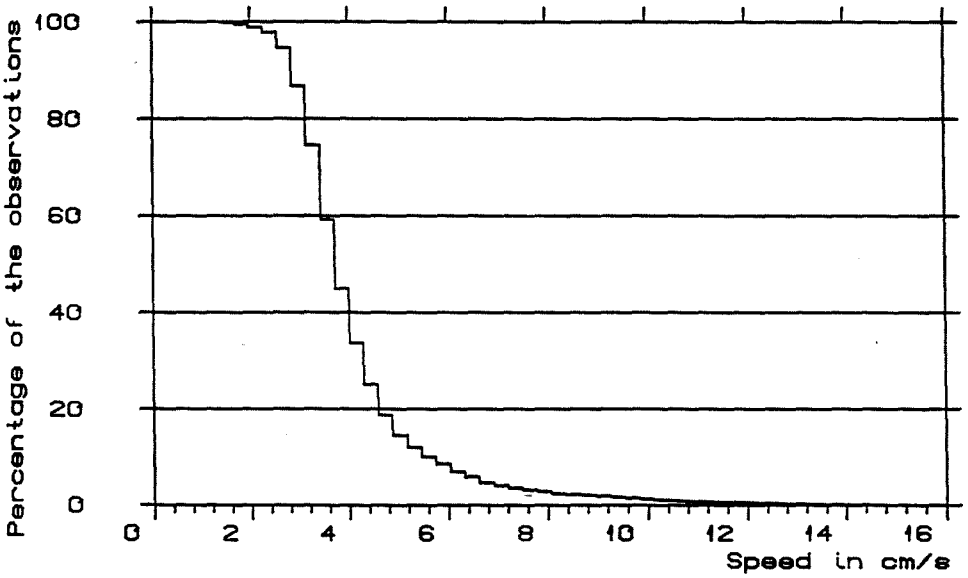
Fig. 1-3-1 Current velocity distribution.

HISTOGRAM





CURRENT SPEED DISTRIBUTION



umber of obeervations : 6200

The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 150.0 m Bottom depth : 315.0 m

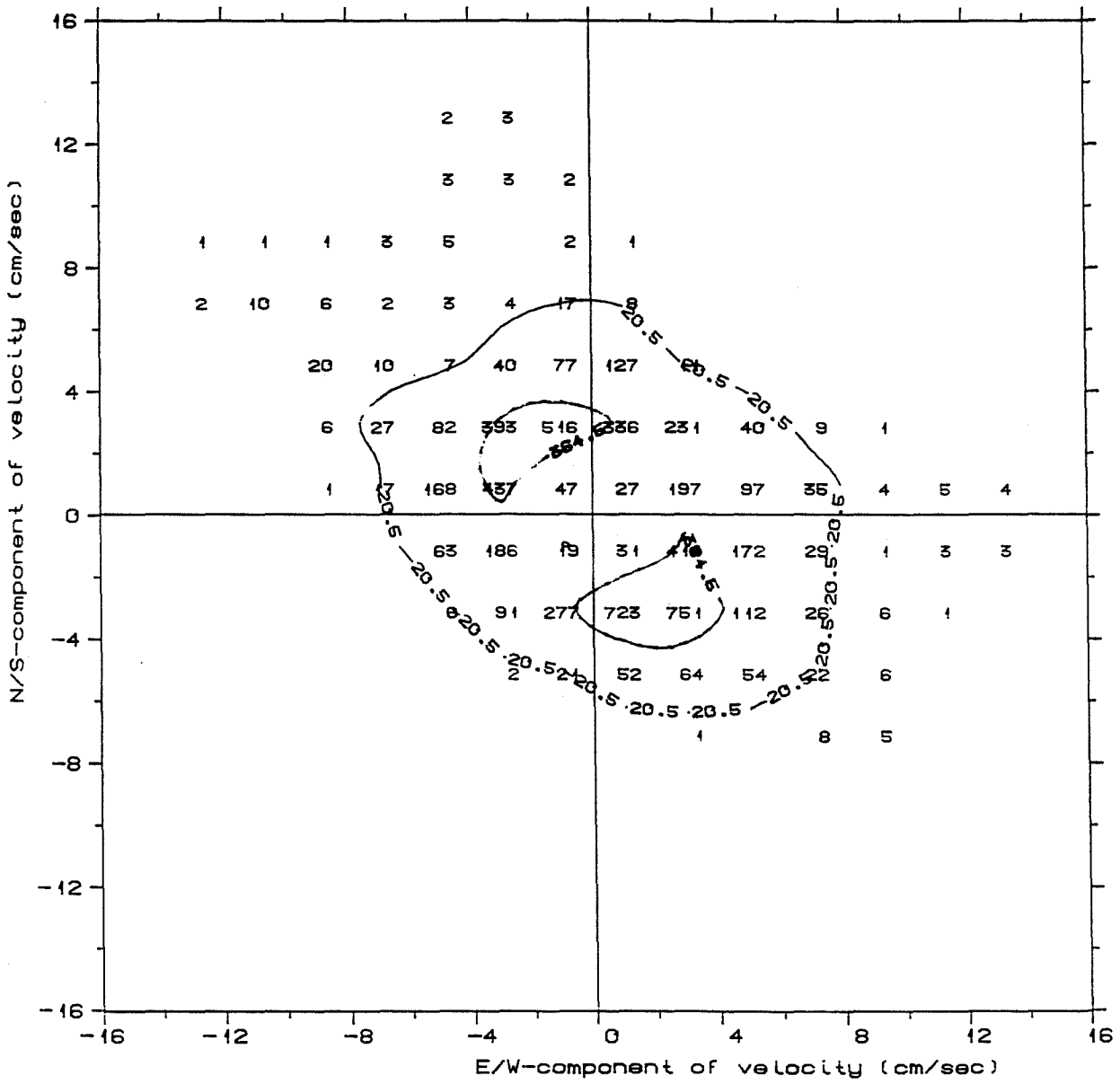
Time interval : 10.00 minutes.

Obeervation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

H I

Fig. 1-3-2 Histogram of speed and direction.
Current speed distribution.

VELOCITY DISTRIBUTION DIAGRAM



Number of observations : 6200

Isoline for 50% and 96%

Number of observations : 6200

The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 150.0 m Bottom depth : 315.0 m

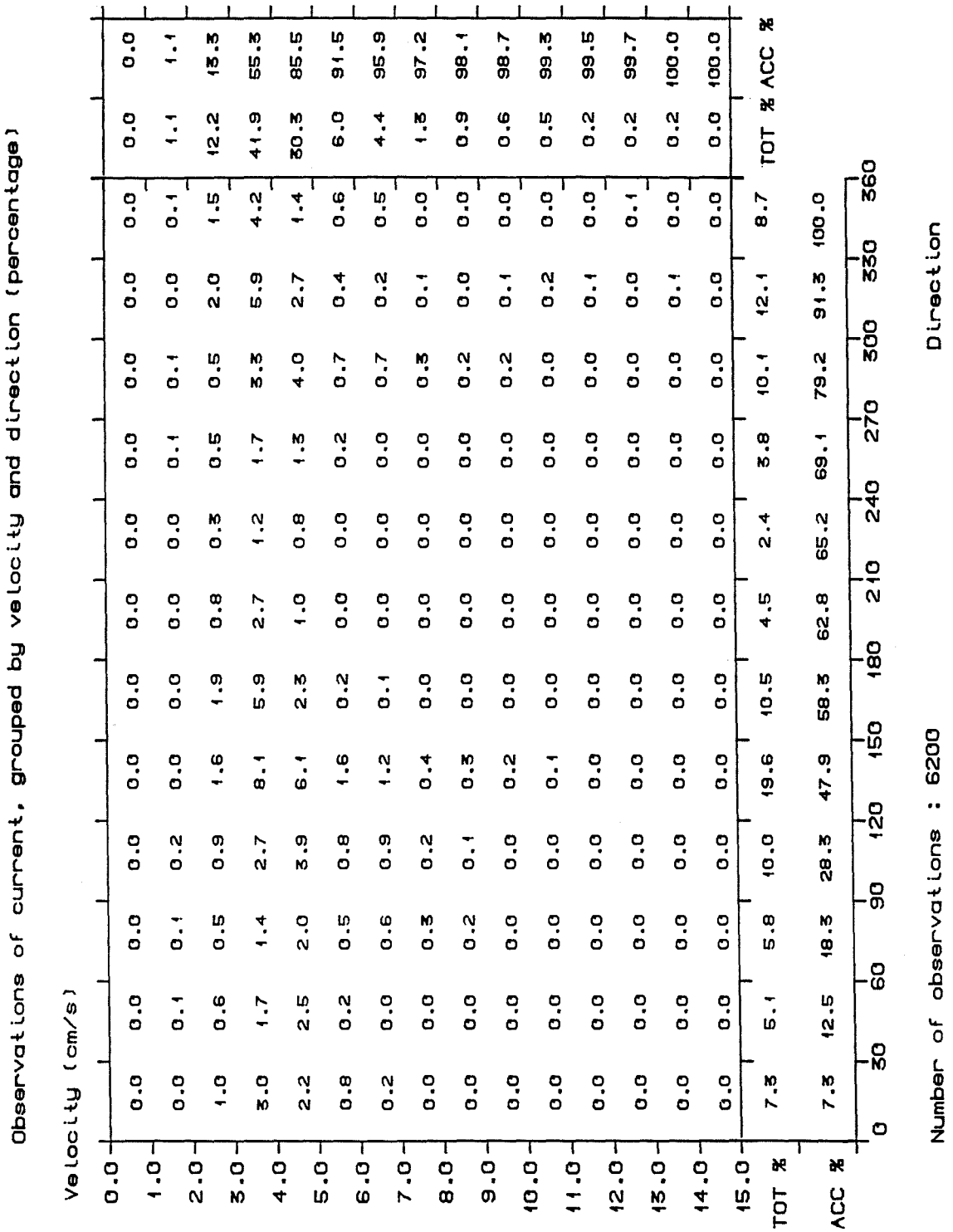
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

H I

Fig. 1-3-3 Velocity distribution diagram.

DIRECTION DISTRIBUTION OF CURRENT VELOCITY



umber of observations : 6200

The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

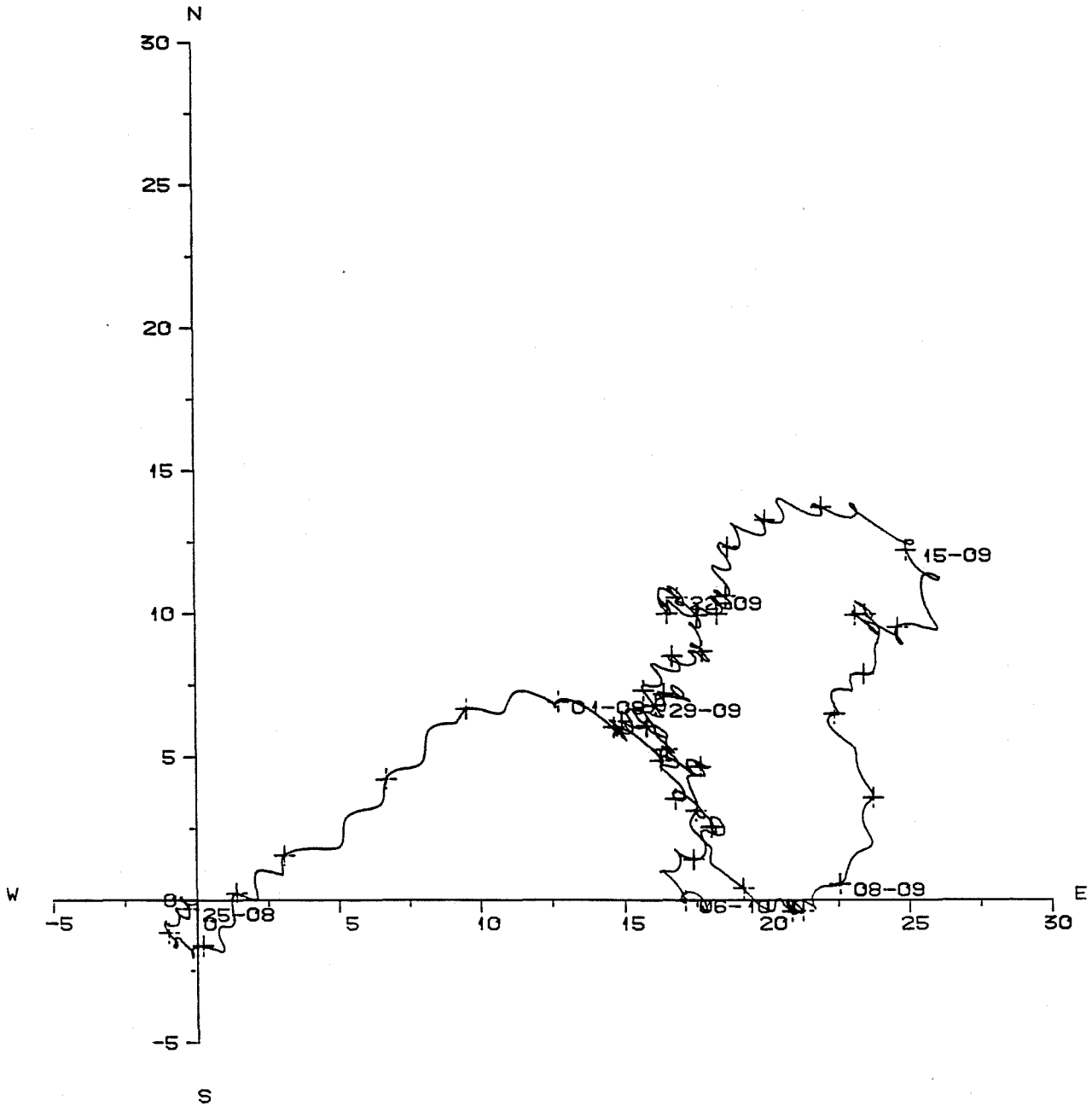
Instrument depth : 150.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

Fig. 1-3-4 Velocity distribution table.

PROGRESSIVE VECTOR DIAGRAM



Units in km

Number of obeservations : 6200

The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

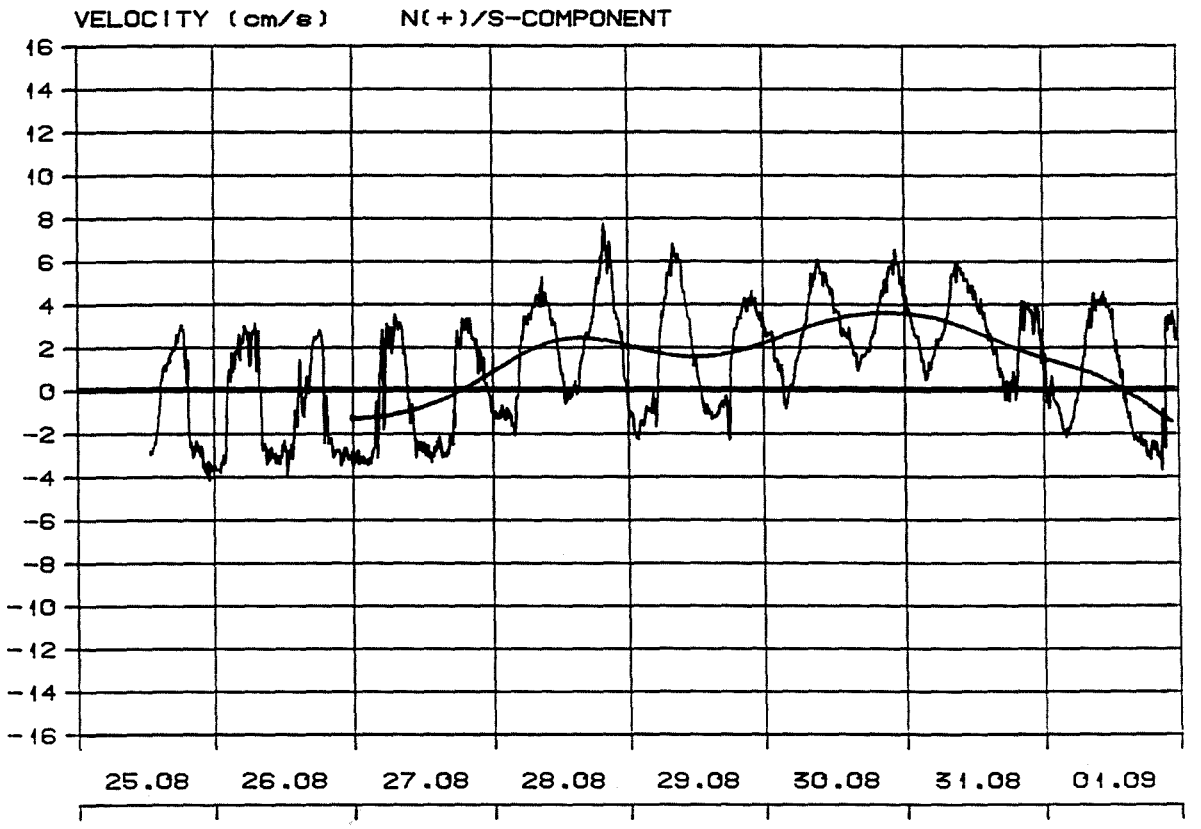
Instrument depth : 150.0 m Bottom depth : 315.0 m

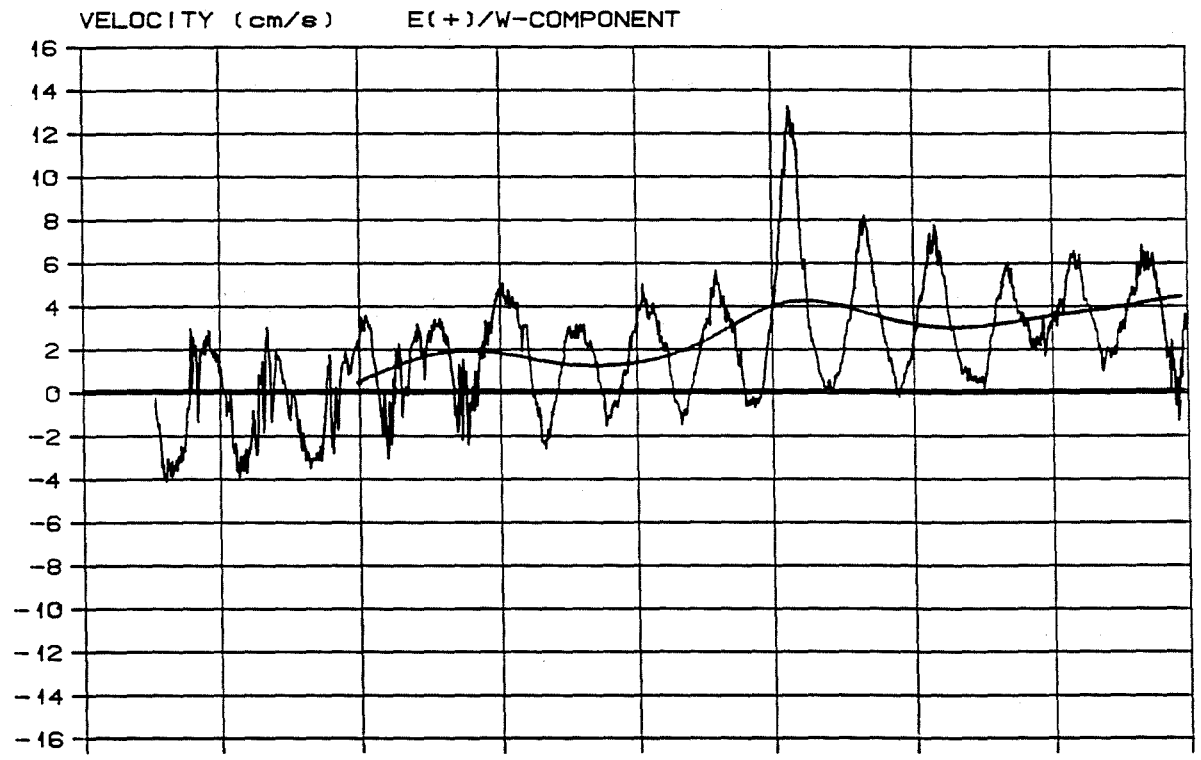
Time interval : 10.00 minutes.

Obeservation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

H 1

Fig. 1-3-5 Progressive vector diagram.





The Barents Sea

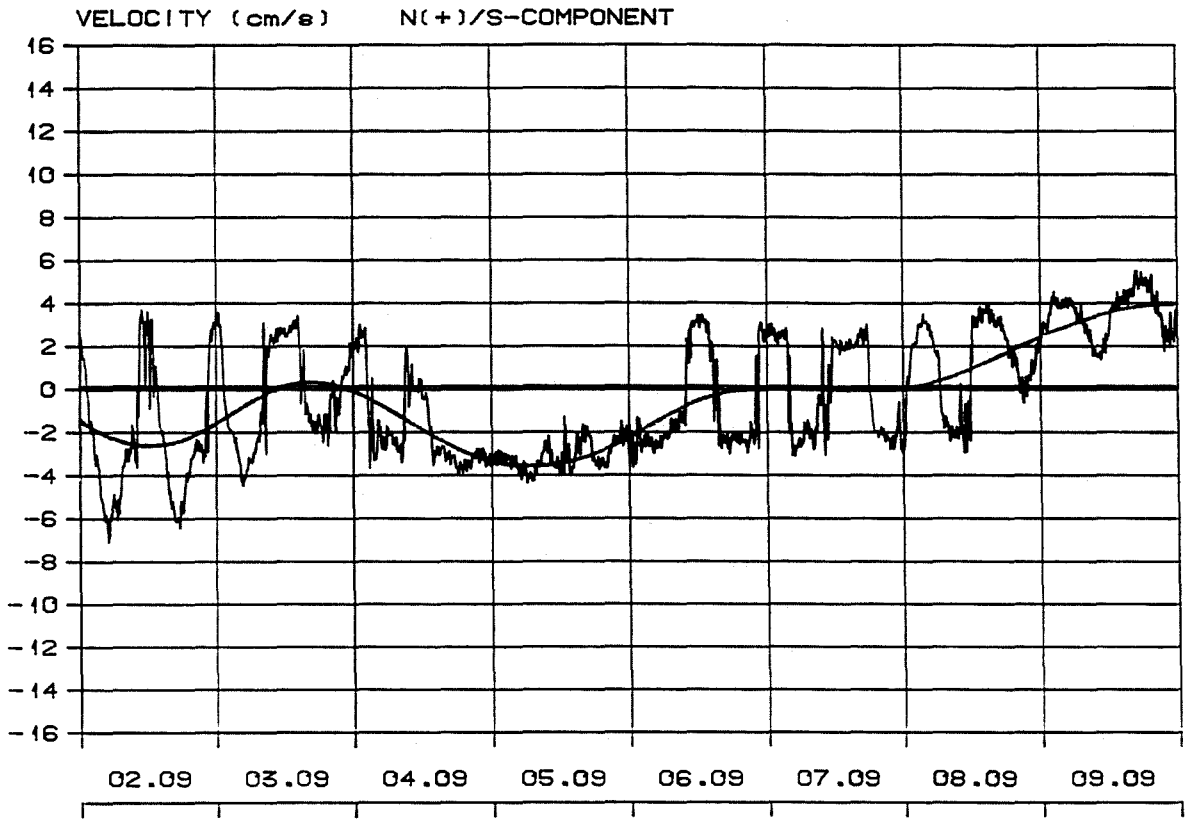
Position : N 73° 4.80' E 40° 0.00'

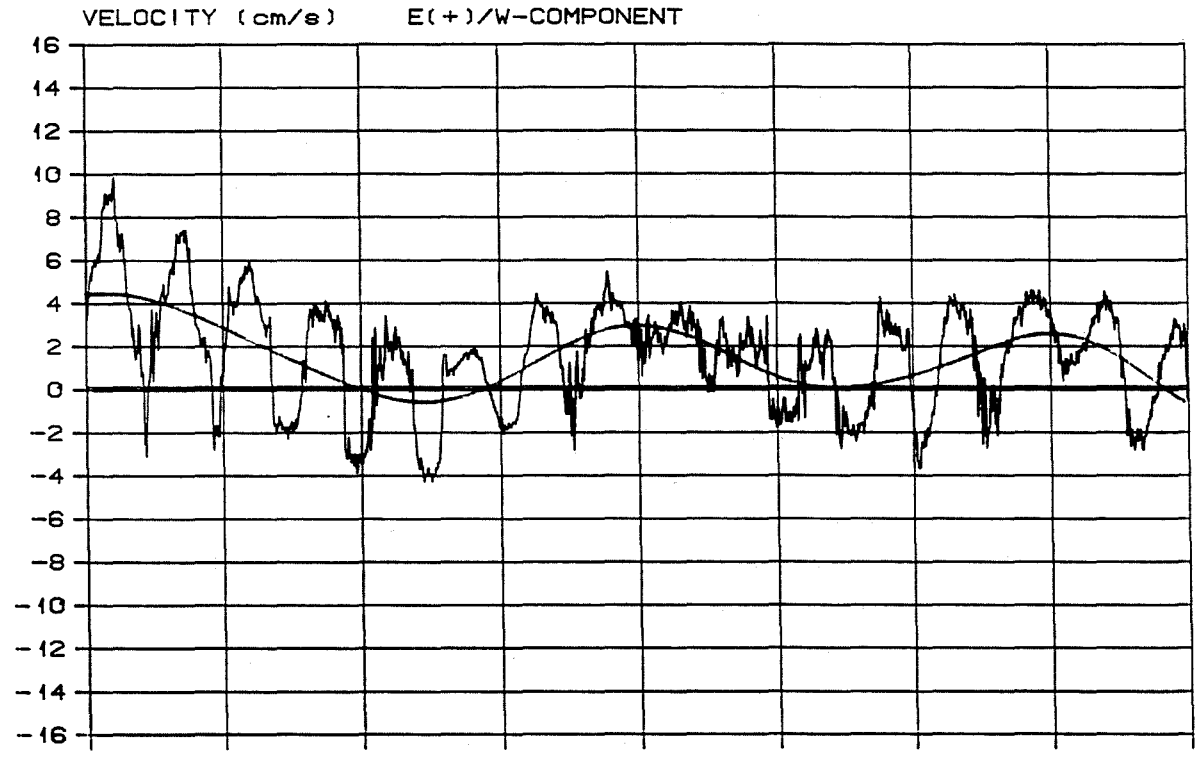
Instrument depth : 150.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Obeervation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

Fig. 1-3-6 N/S and E/W components of current.





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

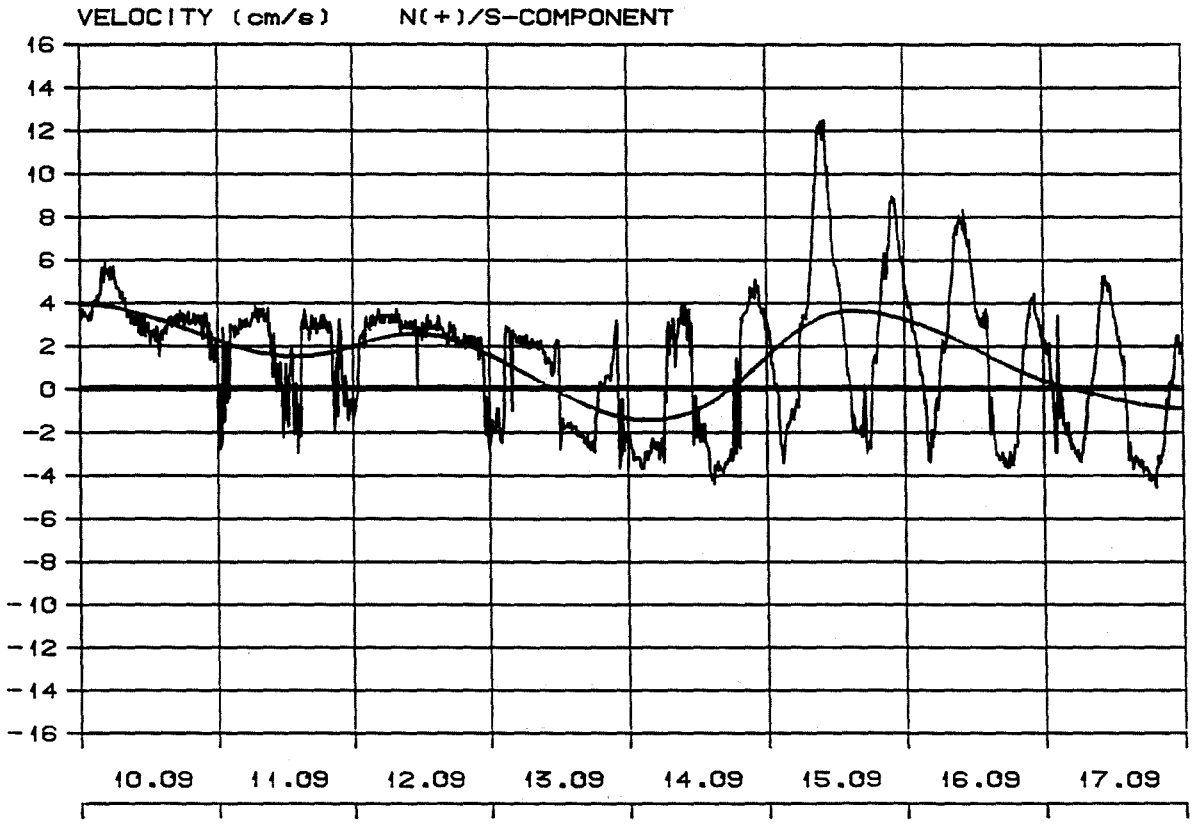
Instrument depth : 150.0 m Bottom depth : 315.0 m

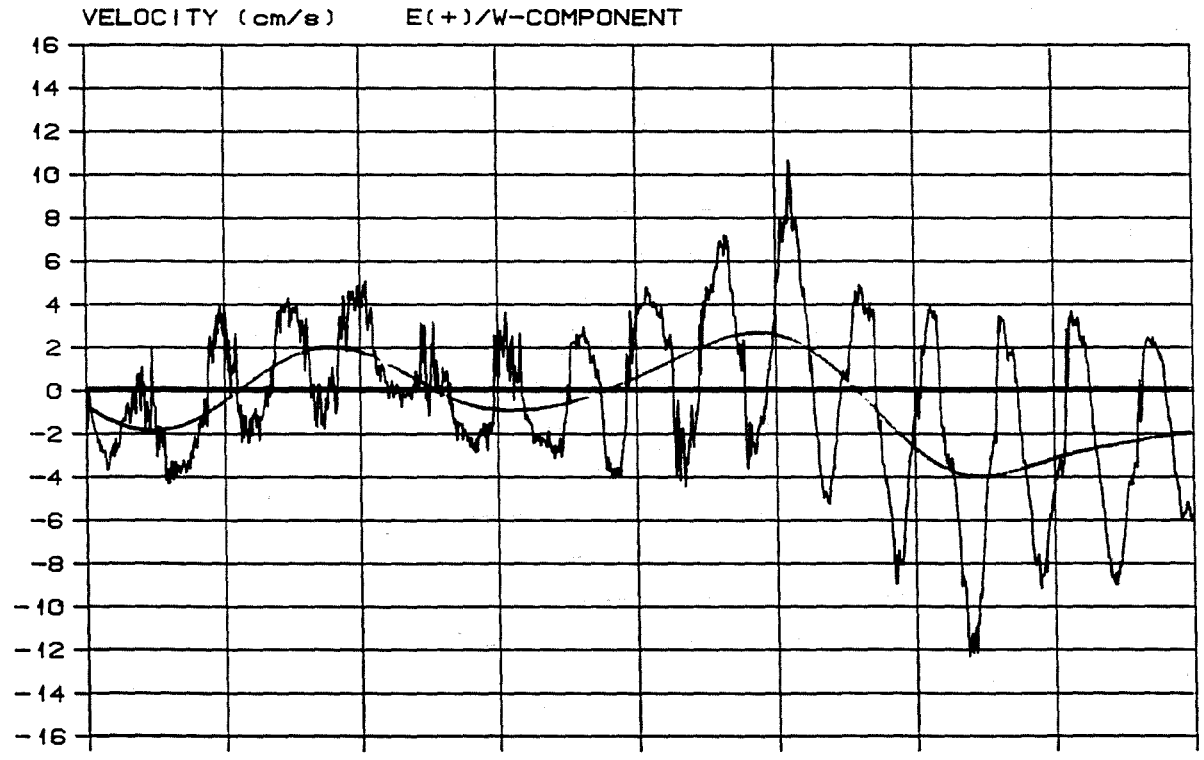
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

Fig. 1-3-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

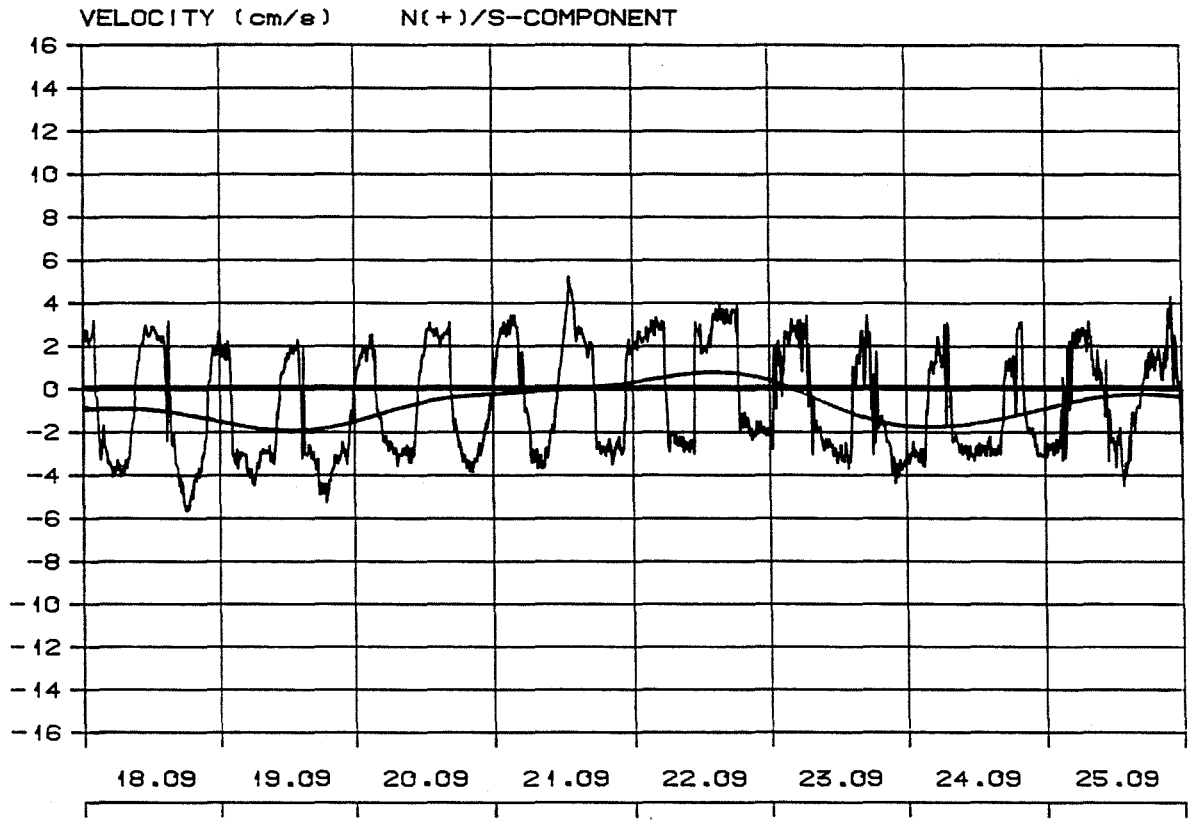
Instrument depth : 150.0 m Bottom depth : 315.0 m

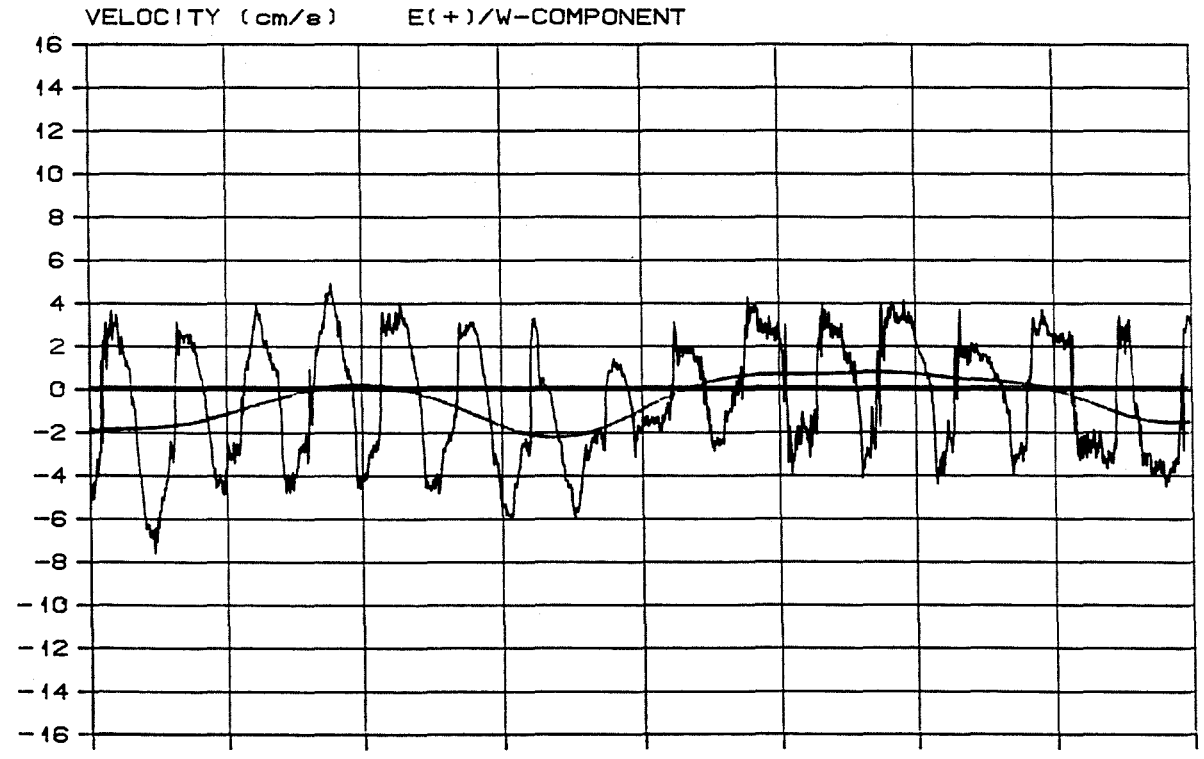
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

Fig. 1-3-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 150.0 m Bottom depth : 315.0 m

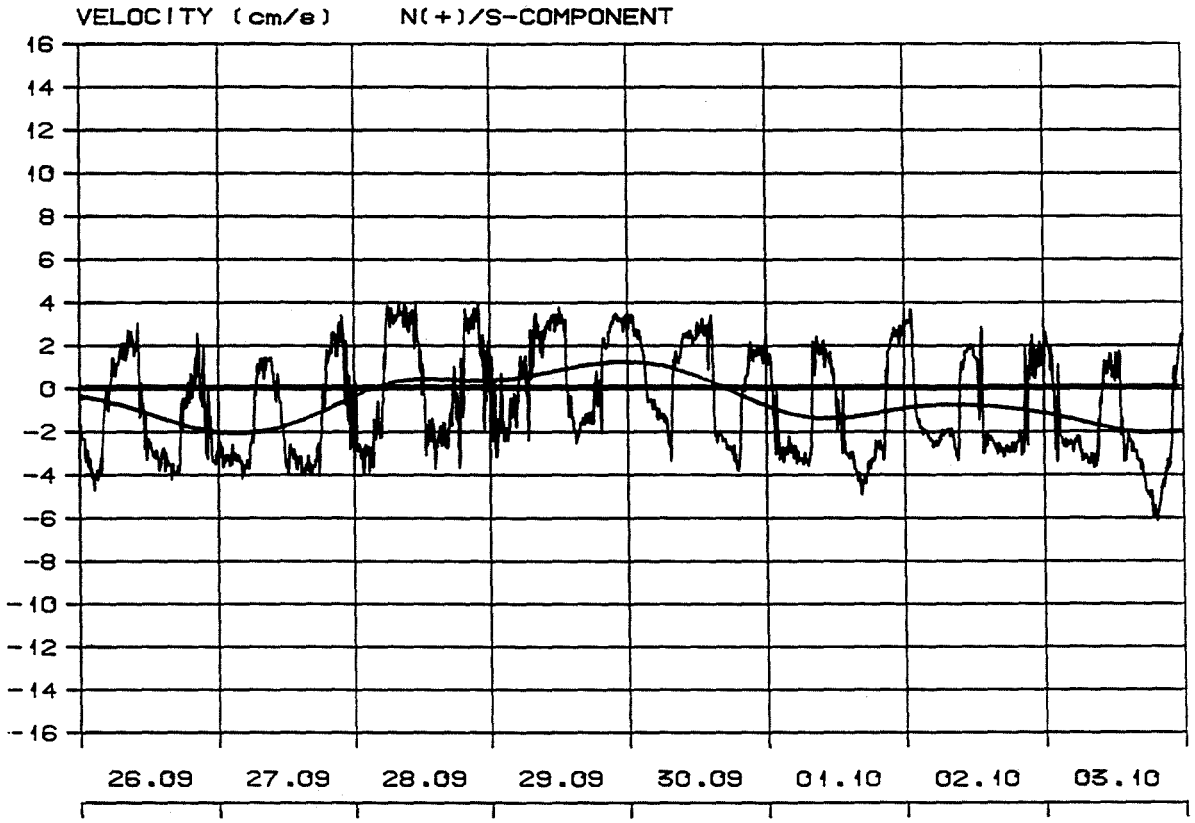
Time interval : 10.00 minutes.

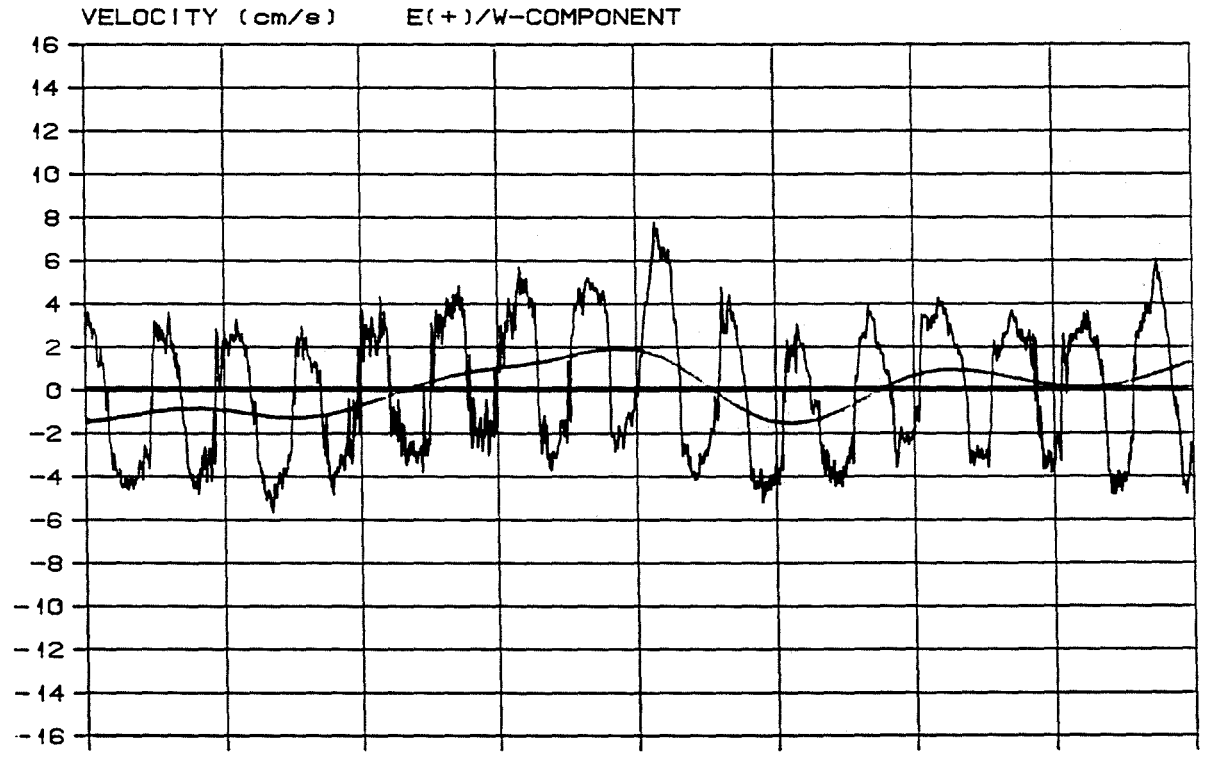
Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

H 1

Fig. 1-3-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 150.0 m Bottom depth : 315.0 m

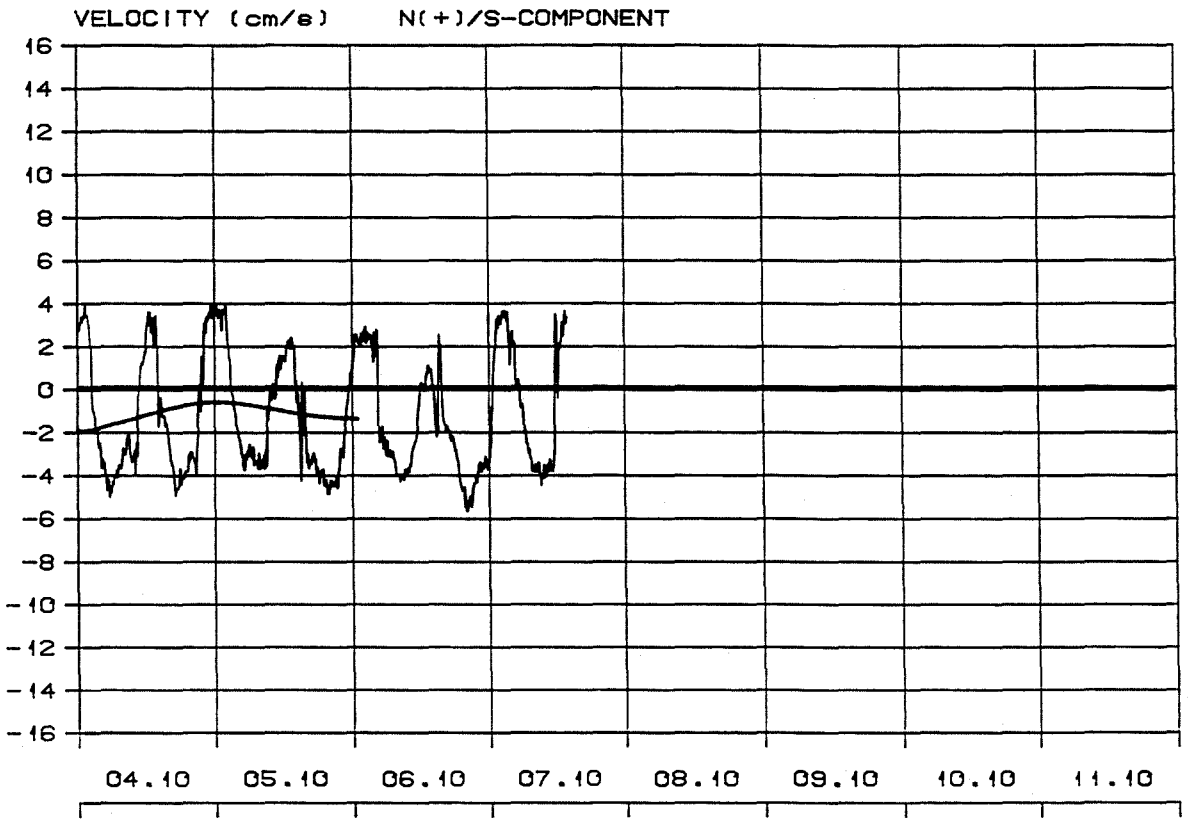
Time interval : 10.00 minutes.

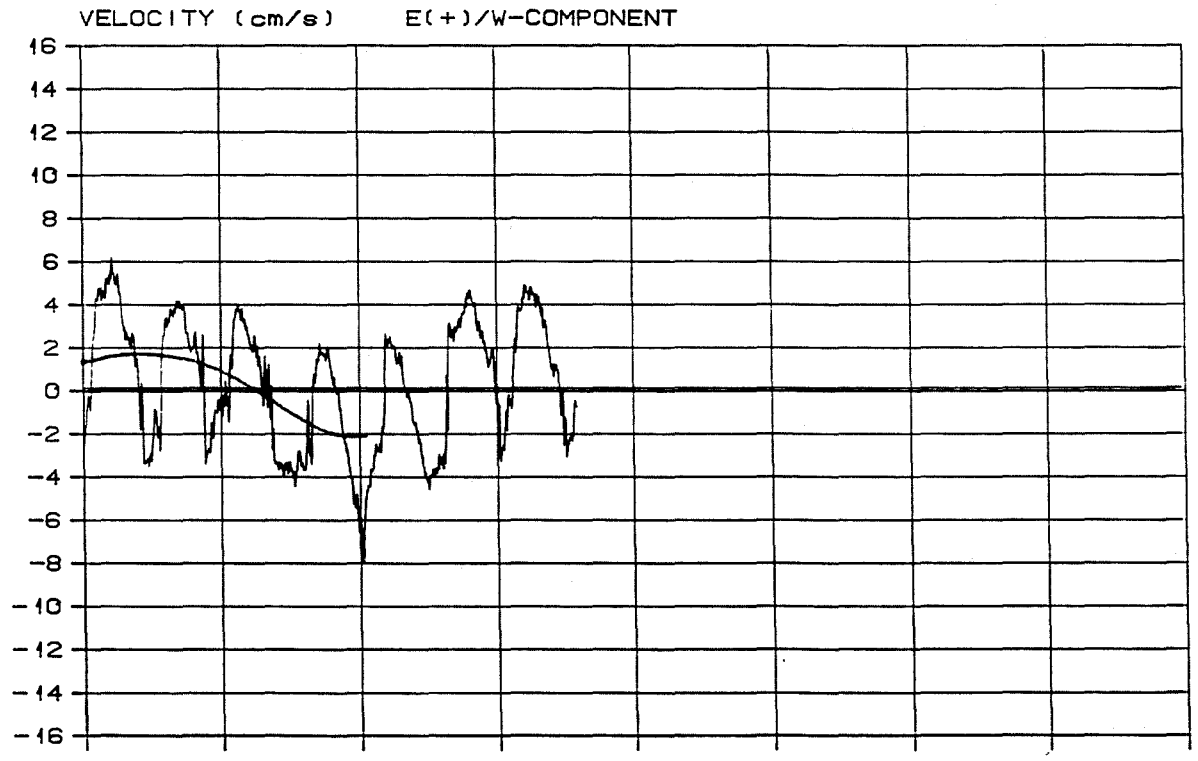
Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

H I

Fig. 1-3-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

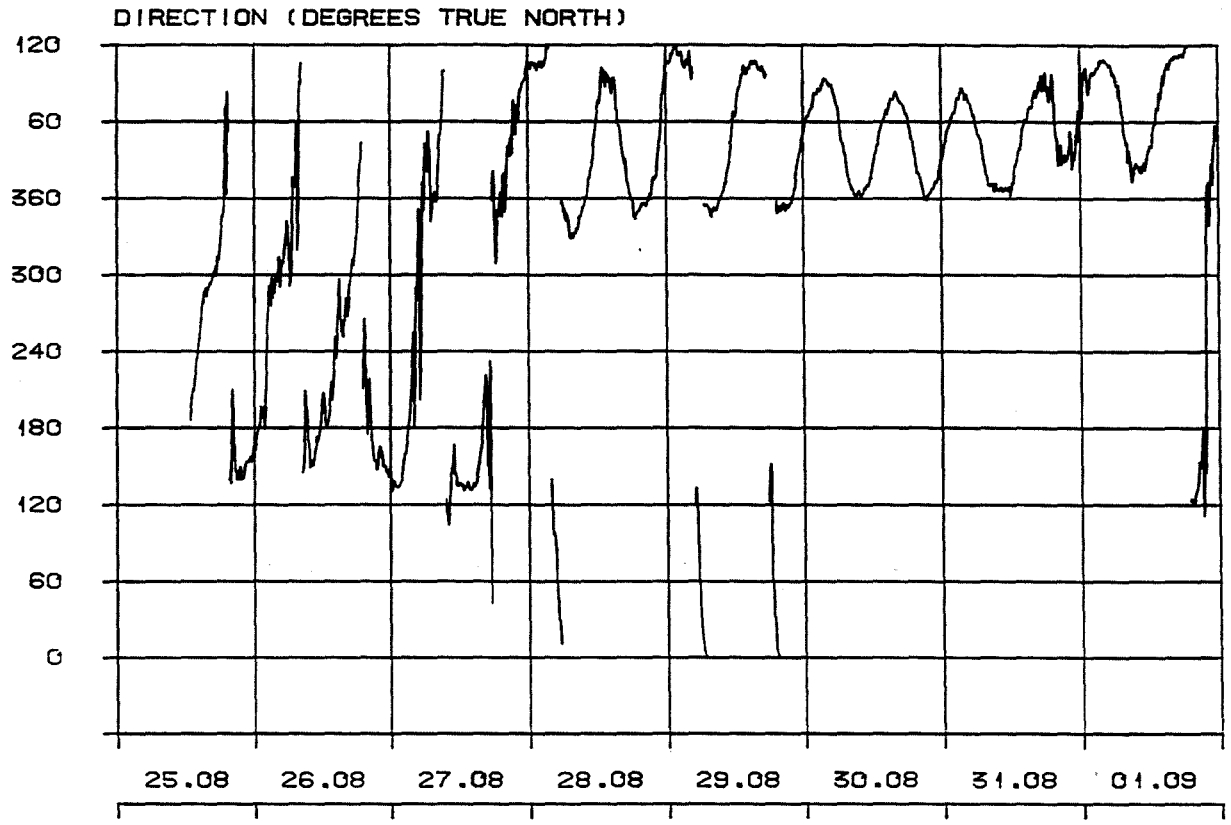
Instrument depth : 150.0 m Bottom depth : 315.0 m

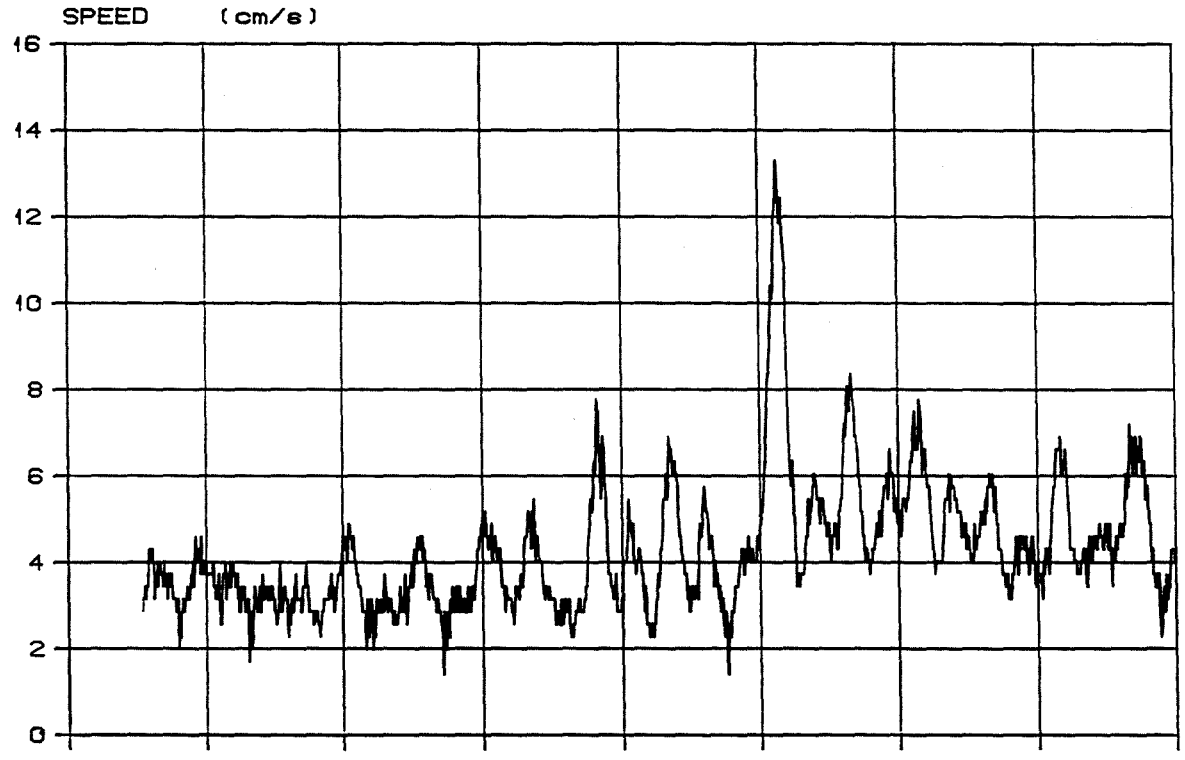
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

Fig. 1-3-6

Continues.....





The Barents Sea

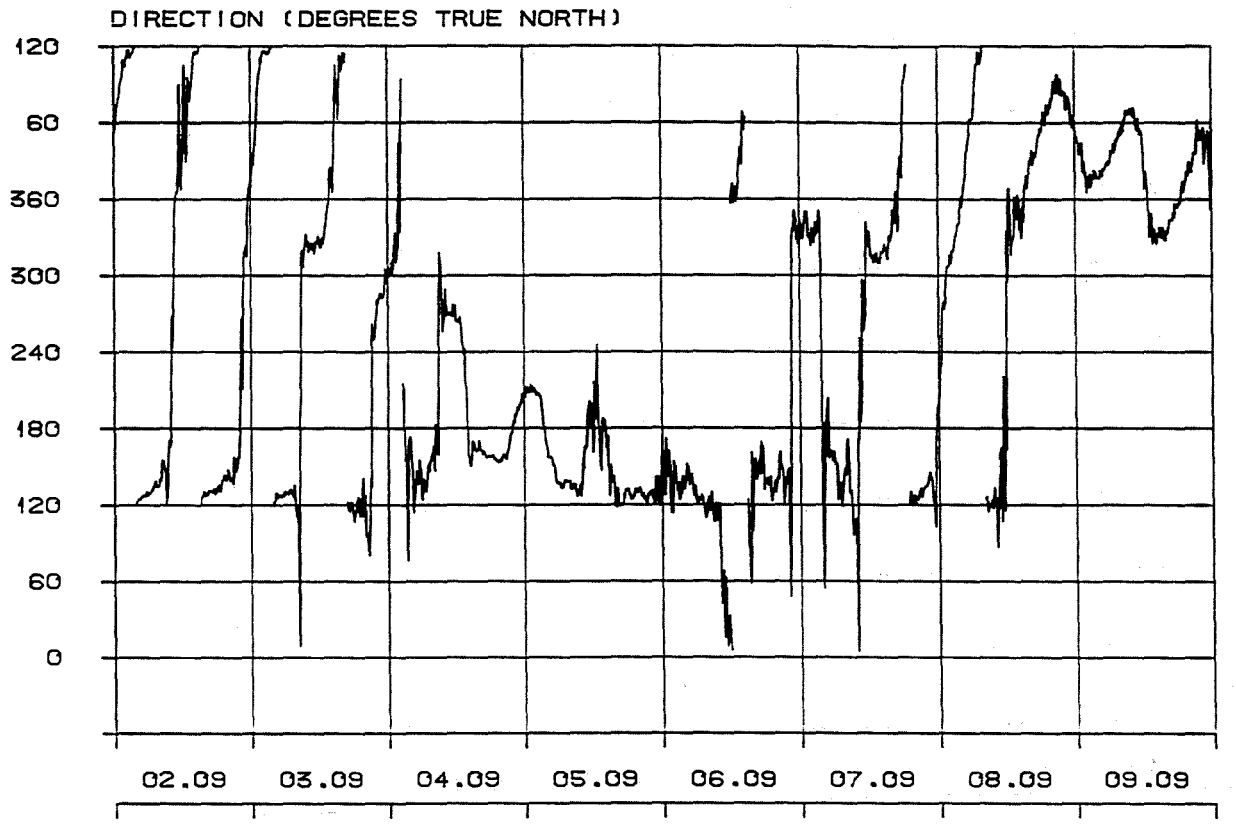
Position : N 73° 4.80' E 40° 0.00'

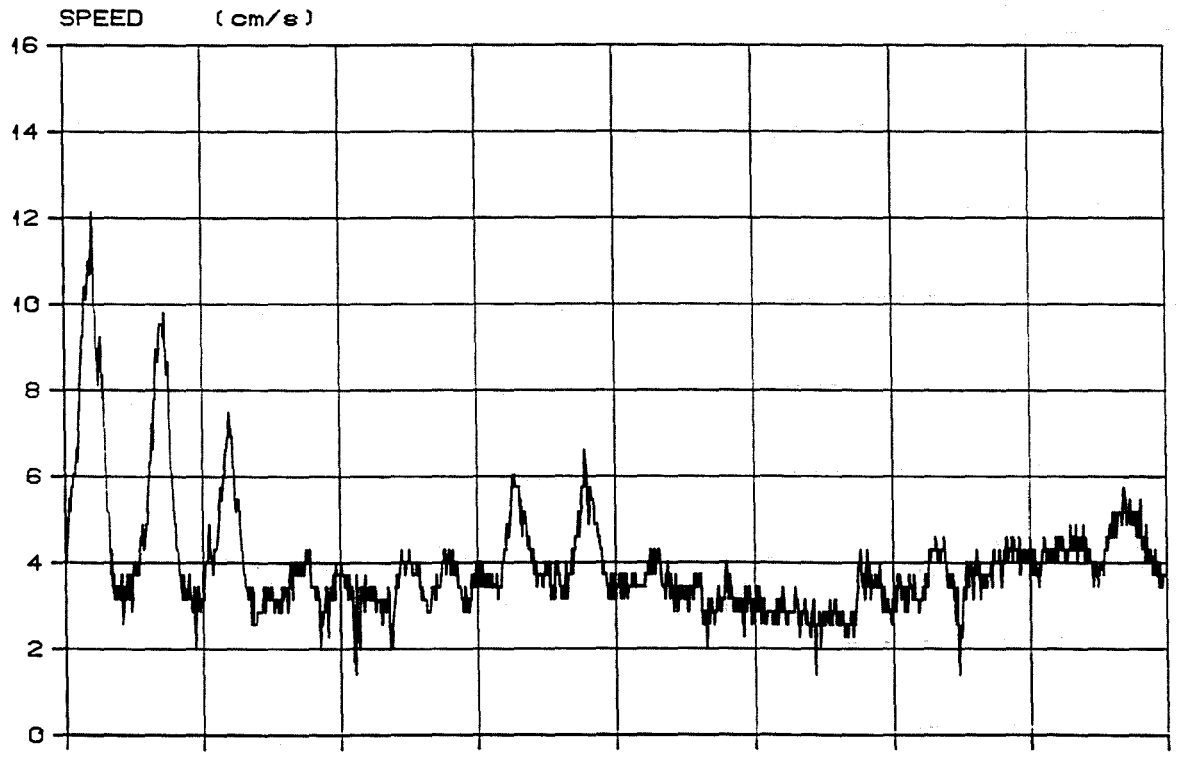
Instrument depth : 150.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Obeservation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

Fig. 1-3-7 Speed and direction of current.





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

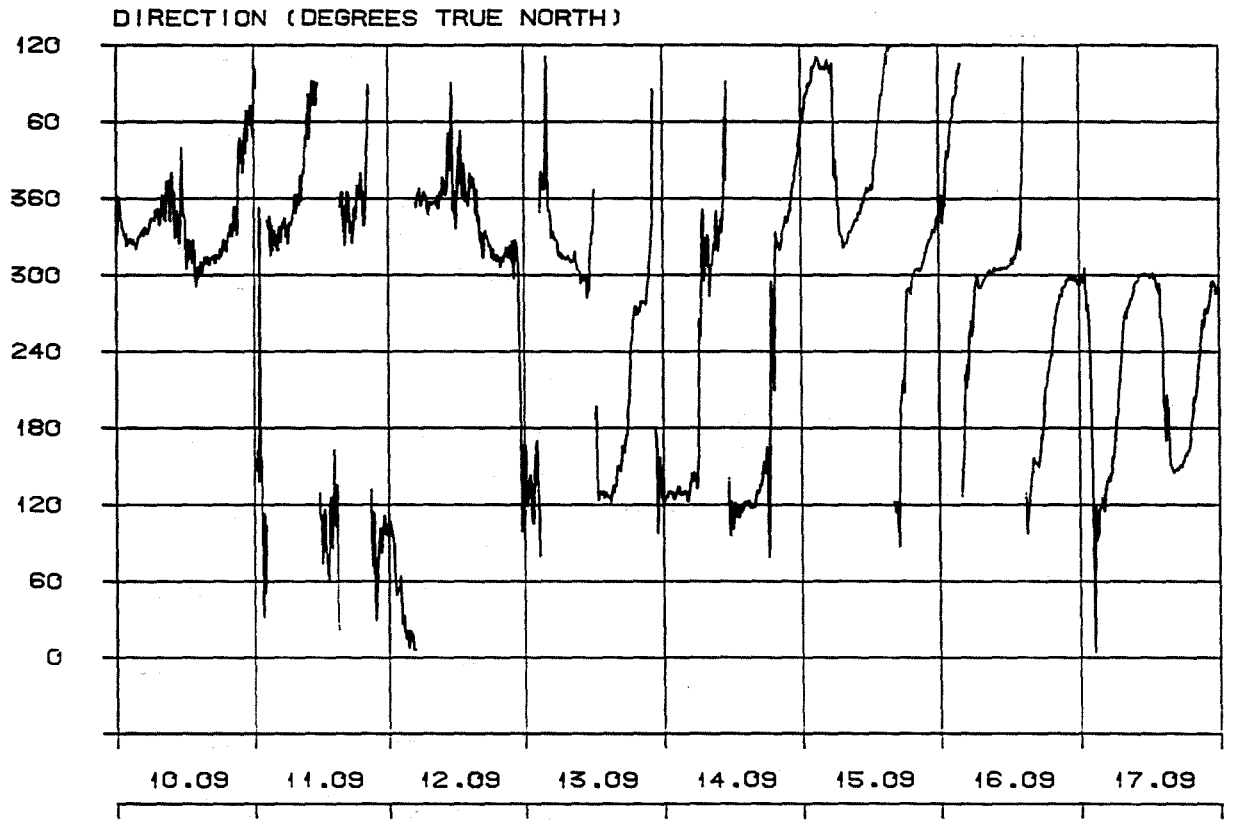
Instrument depth : 150.0 m Bottom depth : 315.0 m

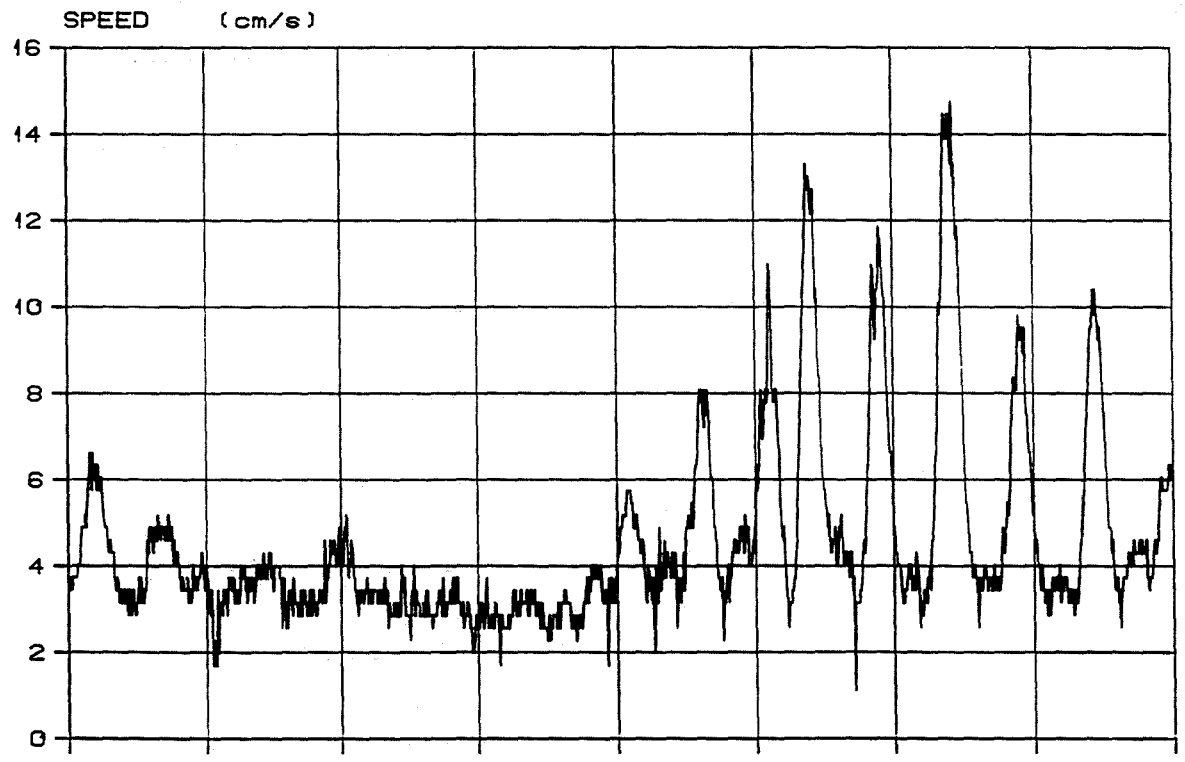
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

Fig. 1-3-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 150.0 m Bottom depth : 315.0 m

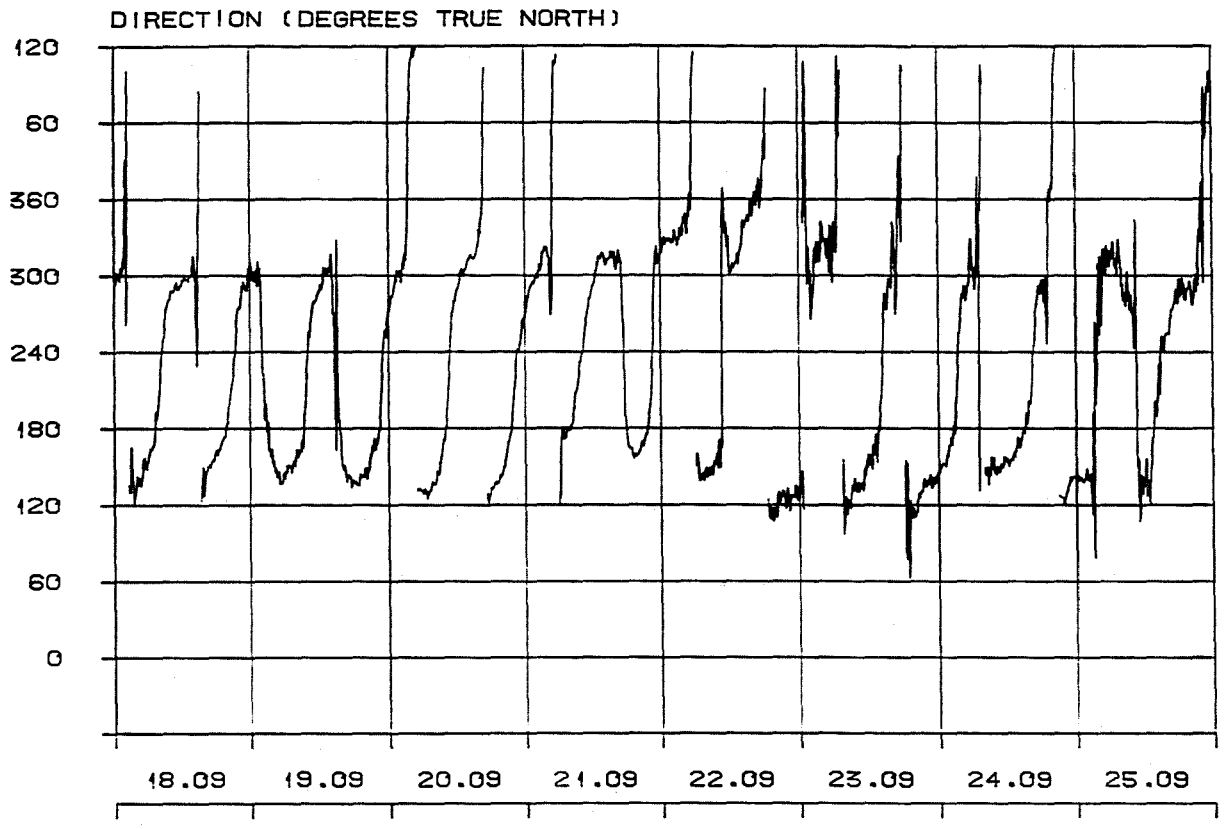
Time interval : 10.00 minutes.

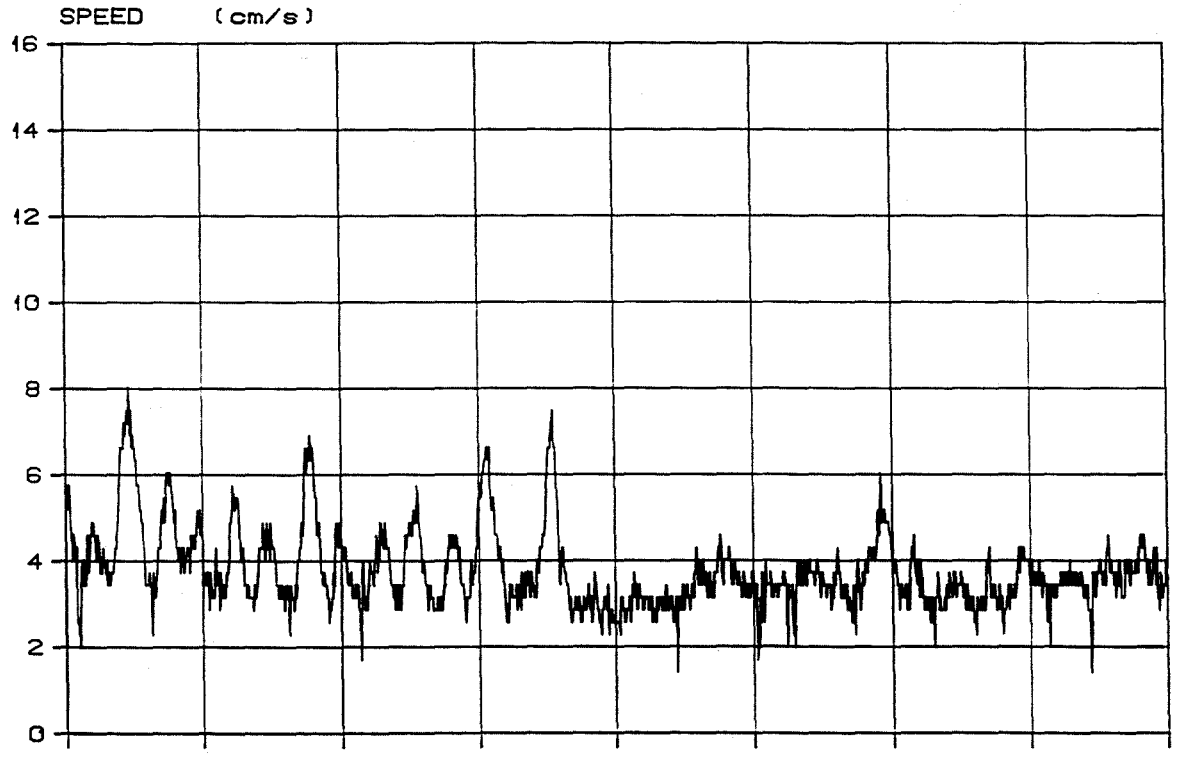
Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

H I

Fig. 1-3-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

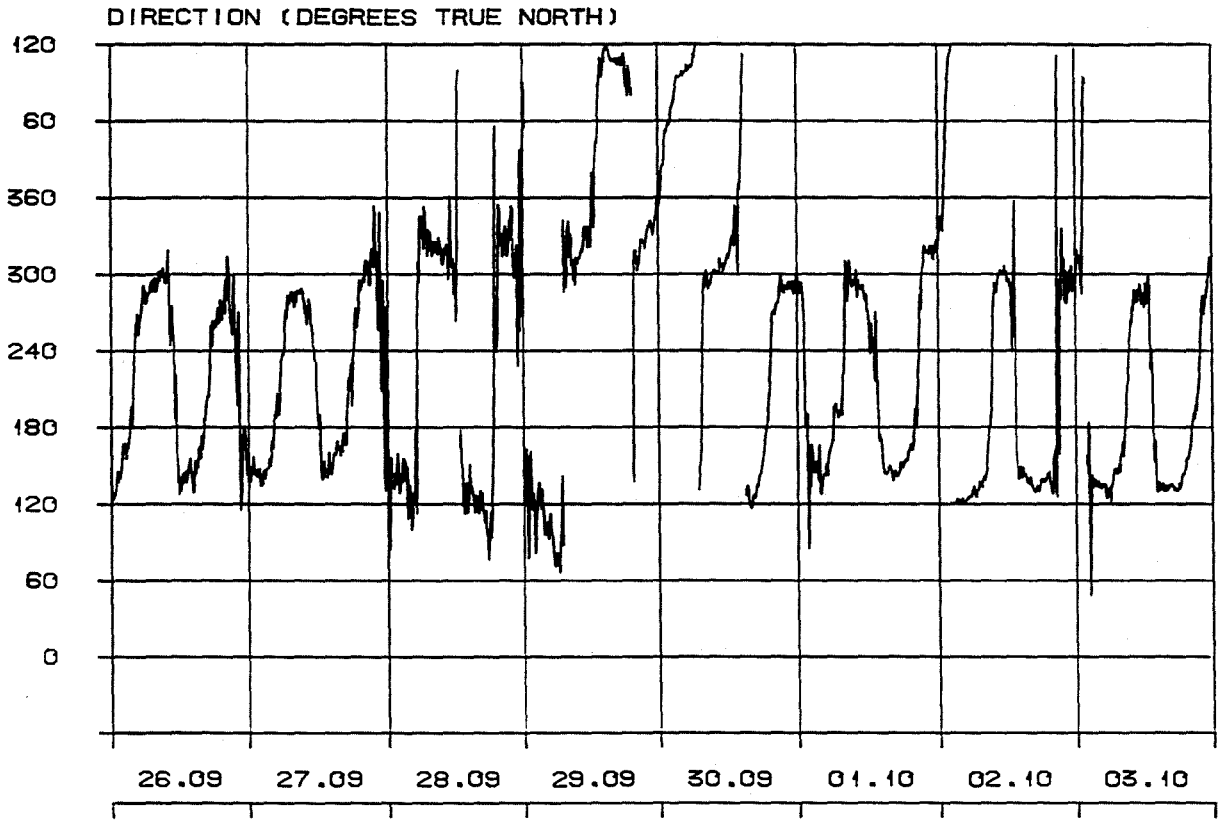
Instrument depth : 150.0 m Bottom depth : 315.0 m

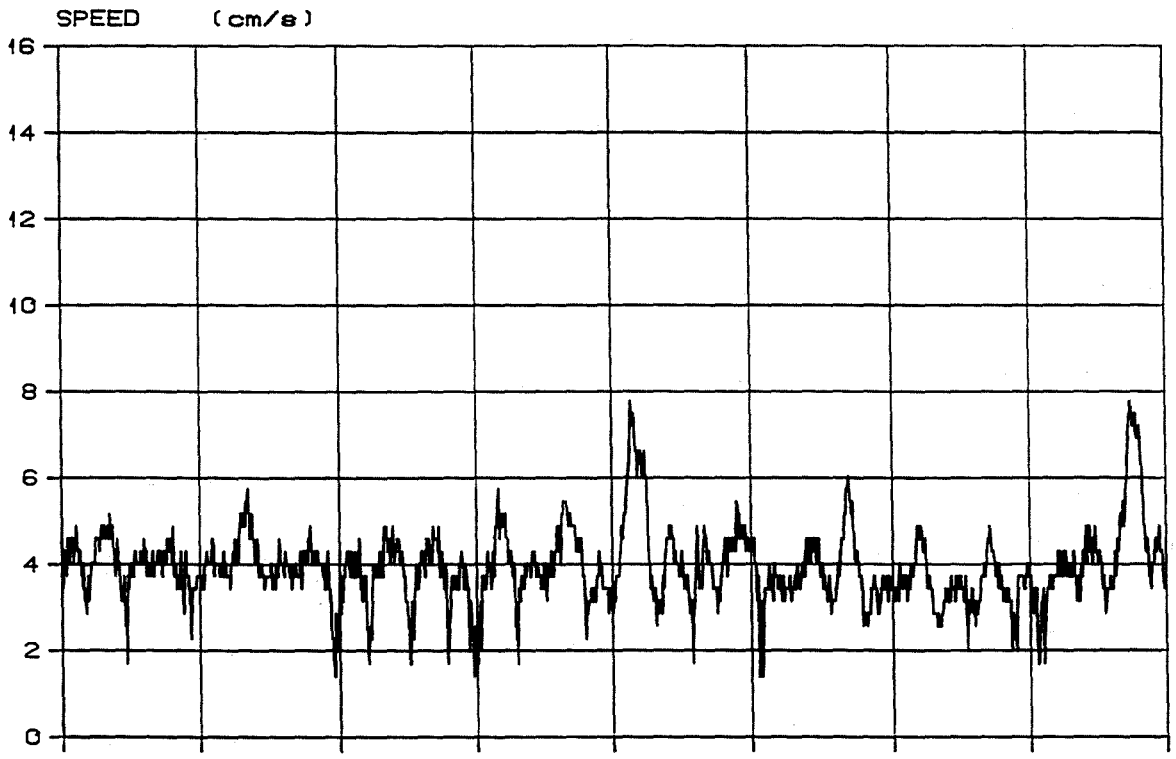
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

Fig. 1-3-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

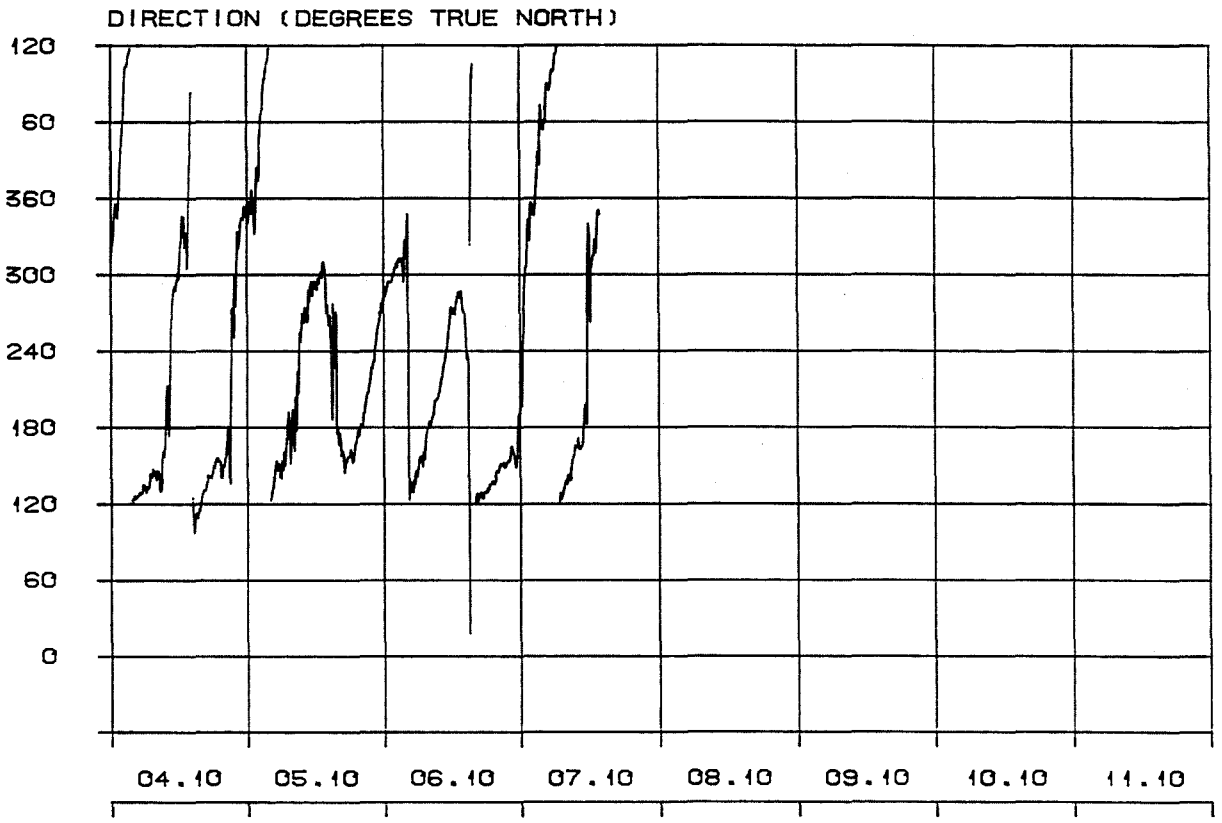
Instrument depth : 150.0 m Bottom depth : 315.0 m

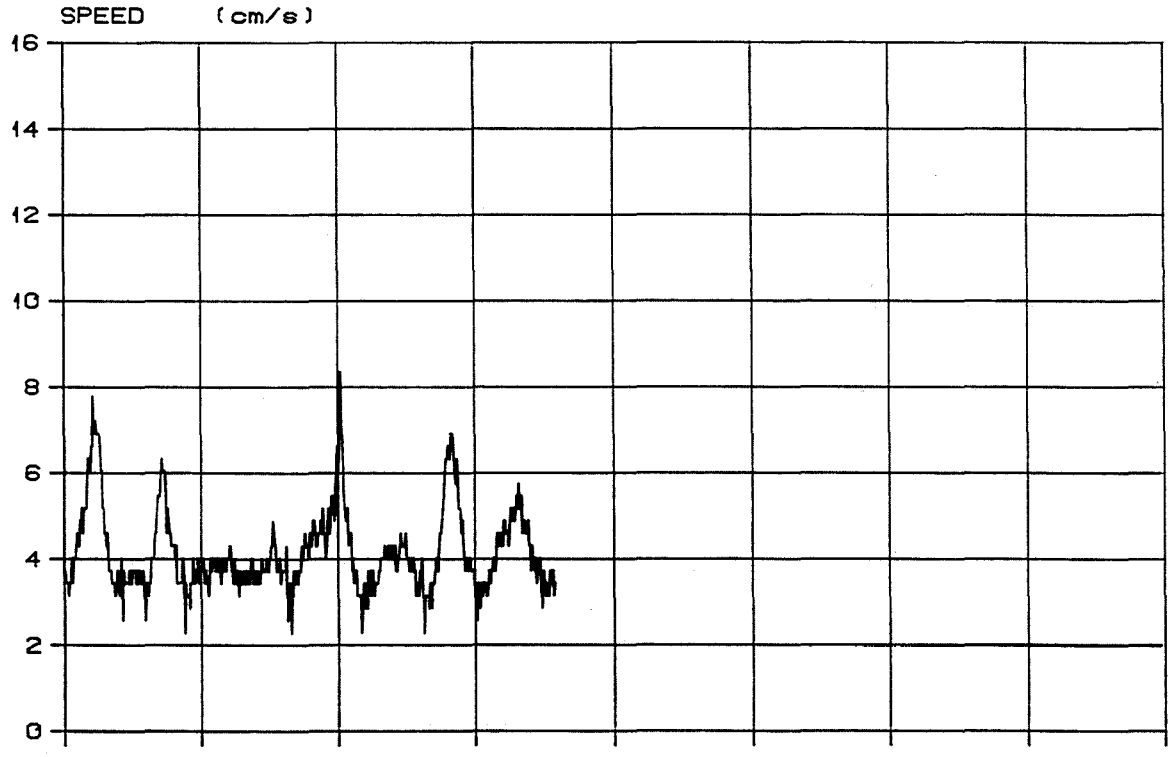
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

Fig. 1-3-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 150.0 m Bottom depth : 315.0 m

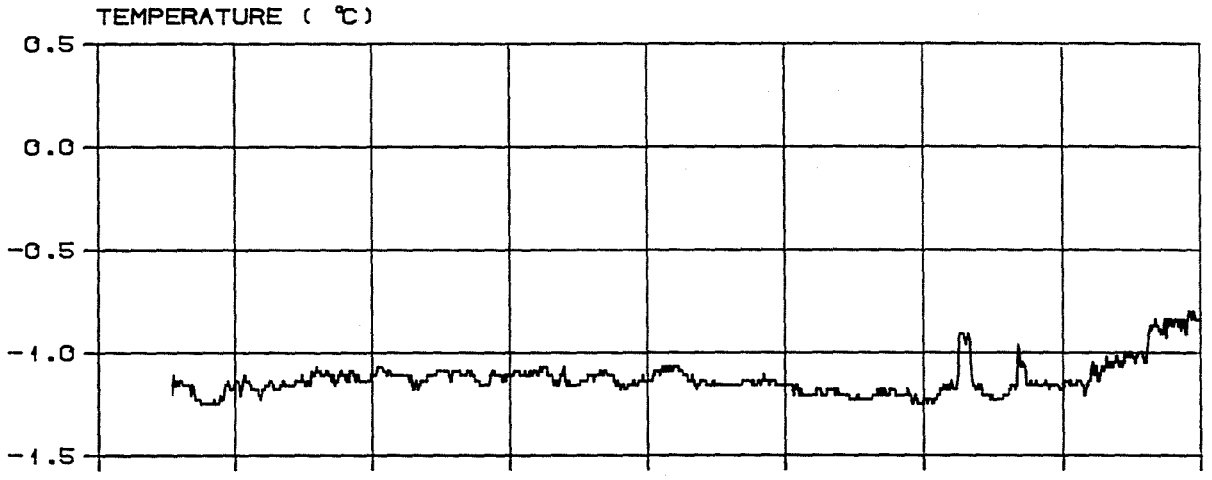
Time interval : 10.00 minutes.

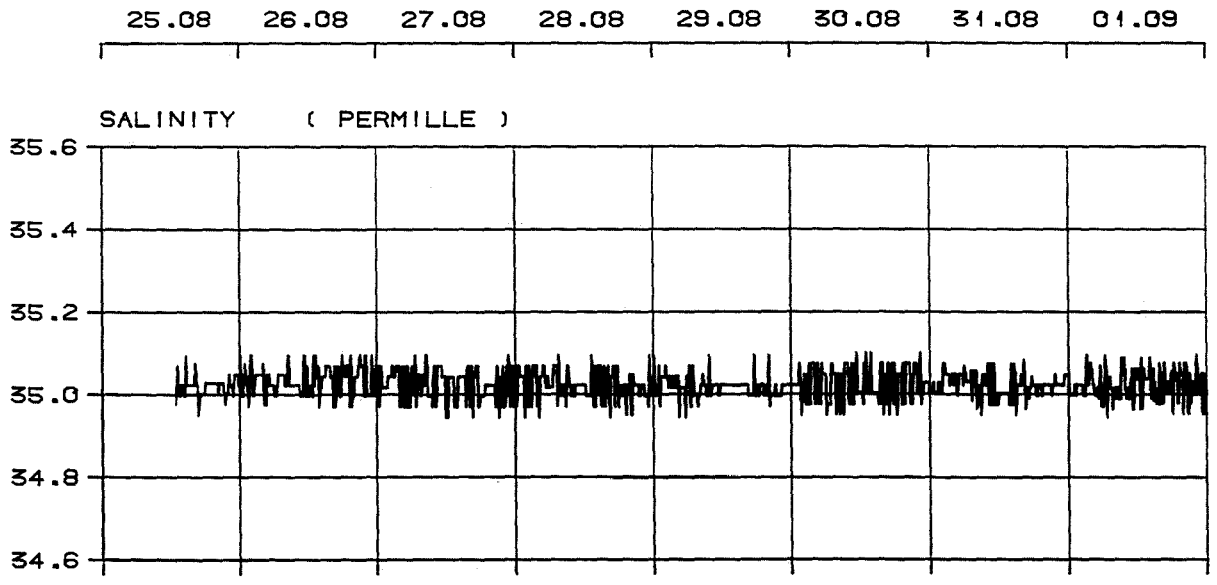
Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

H I

Fig. 1-3-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

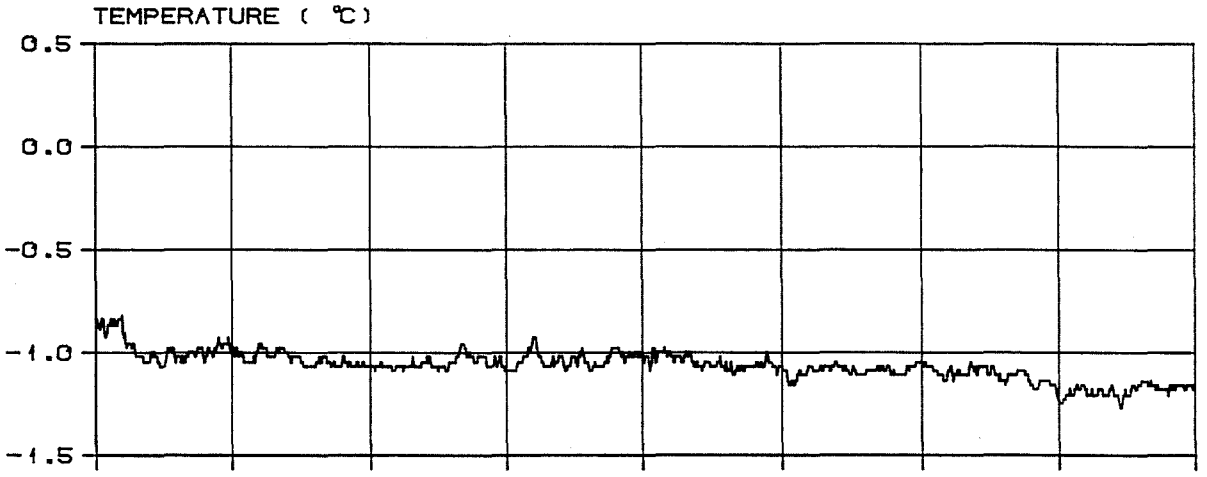
Instrument depth : 150.0 m Bottom depth : 315.0 m

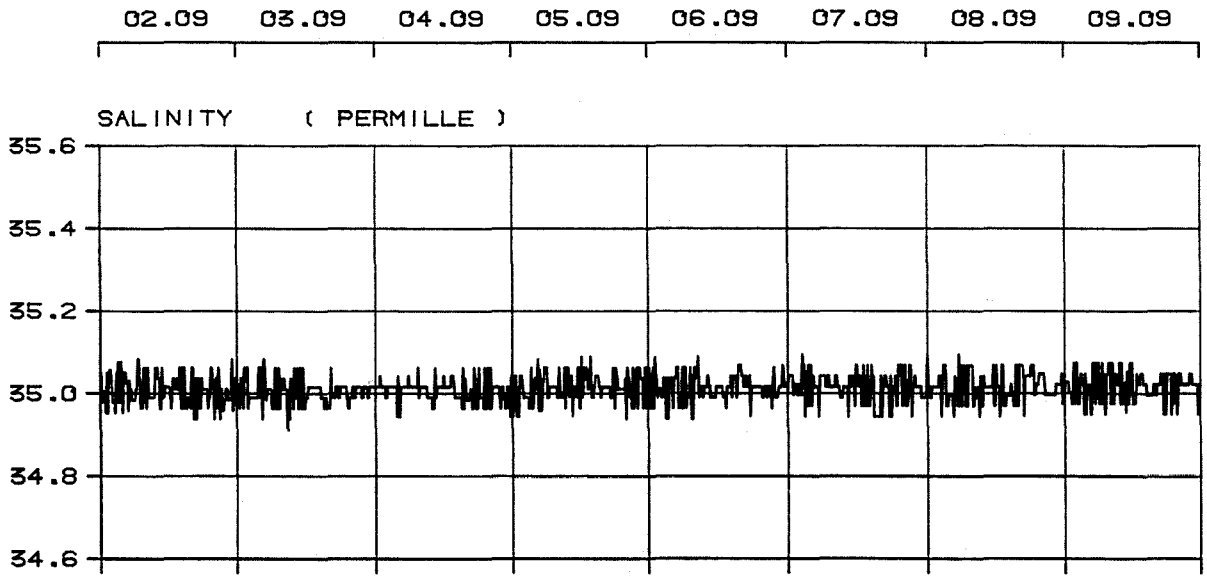
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

H I

Fig. 1-3-8 Temperature and salinity.





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

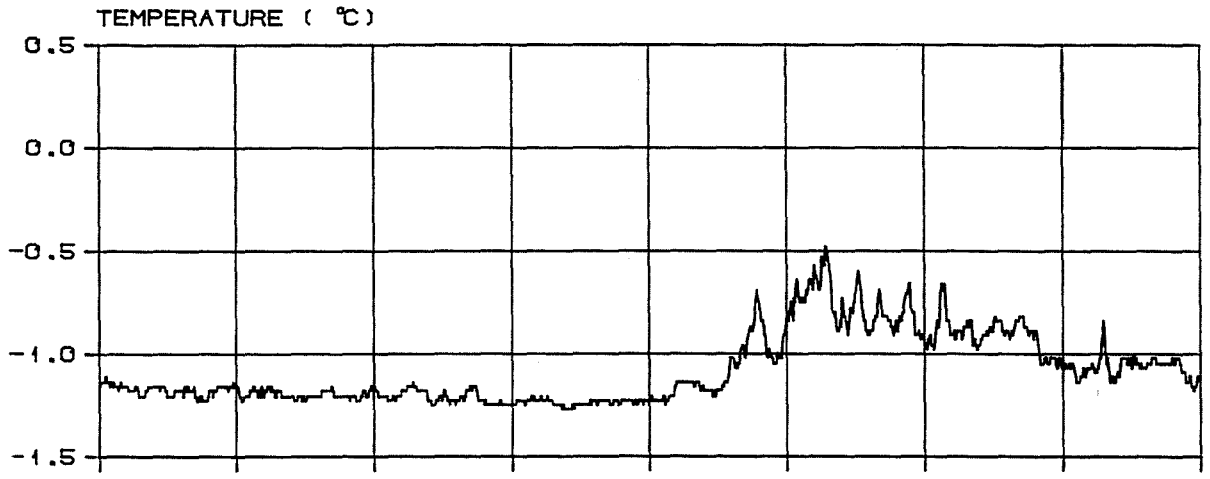
Instrument depth : 150.0 m Bottom depth : 315.0 m

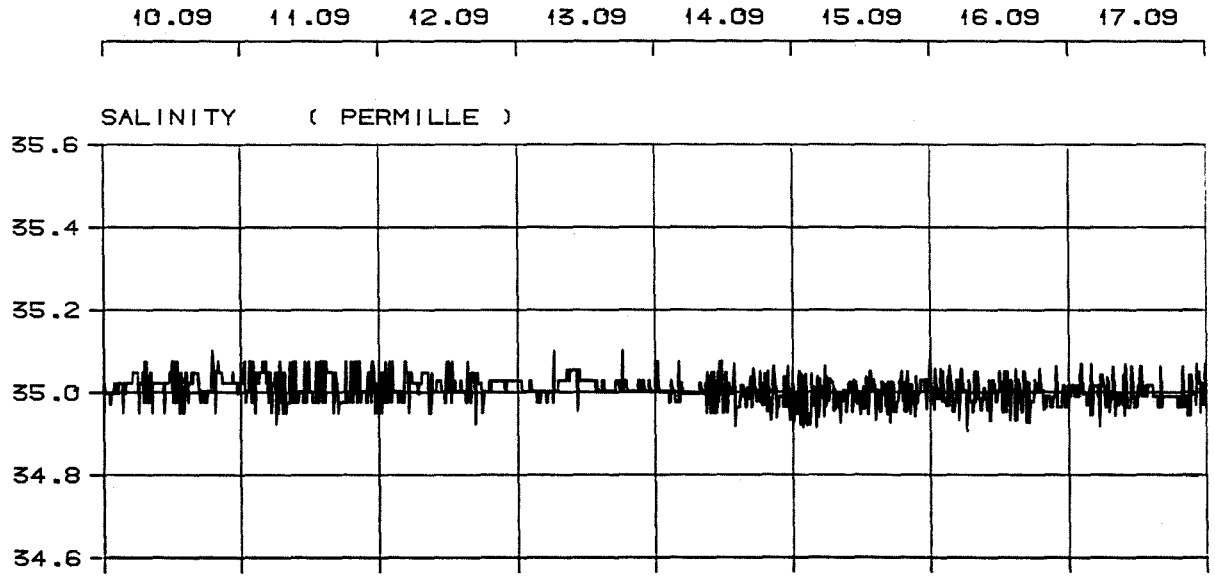
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

Fig. 1-3-8

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

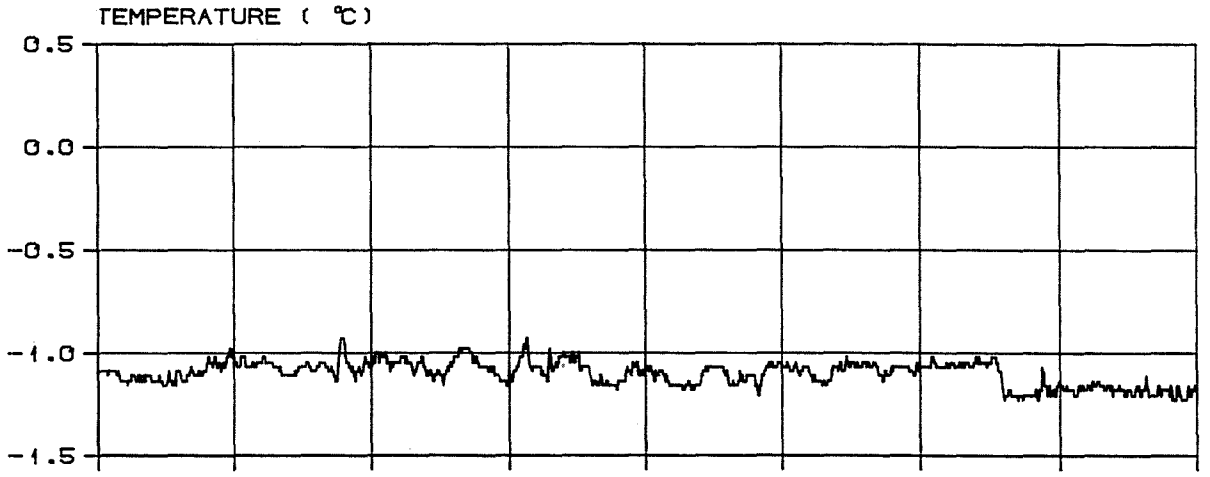
Instrument depth : 150.0 m Bottom depth : 315.0 m

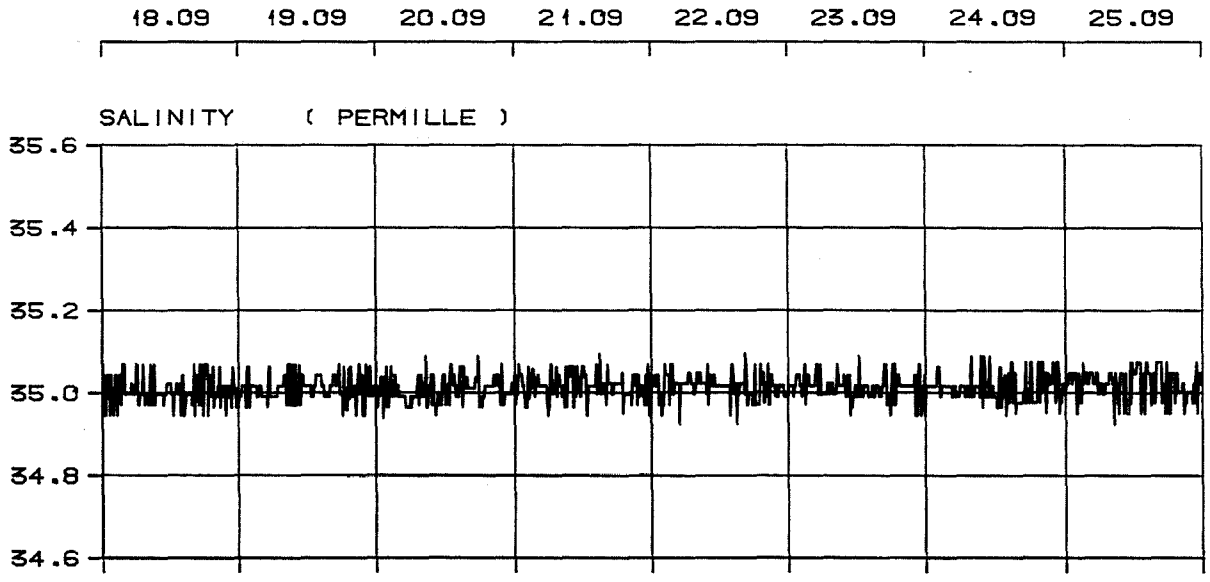
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

Fig. 1-3-8

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

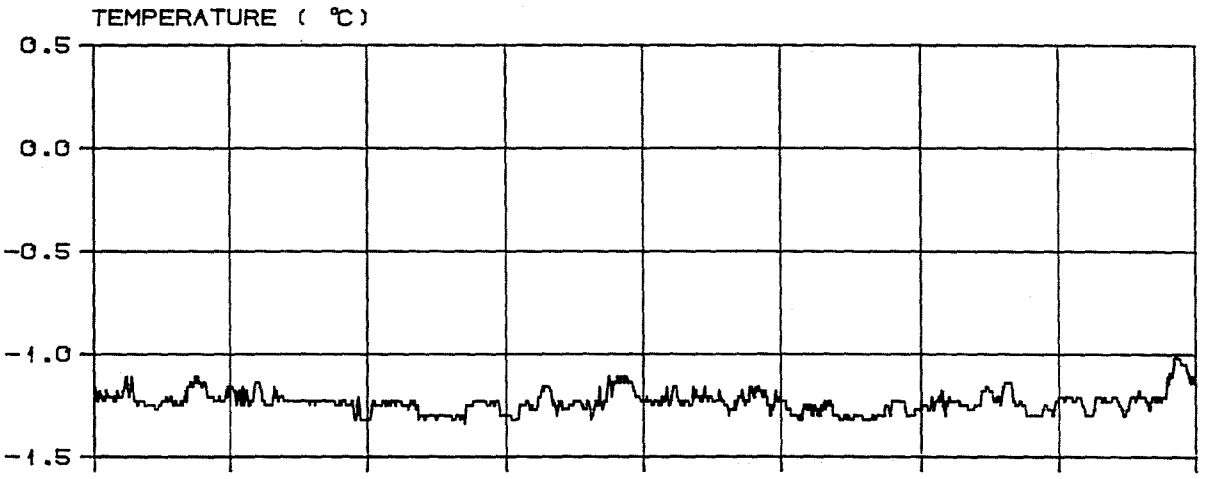
Instrument depth : 150.0 m Bottom depth : 315.0 m

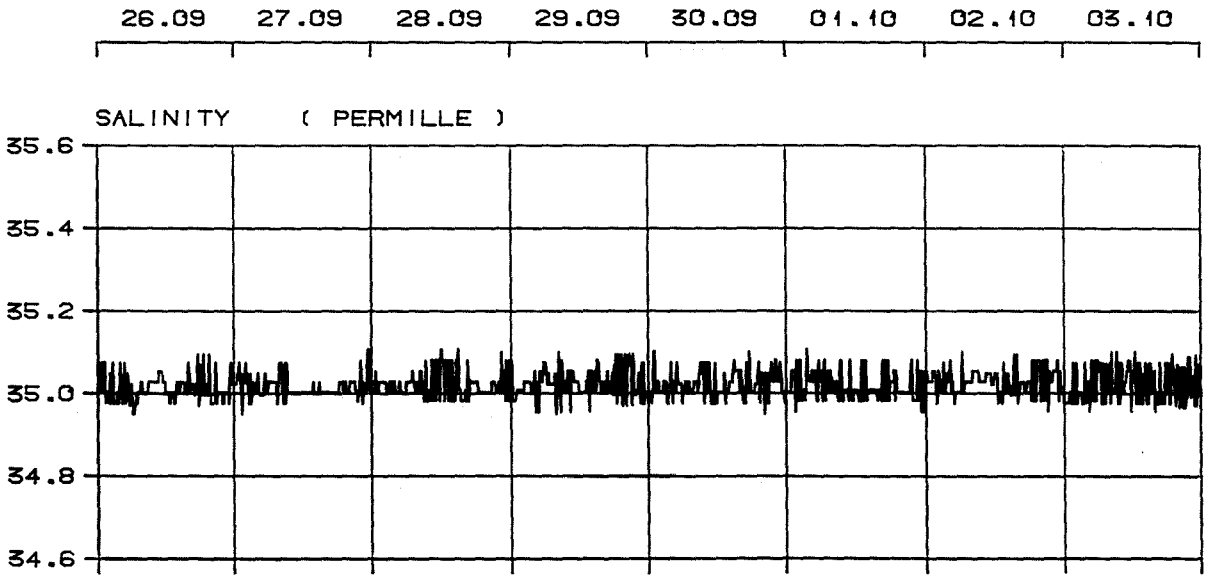
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

Fig. 1-3-8

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

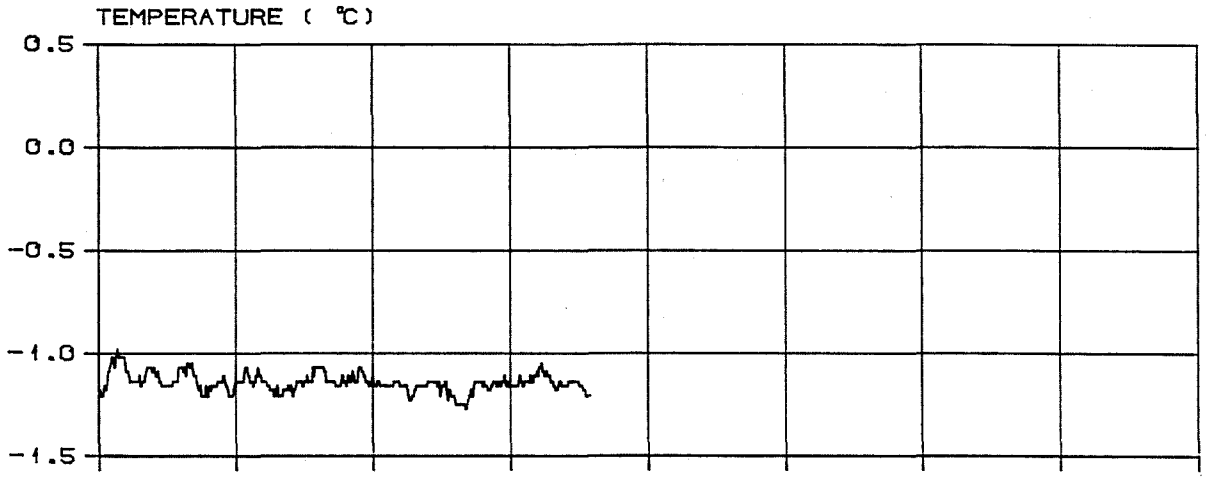
Instrument depth : 150.0 m Bottom depth : 315.0 m

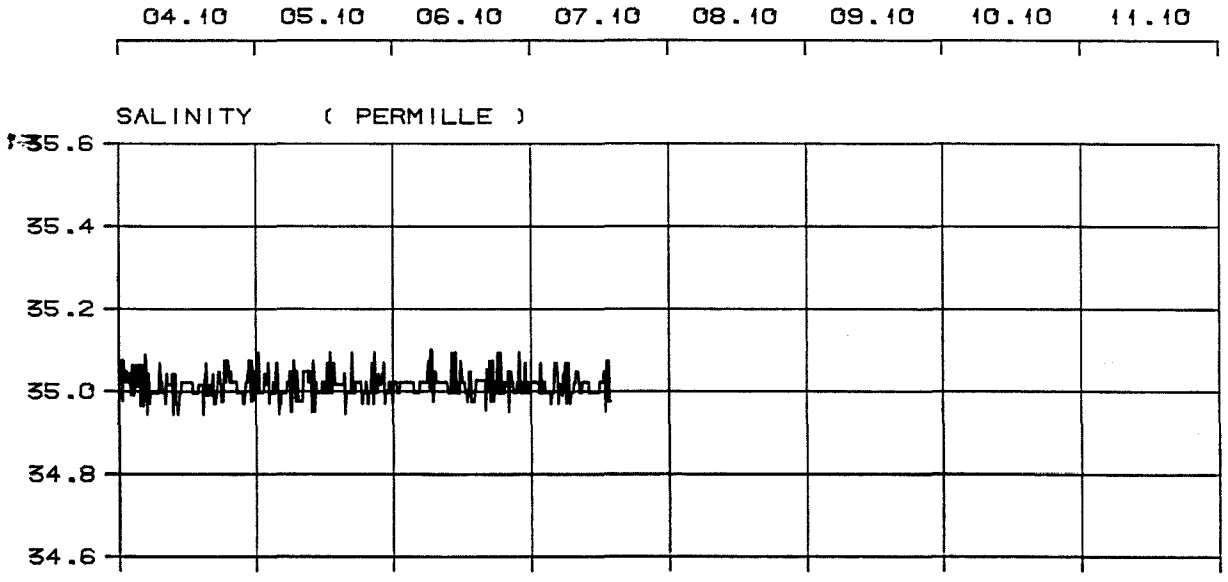
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

Fig. 1-3-8

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 150.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

H 1

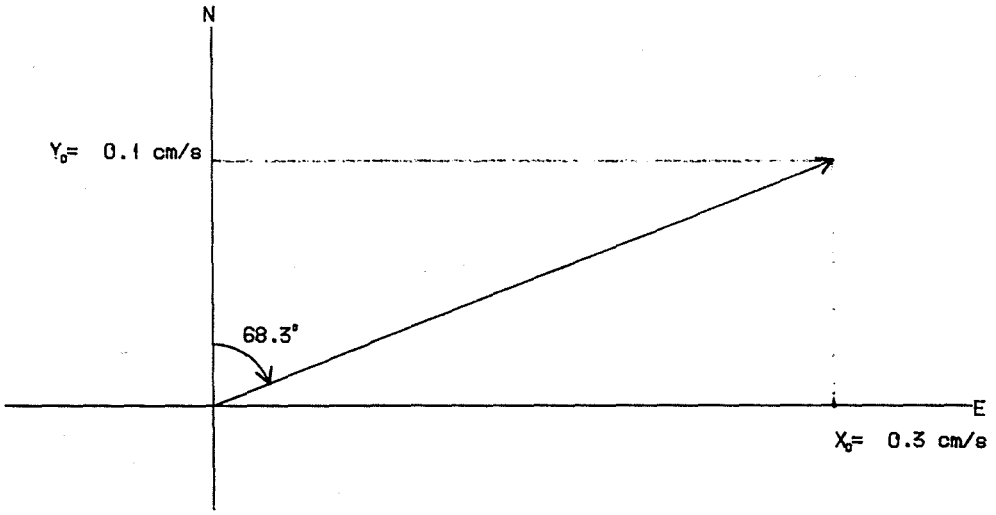
Fig. 1-3-8

Continues.....

HARMONIC ANALYSIS OF CURRENTS

CONSTITUENTS			DECOMPOSED CURRENT				TIDAL CURRENT ELLIPSE				
			E/W		N/S		Major axis	Minor axis			
Symbol	Period houres	Frequense °/hour	X_j cm/s	g_{xj} °	Y_j cm/s	g_{yj} °	A_j cm/s	B_j cm/s	θ_j °	g_j °	BETA. °
MM	661.31	0.5	1.2	174.1	0.7	299.5	1.3	0.6	294.7	342.8	5.2
MSF	354.37	1.0	0.4	312.7	1.3	298.6	1.4	-0.1	16.7	299.8	105.3
N2	12.66	28.4	0.9	73.6	0.8	280.9	1.2	-0.3	129.0	84.6	45.3
M2	12.42	29.0	3.0	88.3	2.6	294.9	4.0	-0.9	130.3	99.5	82.8
S2	12.00	30.0	1.2	130.3	0.8	340.1	1.4	-0.3	121.3	138.6	108.7

MEAN CURRENT



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 150.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

H 1

Fig. 1-3-9 Harmonic analysis of current.

A discription of the model and its definitions :

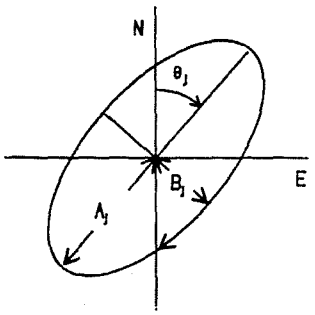
Current-vector decomposed in E/W (real) - and N/S (imaginary) - direction :

$$Z(t)=X_0+\sum_{j=1}^{n}(X_j\cos(\sigma_j t+(V_0+u)_j-g_{xj})+i(Y_0+\sum_{j=1}^{n}Y_j\cos(\sigma_j t+(V_0+u)_j-g_{yj}))$$

g_{xj} , g_{yj} : Greenwich-phase for E/W- and N/S-components of each constituent.

With ellipseparameters :

$$Z(t)=\sum_{j=1}^{n}\exp(i(90^\circ-\theta_j))(A_j\cos(\sigma_j t+(V_0+u)_j-g_j)+iB_j\sin(\sigma_j t+(V_0+u)_j-g_j))$$



g_j : Greenwich phase of the current-vector for each constituent.

Rotationdirection : anticlockwise when $B_j > 0$, clockwise when $B_j < 0$

BETA : The angle between t=0 and major halv axis in the ellipse.

Common for both modles :

σ_j : Frequence in degrees/hour.

$(V_0+u)_j$: Astronomic argument relative to Greenwich-meridian.

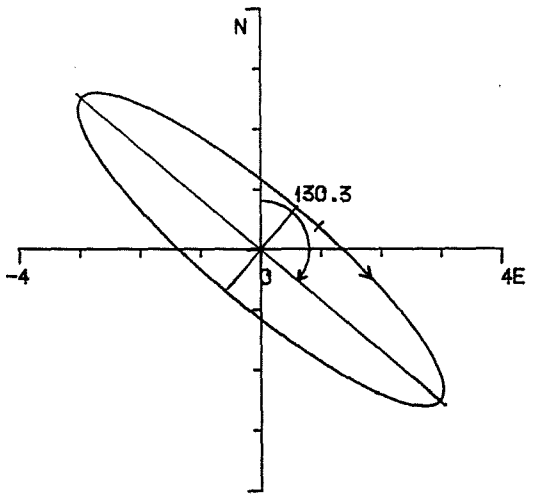
During the calculation of Z(t) will V_0+u be put into the formulas at the time t=0.

The time t is in houres; the same timezone as the analysed data.

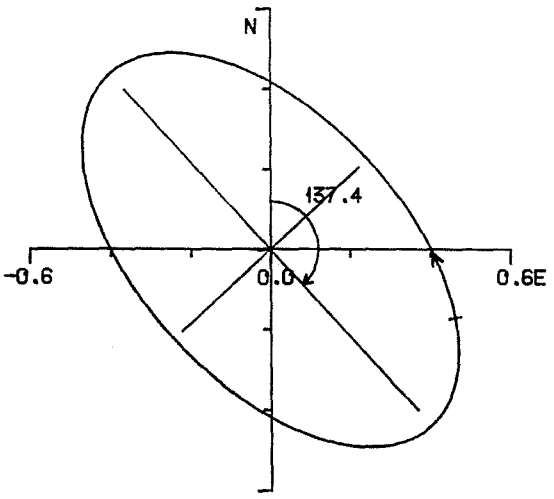
t=0 in the midle of the measurement series : 1989 16.09 H. 0100 ,

marked with a line on the ellipse.

M2-ellipse



K1-ellipse



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 150.0 m Bottom depth : 315.0 m

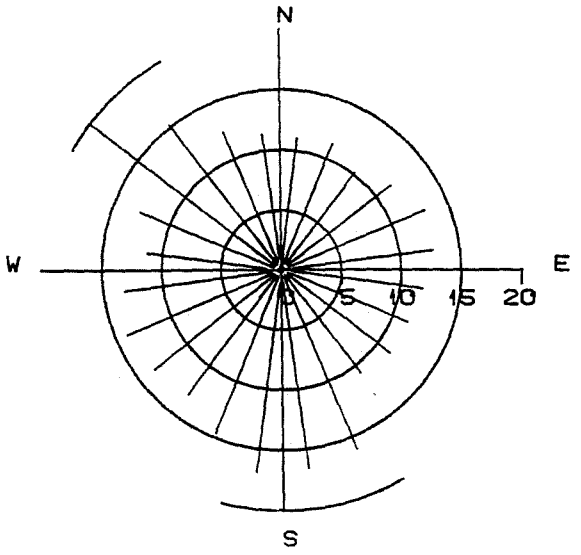
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 07.10 H. 1350

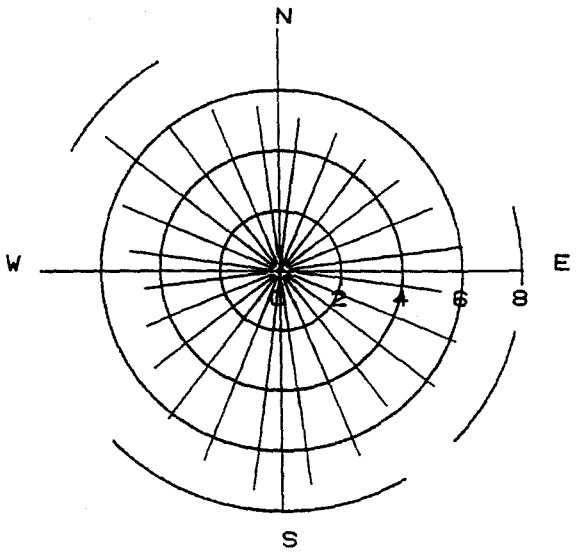
H 1

Fig. 1-3-10 M2 and K1 ellipse.

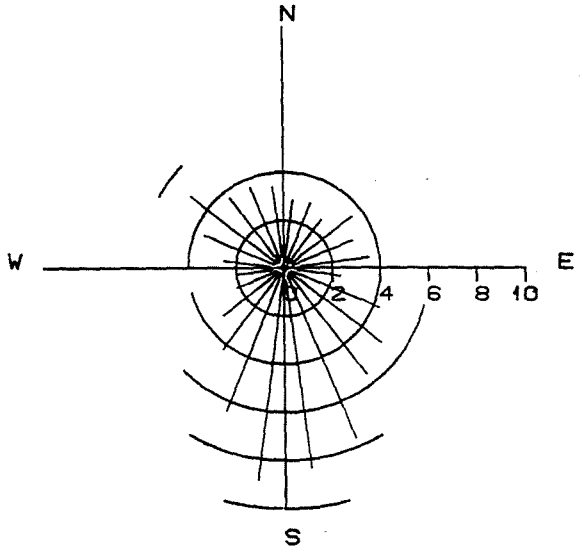
CURRENT VELOCITY DISTRIBUTION



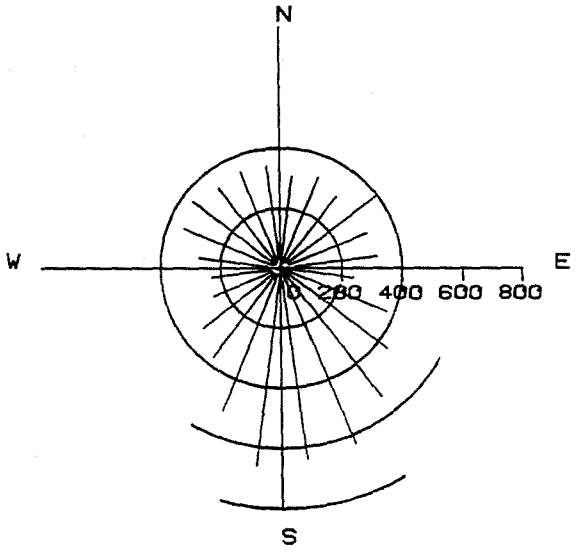
Maksimum velocity (cm/s)



Mean velocity (cm/s)



Relative flux in %



Number measured

Number of obeservations : 9168

The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

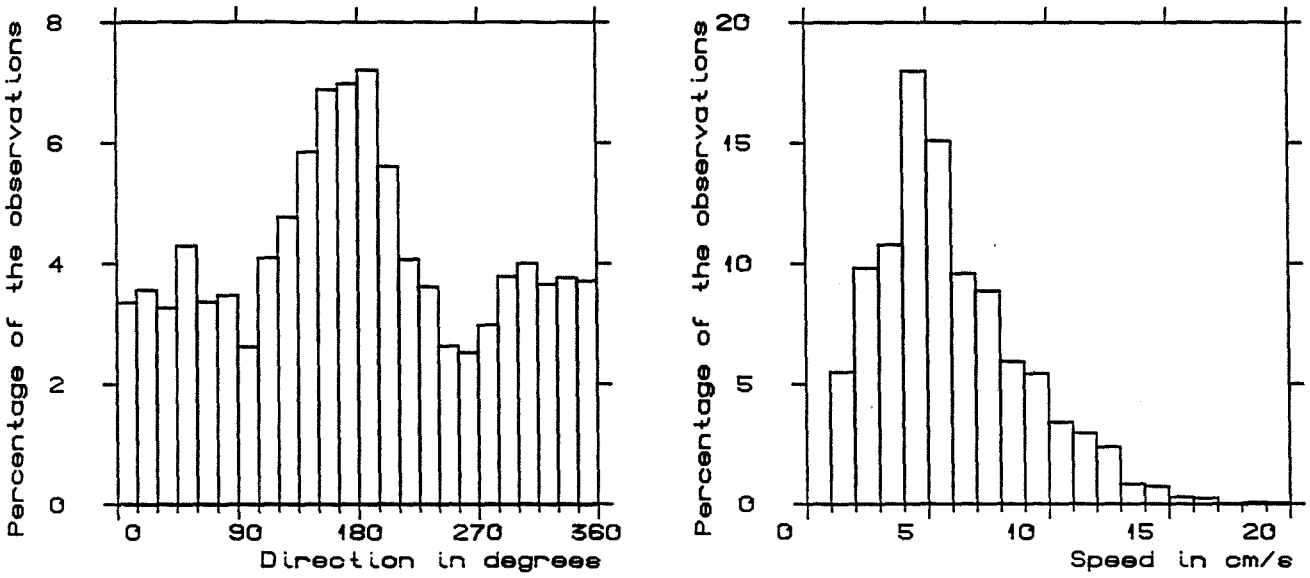
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

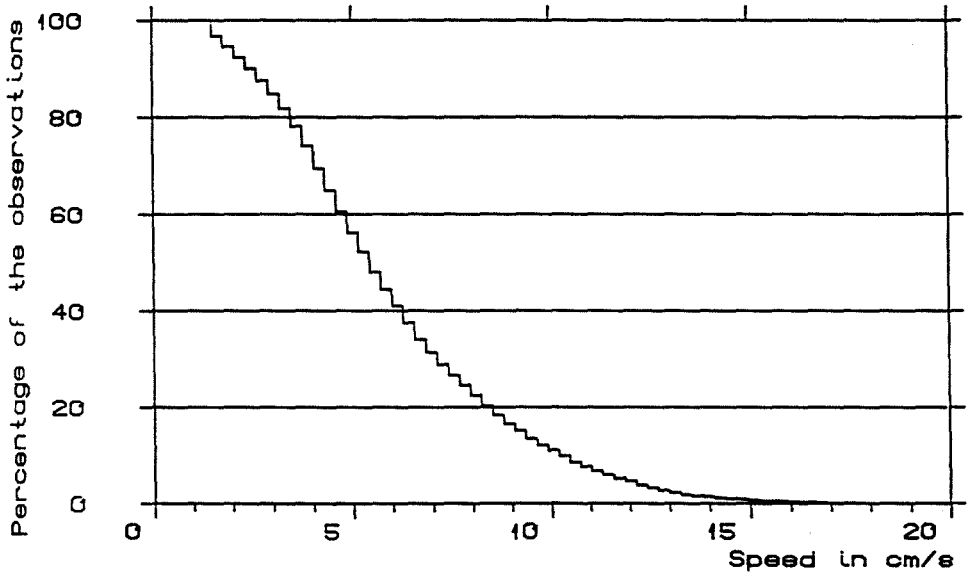
H 1

Fig. 1-4-1 Current velocity distribution.

HISTOGRAM



CURRENT SPEED DISTRIBUTION



Number of observations : 9168

The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

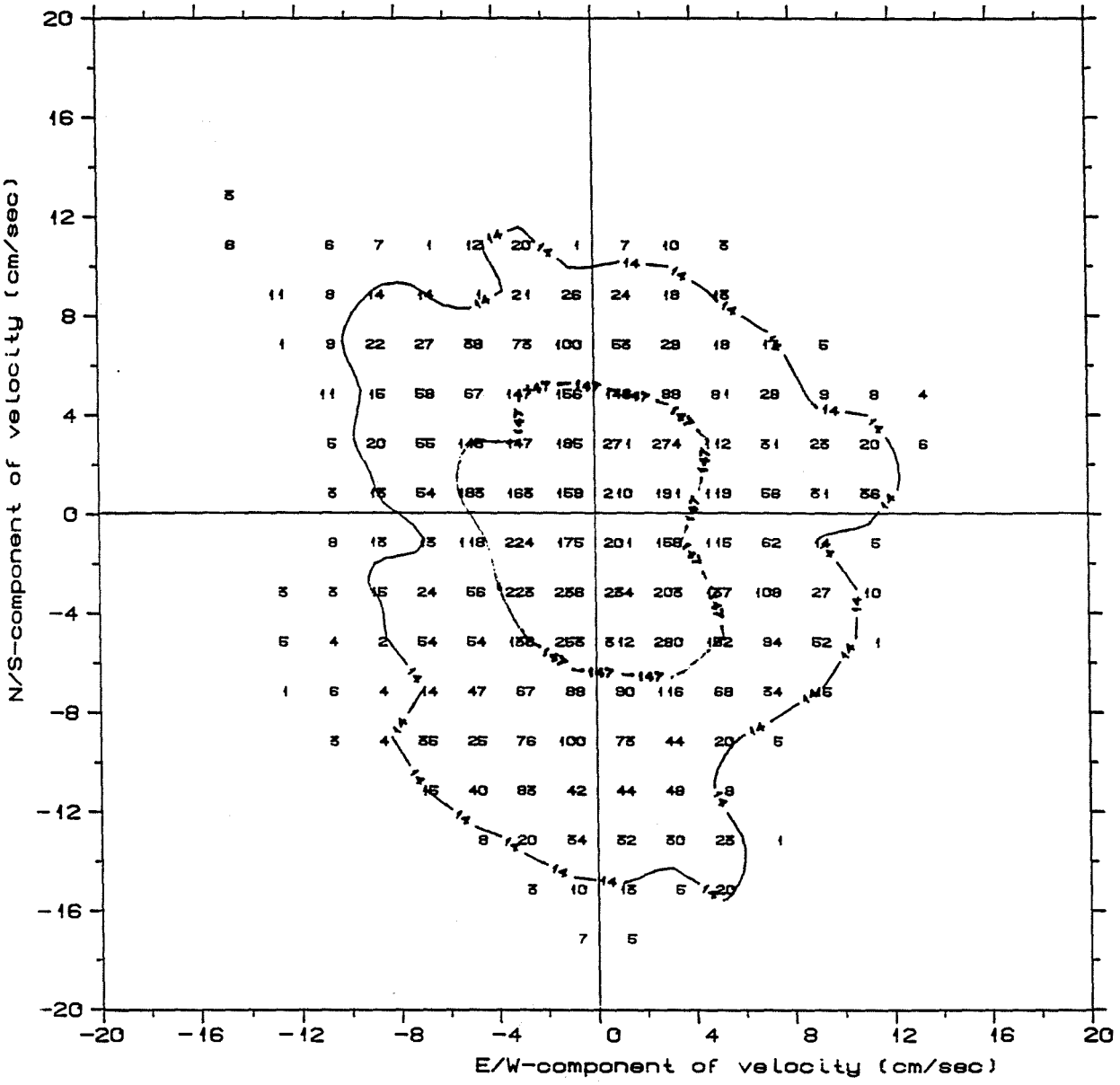
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 -- 1989 28.10 H. 0430

H I

Fig. 1-4-2 Histogram of speed and direction.
Current speed distribution.

VELOCITY DISTRIBUTION DIAGRAM



Number of obeervations : 9168

Isoline for 50% and 96%

Number of obeervations : 9168

The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

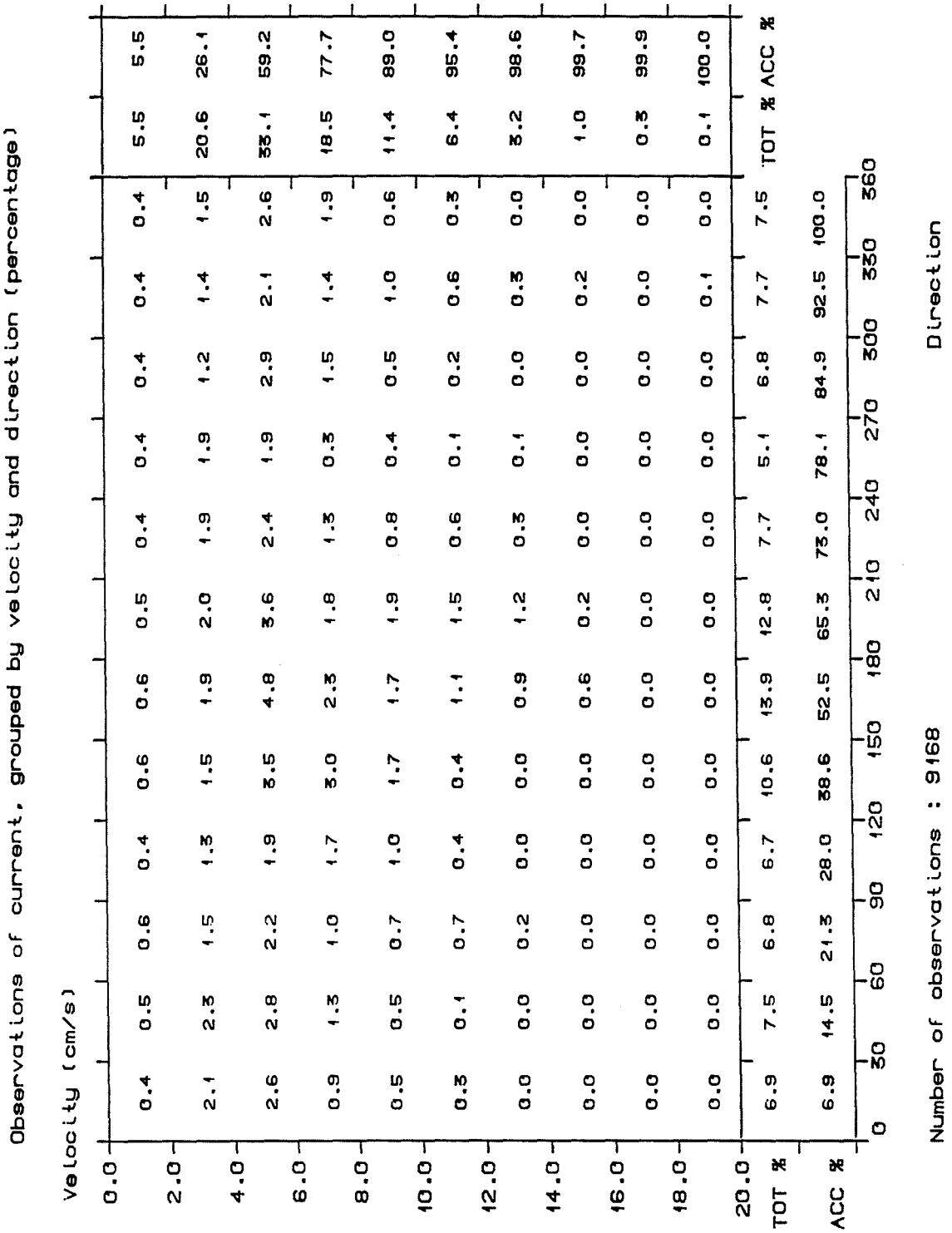
Time interval : 10.00 minutes.

Obeervation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H 1

Fig. 1-4-3 Velocity distribution diagram.

DIRECTION DISTRIBUTION OF CURRENT VELOCITY



Number of observations : 9168

The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

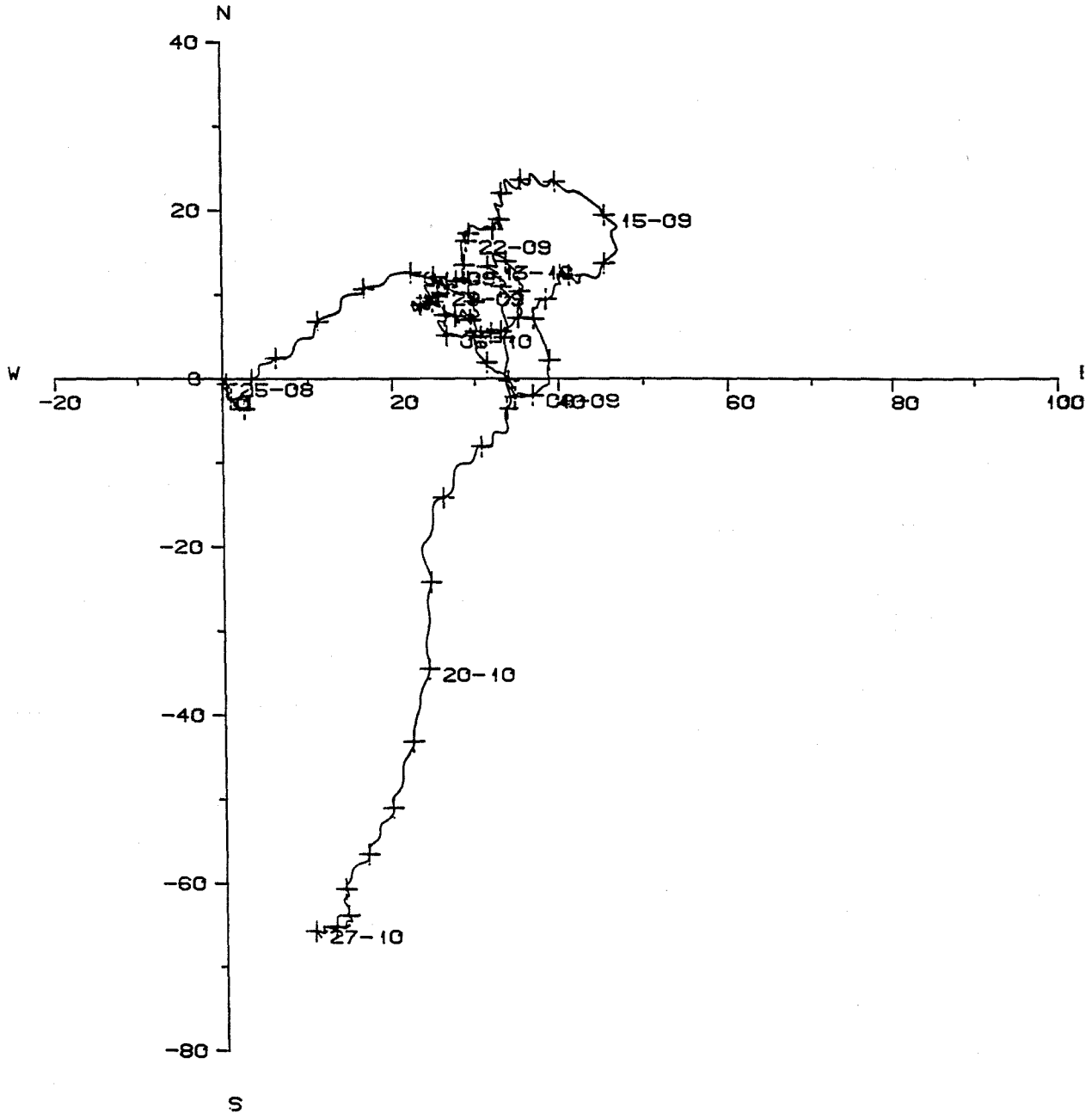
Instrument depth : 305.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

Fig. 1-4-4 Velocity distribution table.

PROGRESSIVE VECTOR DIAGRAM



Units in km

Number of observations : 9168

The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

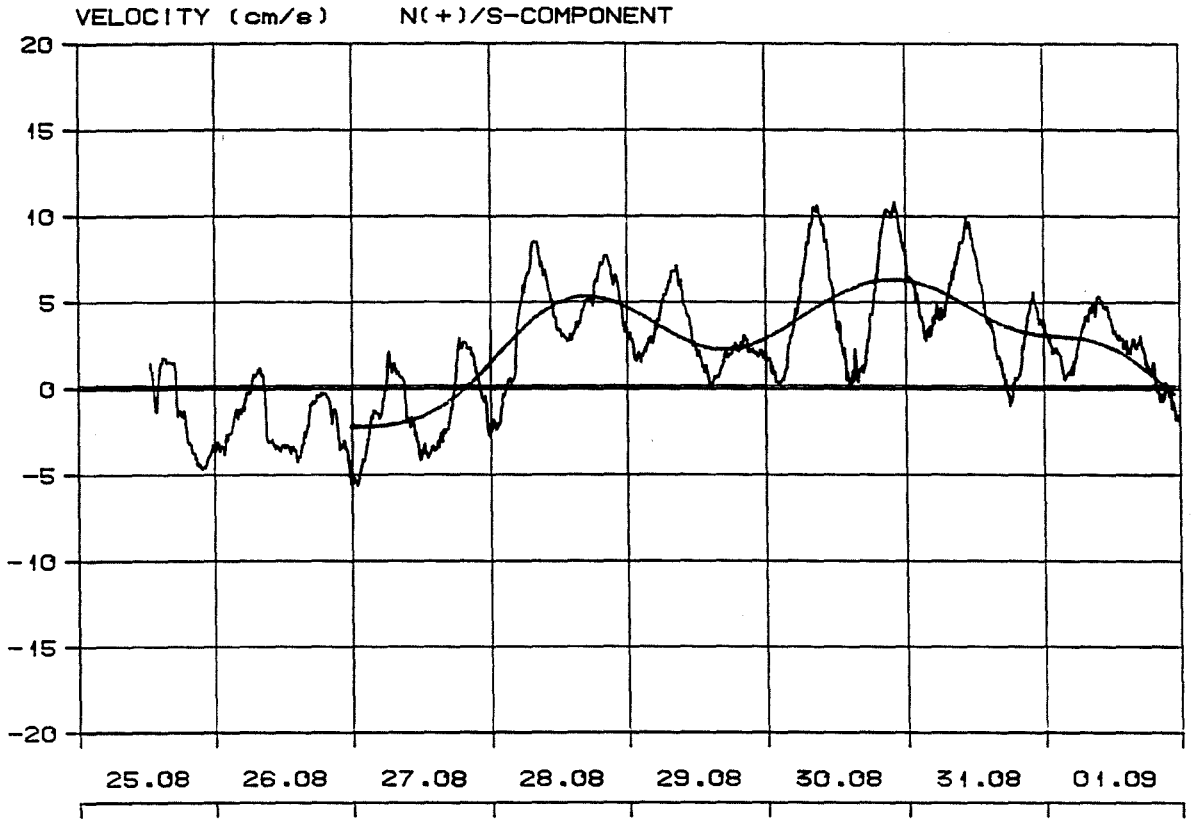
Instrument depth : 305.0 m Bottom depth : 315.0 m

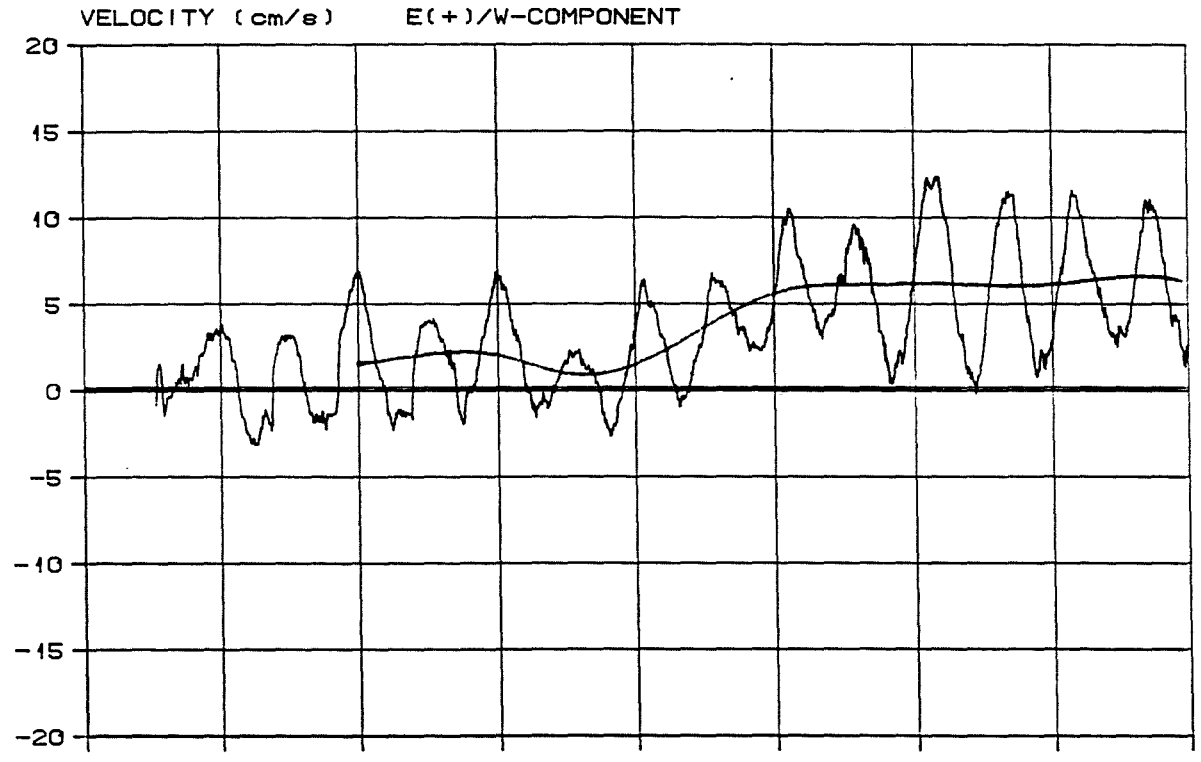
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H 1

Fig. 1-4-5 Progressive vector diagram.





The Barents Sea

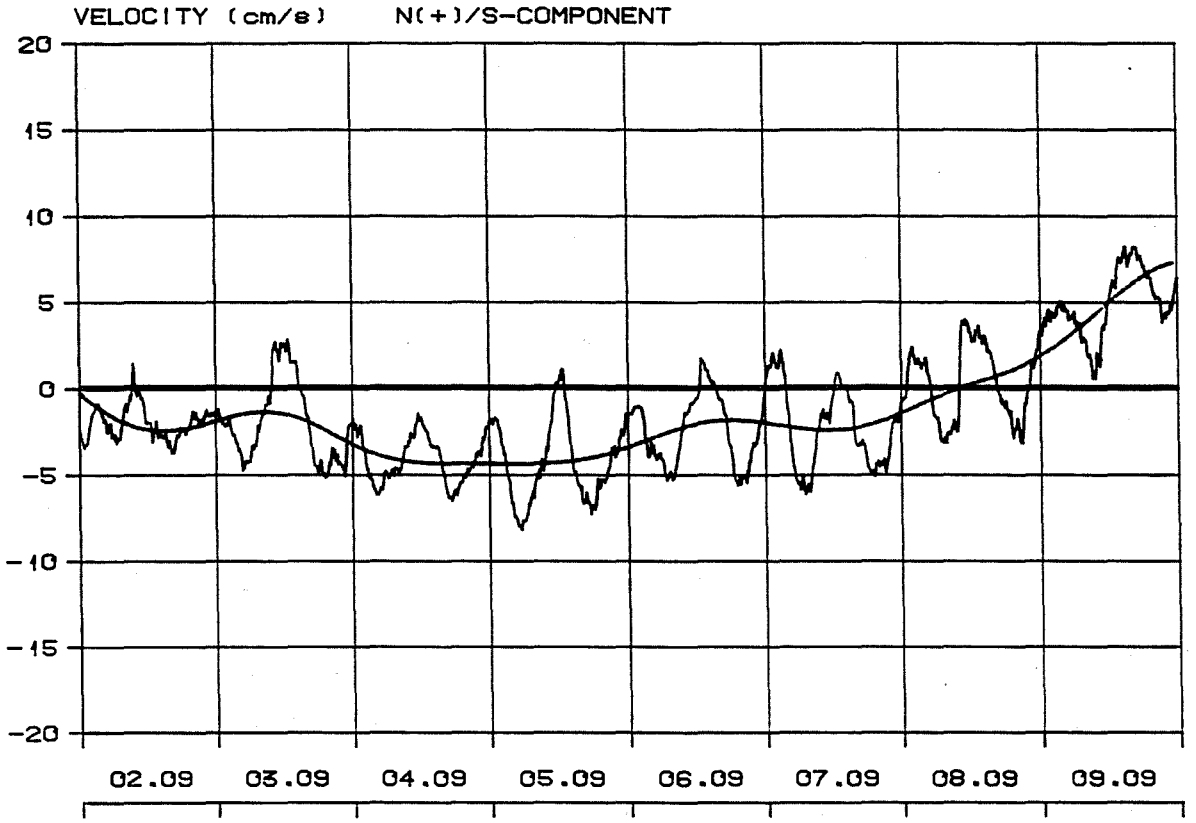
Position : N 73° 4.80' E 40° 0.00'

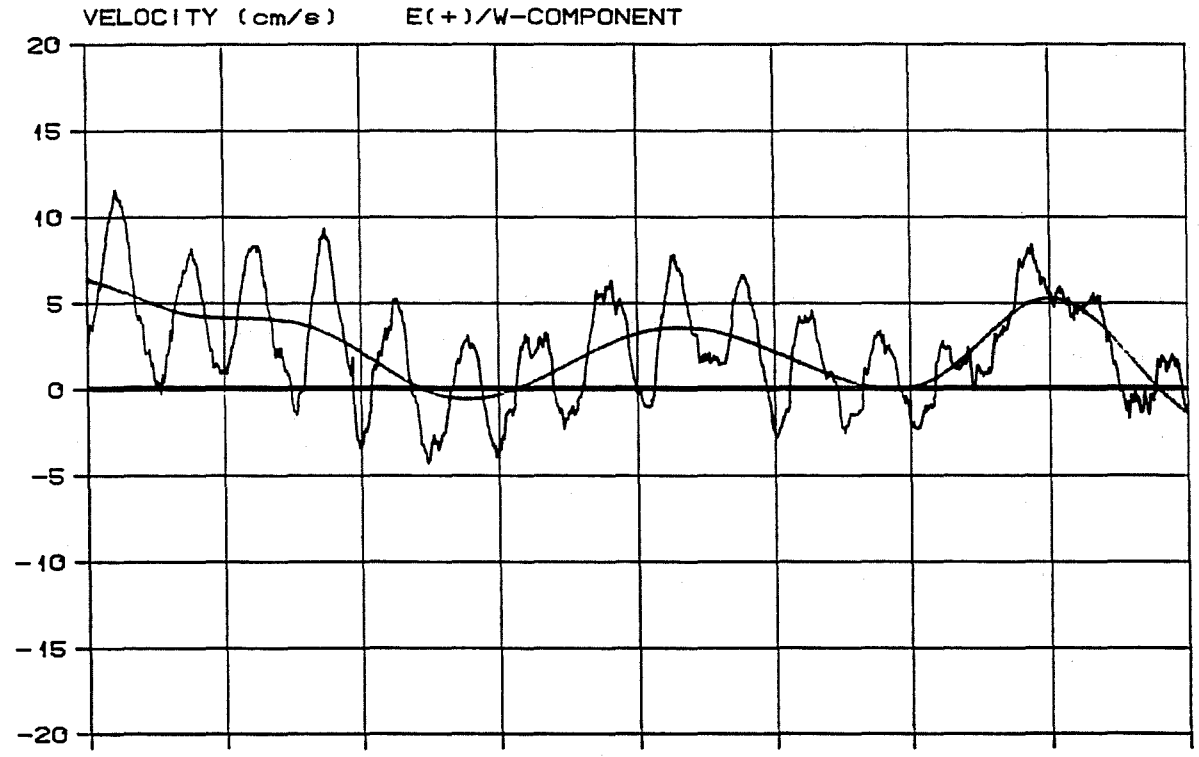
Instrument depth : 305.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

Fig. 1-4-6 N/S and E/W components of current.





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

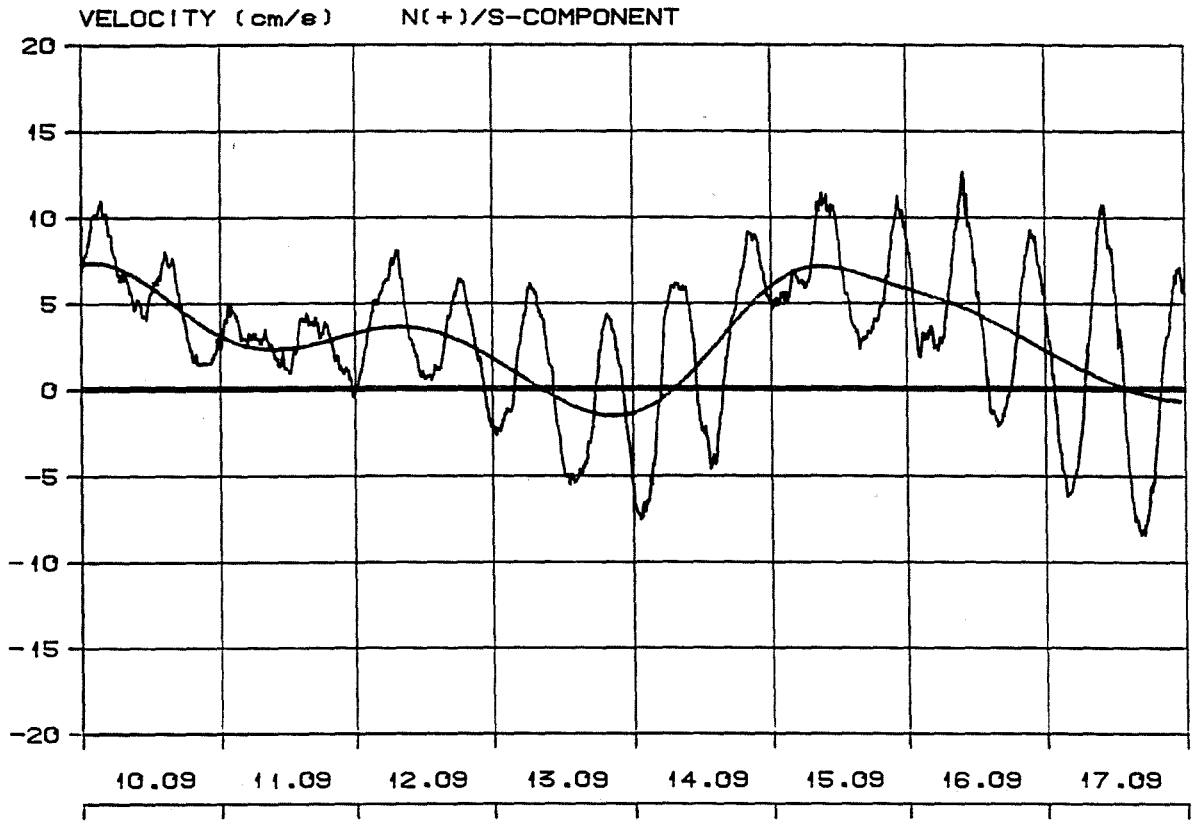
Time interval : 10.00 minutes.

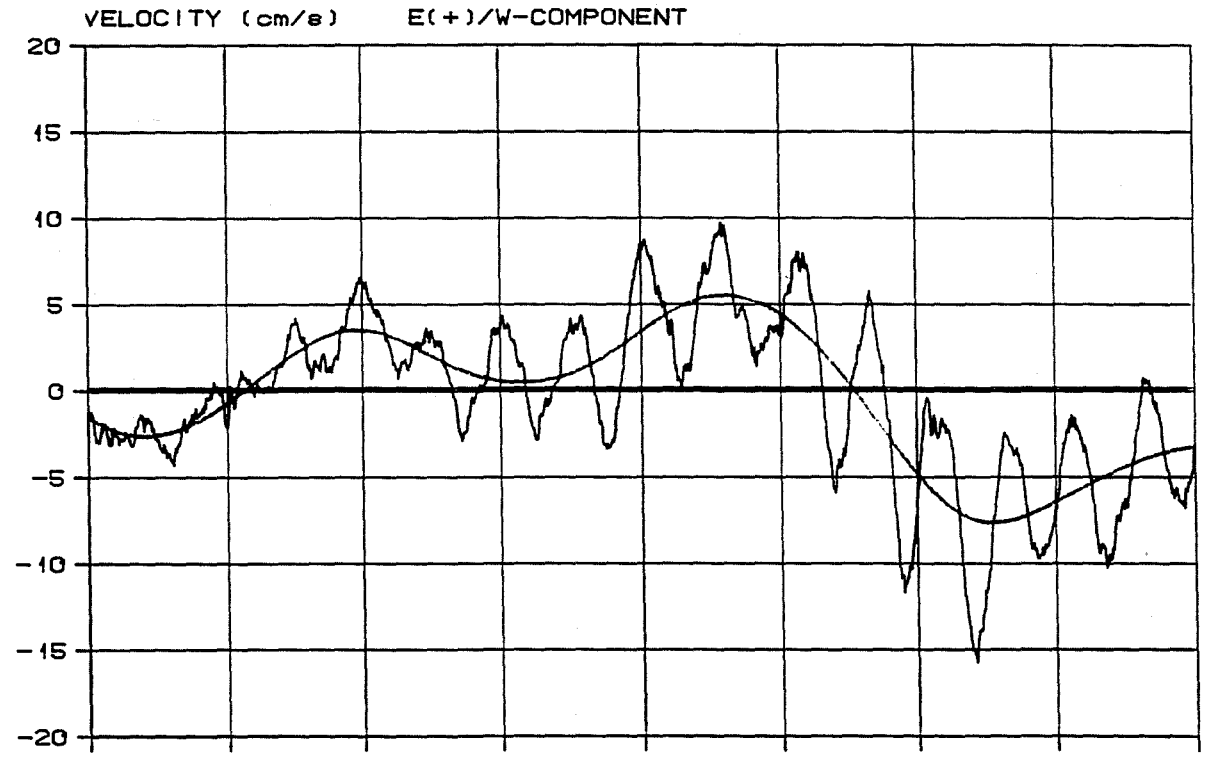
Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H I

Fig. 1-4-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

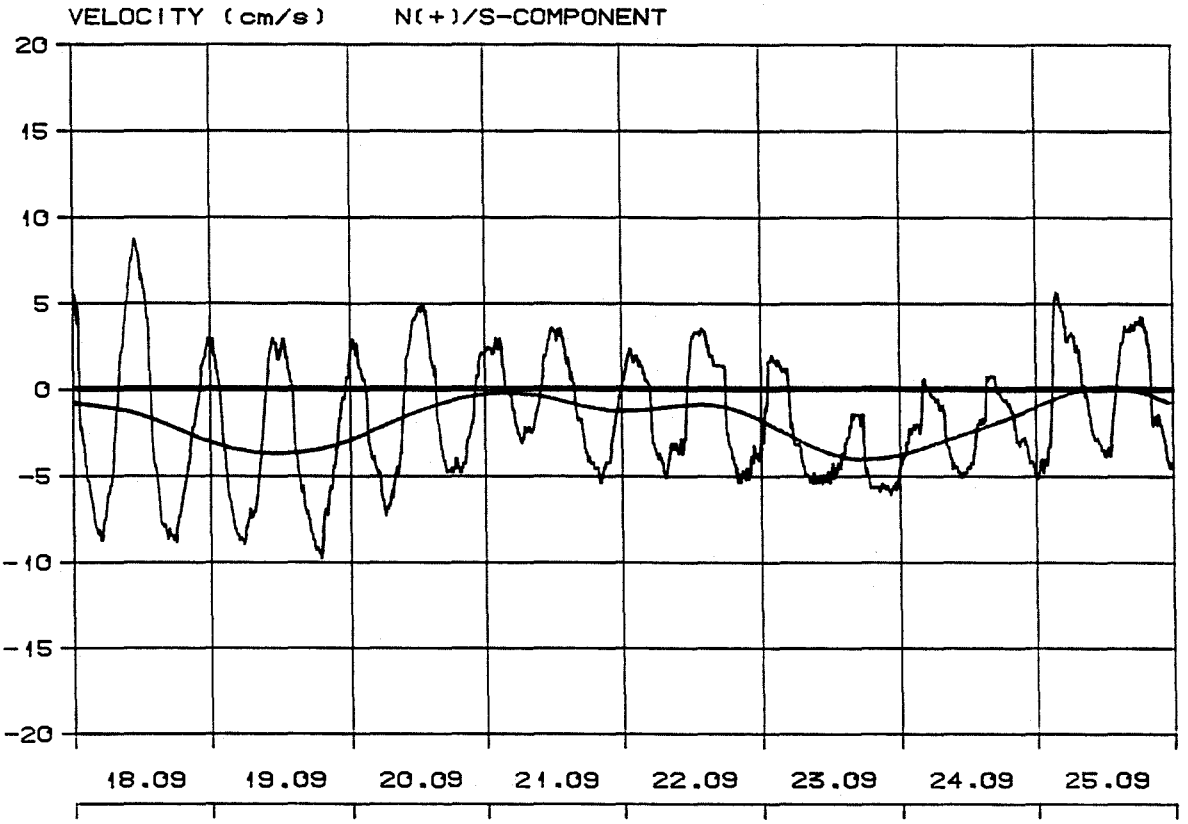
Instrument depth : 305.0 m Bottom depth : 315.0 m

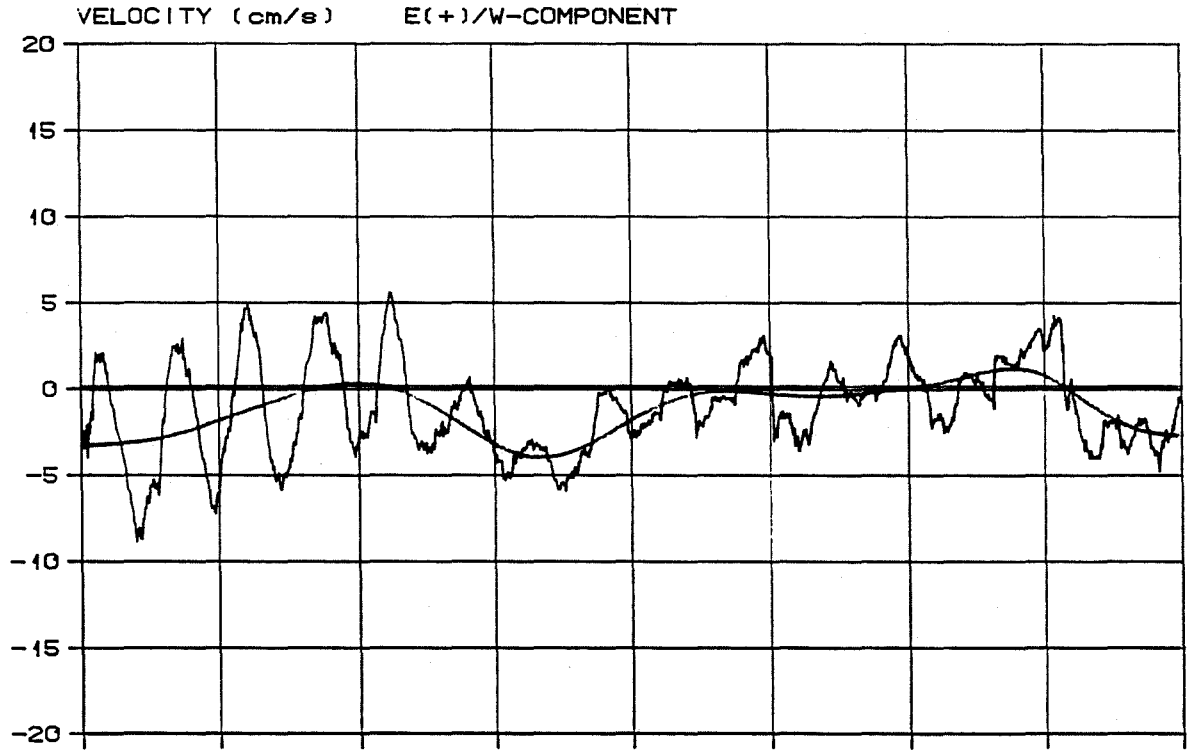
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

Fig. 5-4-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

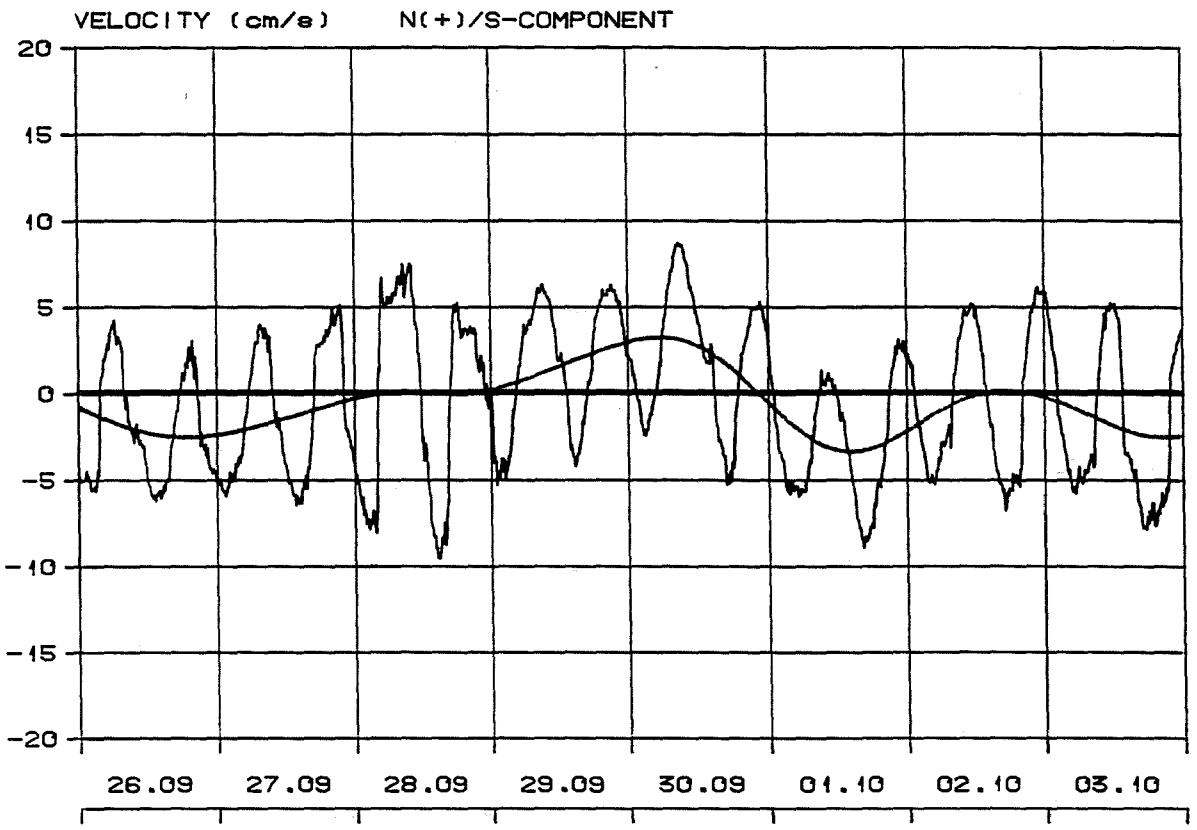
Time interval : 10.00 minutes.

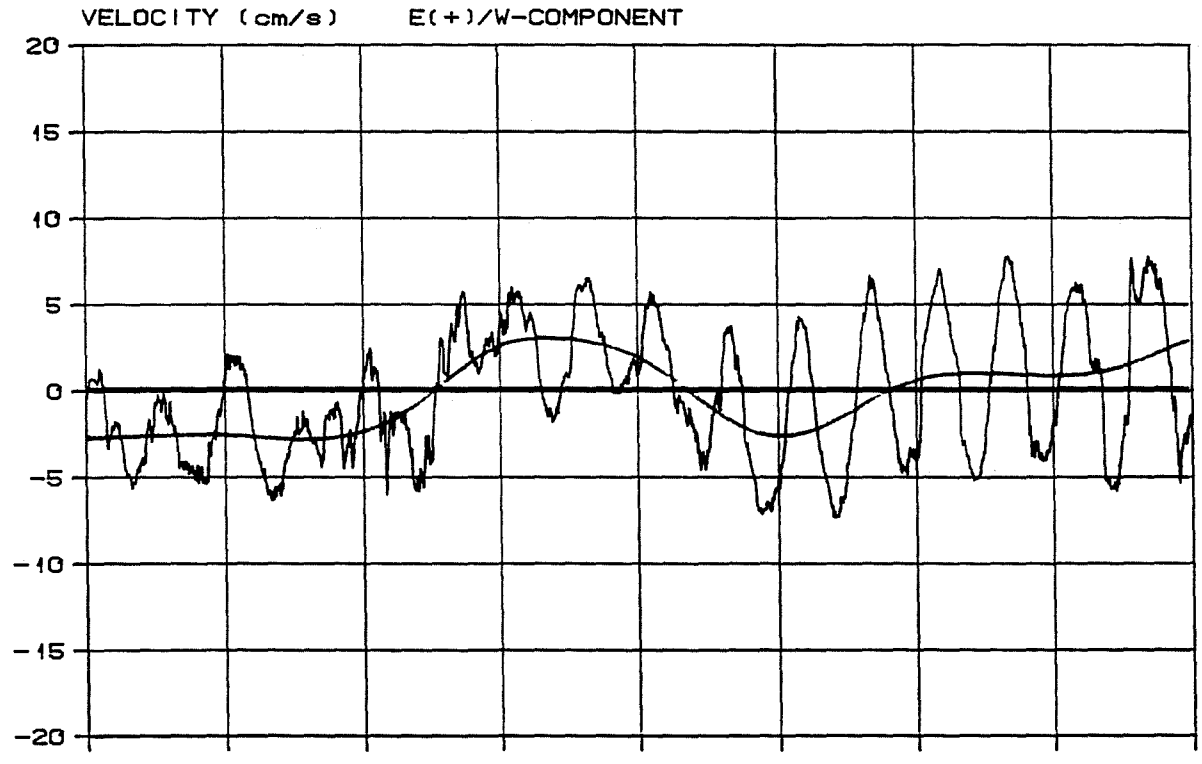
Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H 1

Fig. 1-4-6

Continues.....



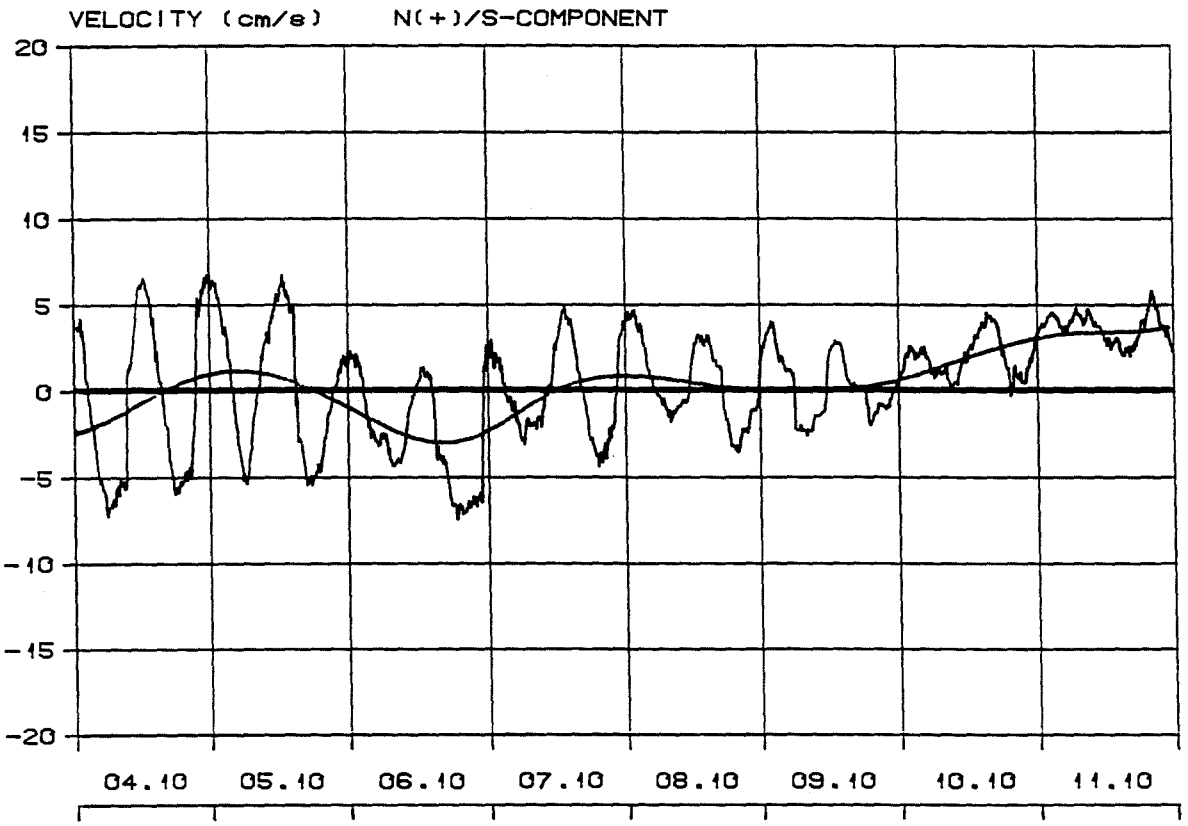


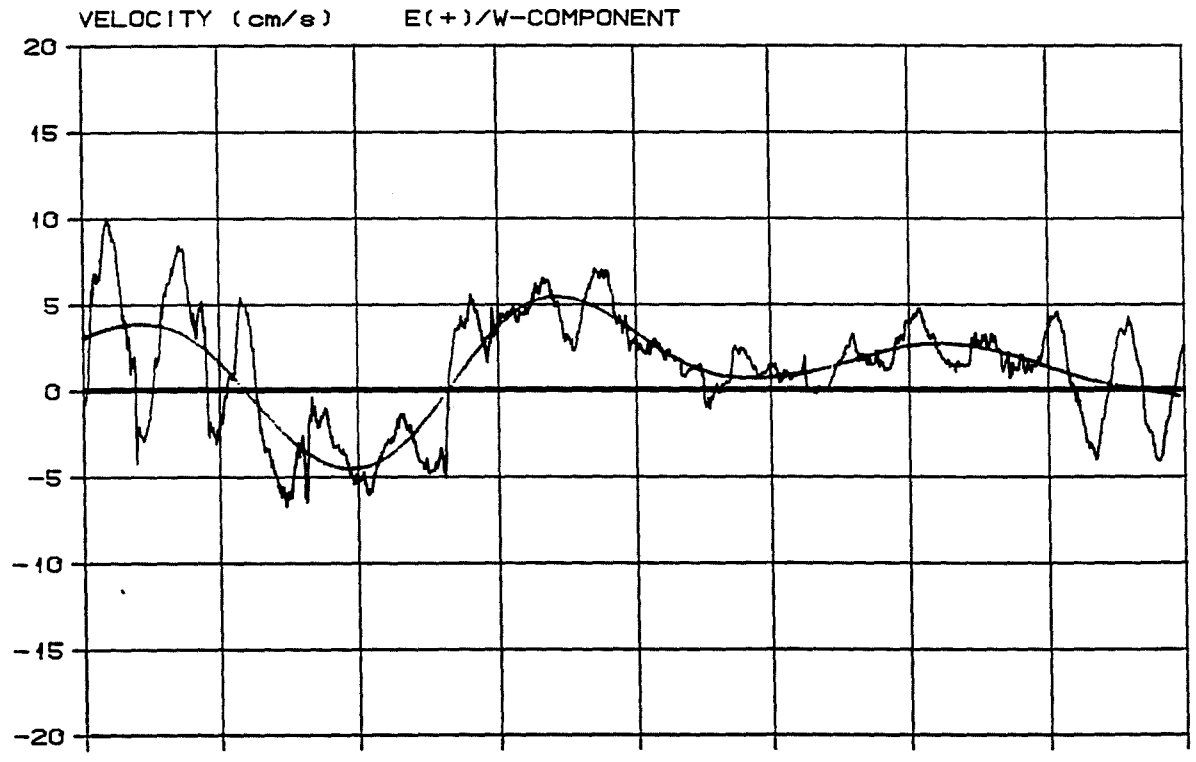
The Barents Sea

Position : N 73° 4.80' E 40° 0.00'
Instrument depth : 305.0 m Bottom depth : 315.0 m
Time interval : 10.00 minutes.
Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

Fig. 1-4-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

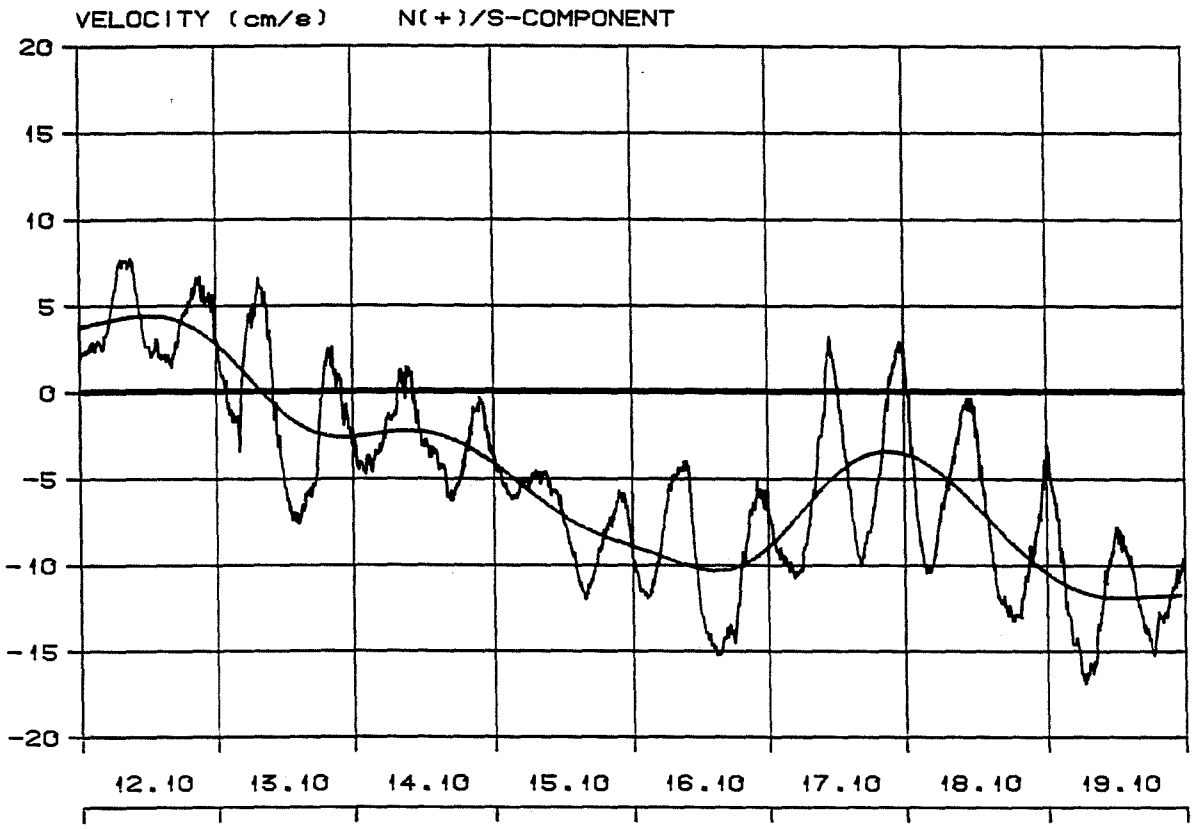
Time interval : 10.00 minutes.

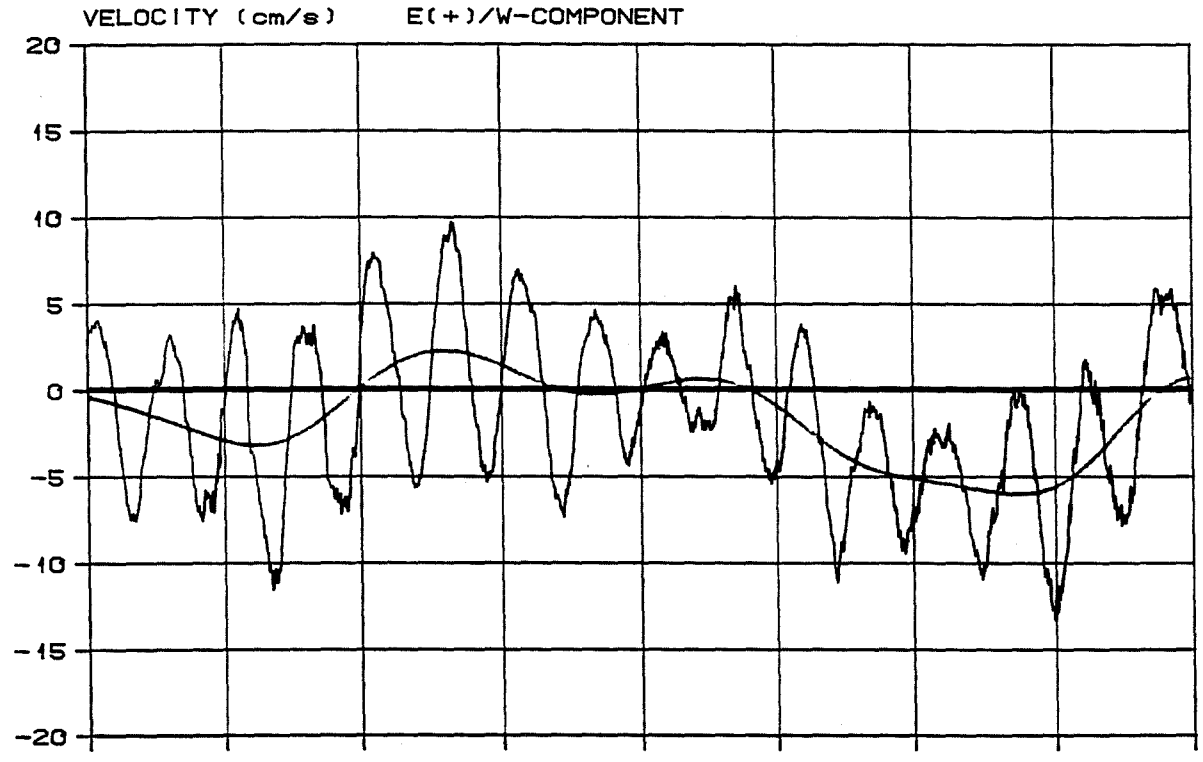
Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H 1

Fig. 1-4-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

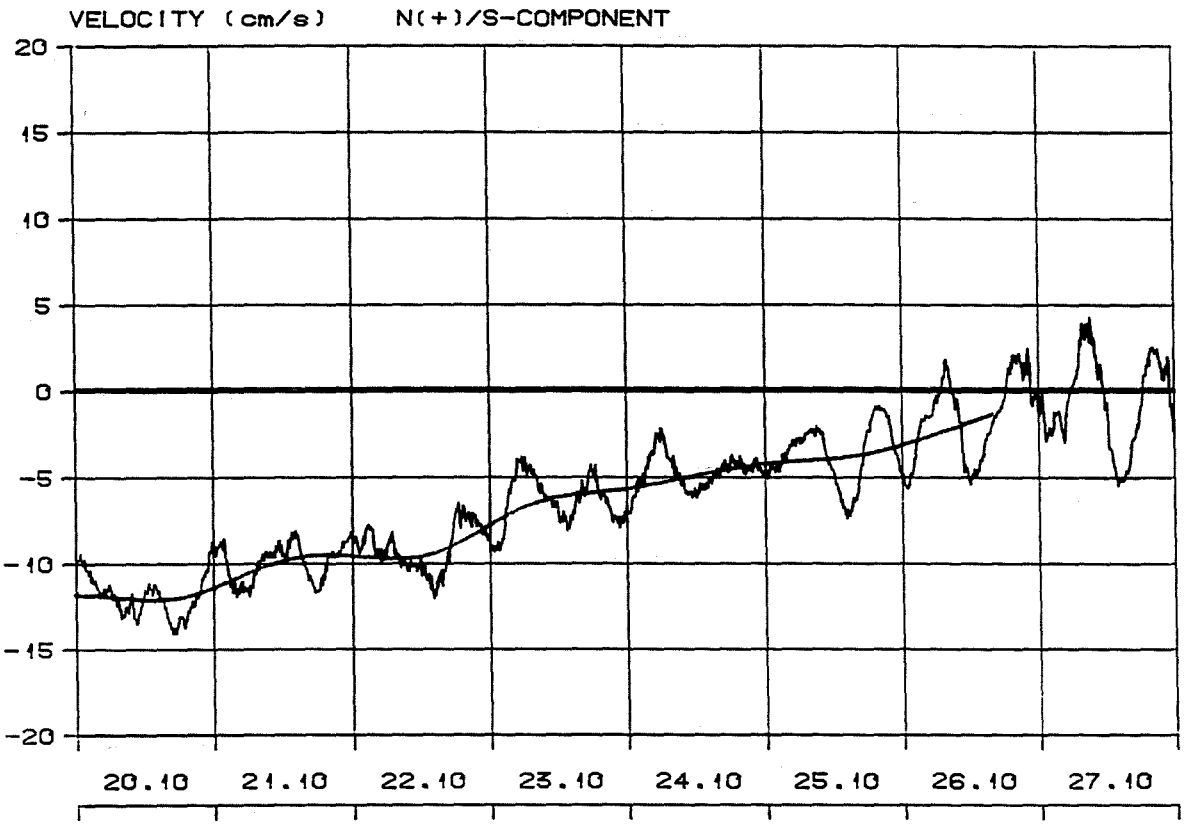
Time interval : 10.00 minutes.

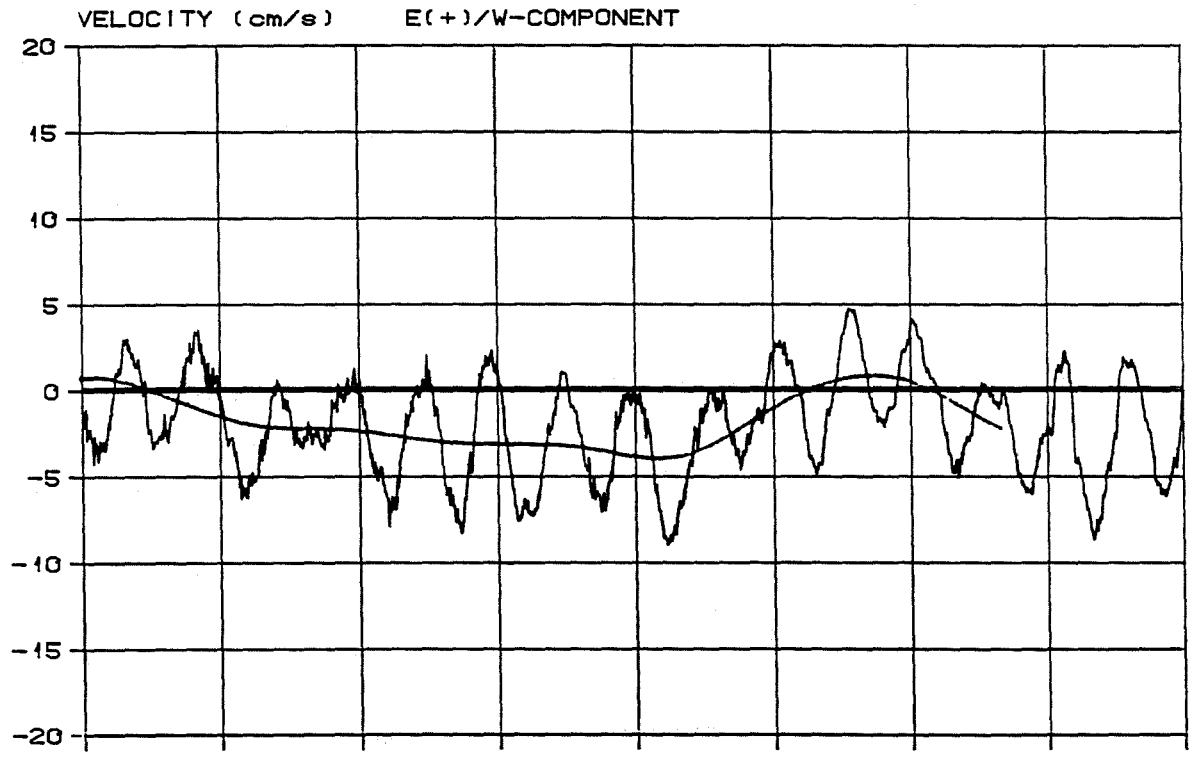
Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H I

Fig. 1-4-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

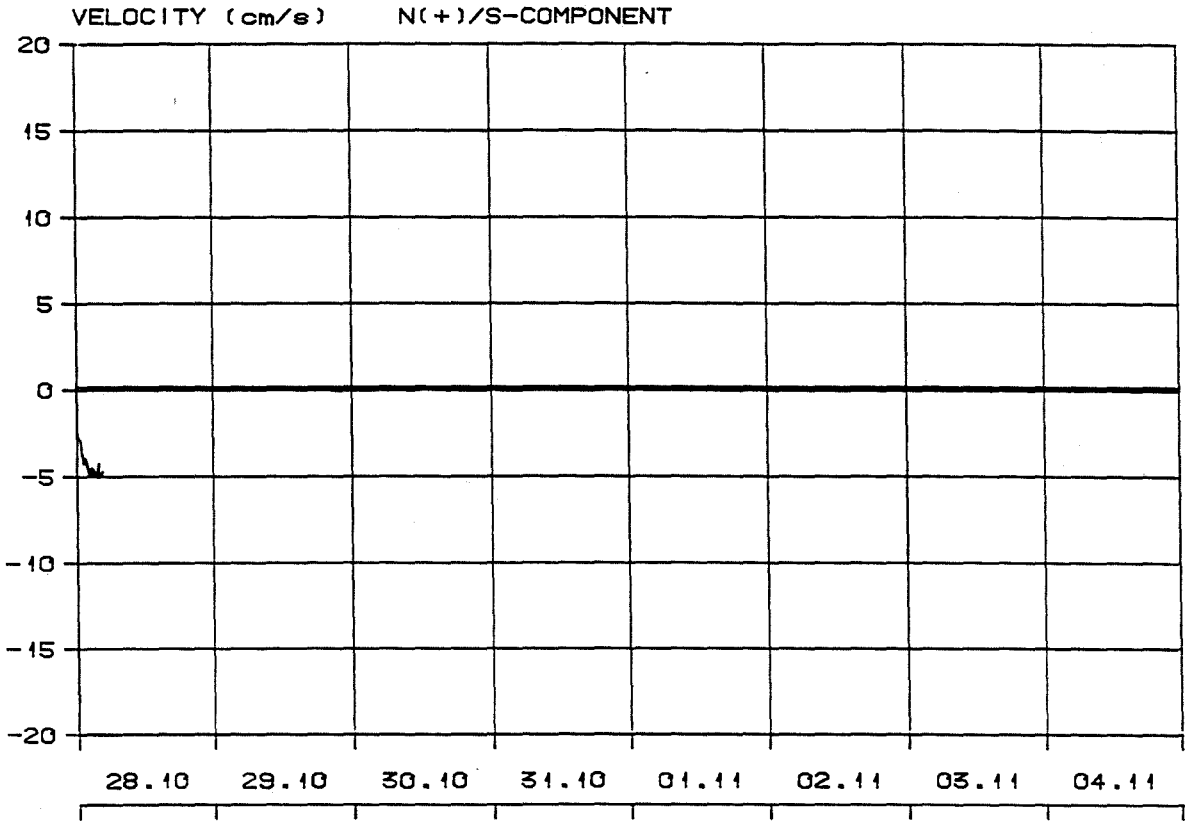
Time interval : 10.00 minutes.

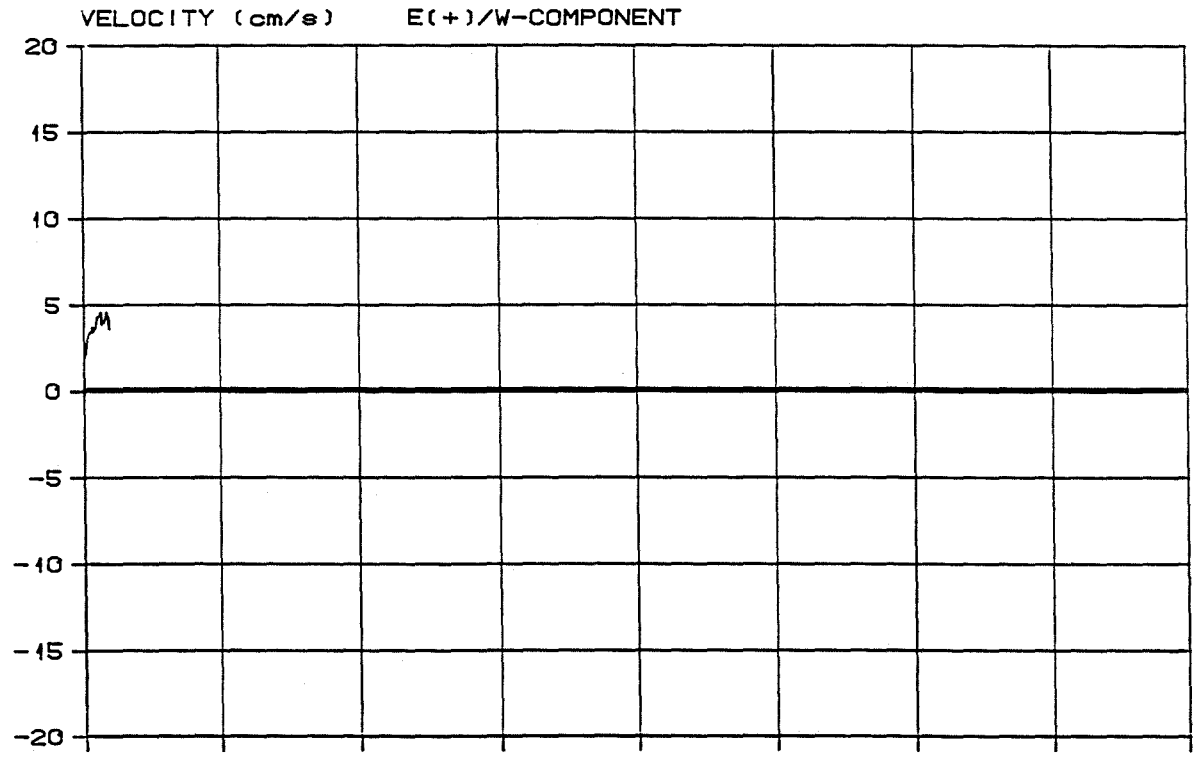
Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H 1

Fig. 1-4-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

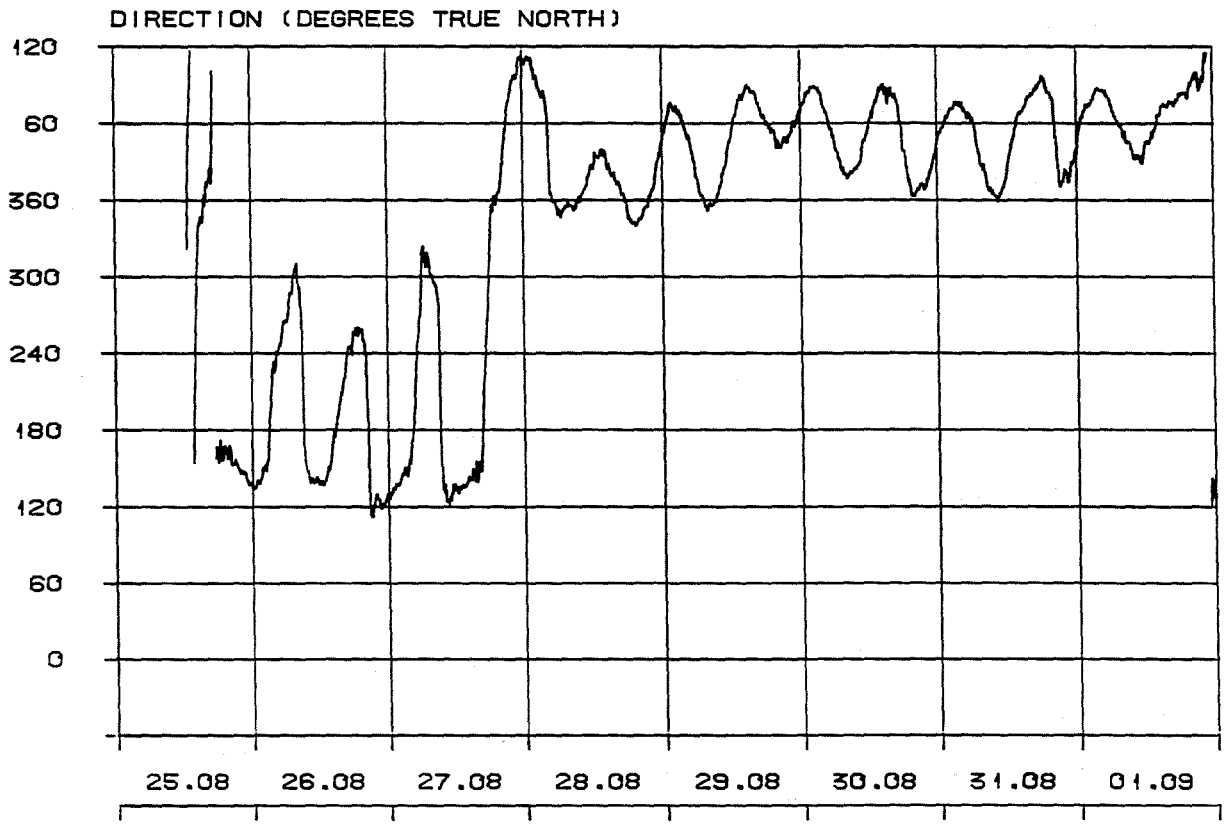
Time interval : 10.00 minutes.

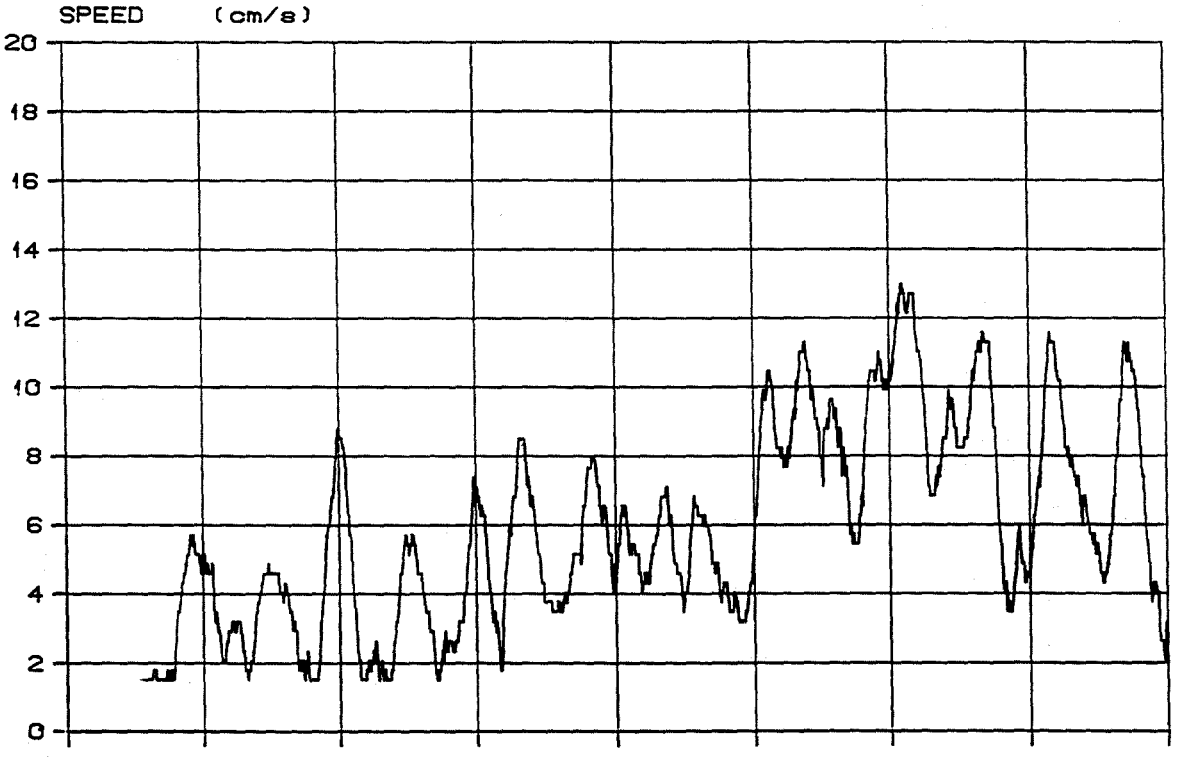
Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H 1

Fig. 1-4-6

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

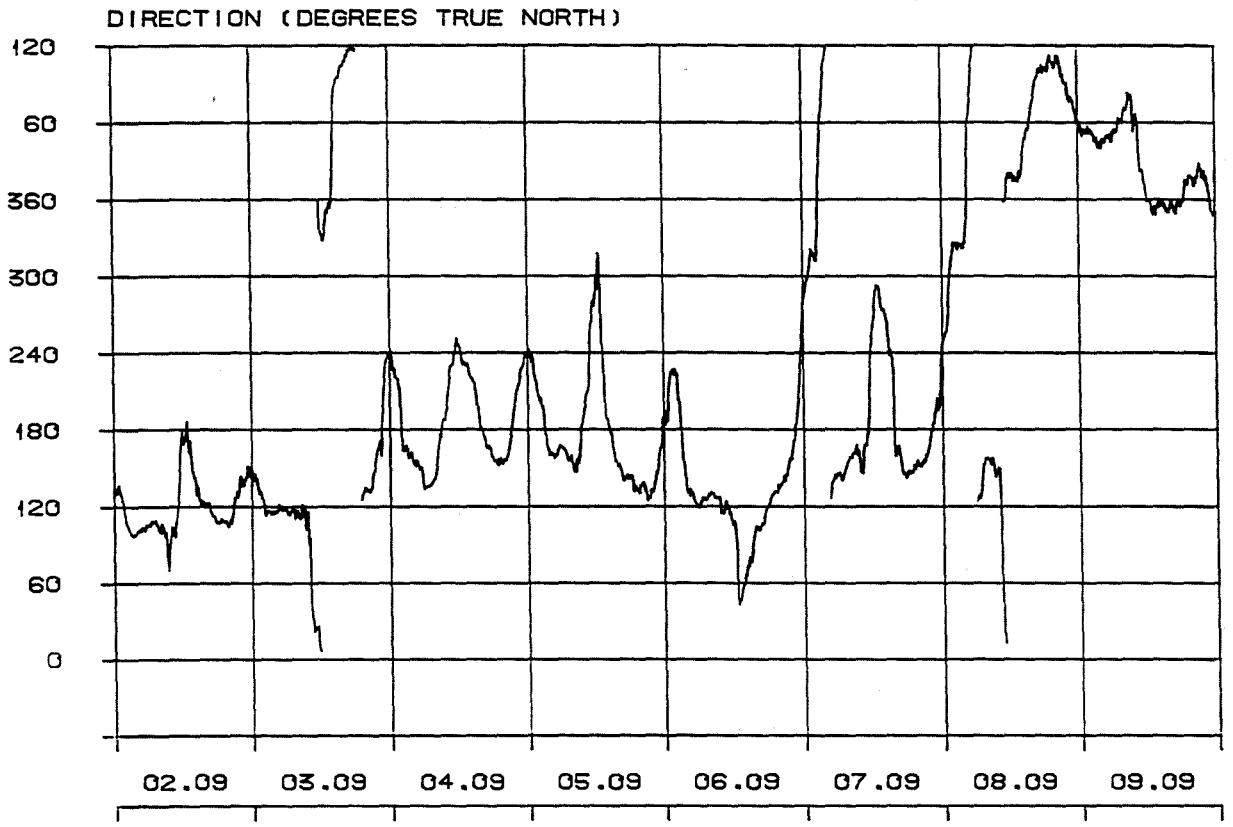
Instrument depth : 305.0 m Bottom depth : 315.0 m

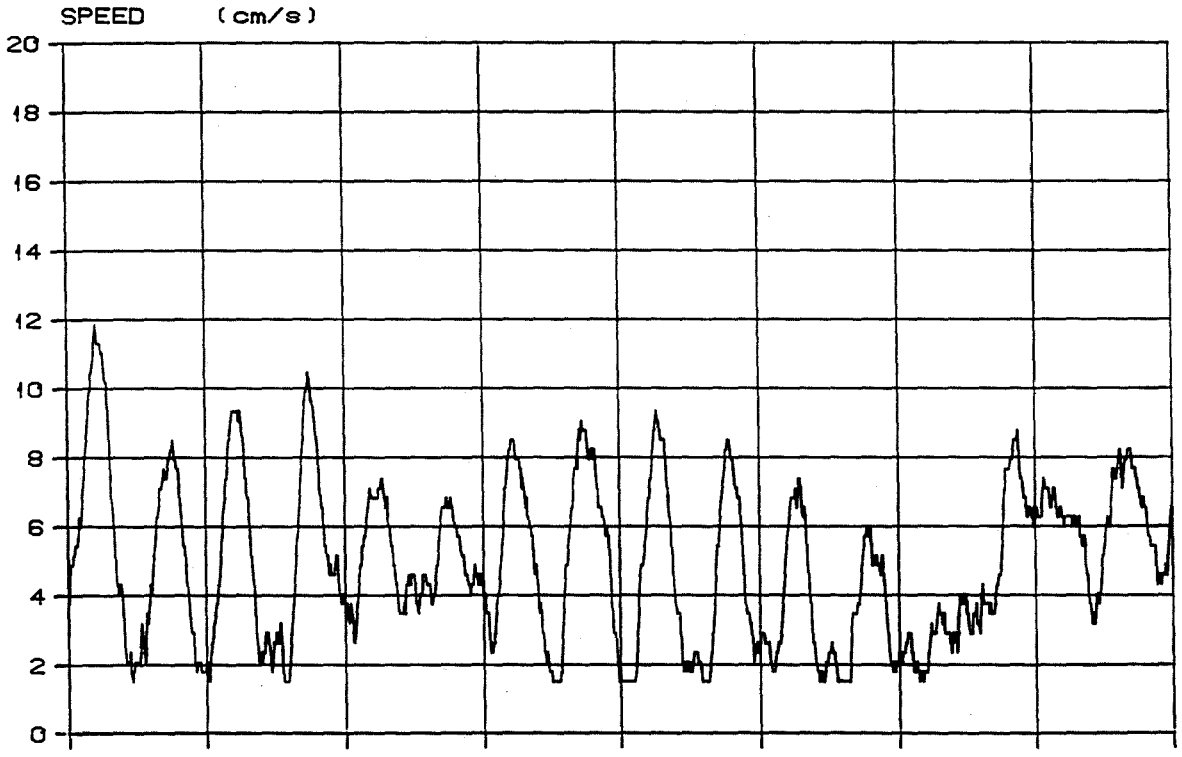
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H 1

Fig. 1-4-7 Speed and direction of current.



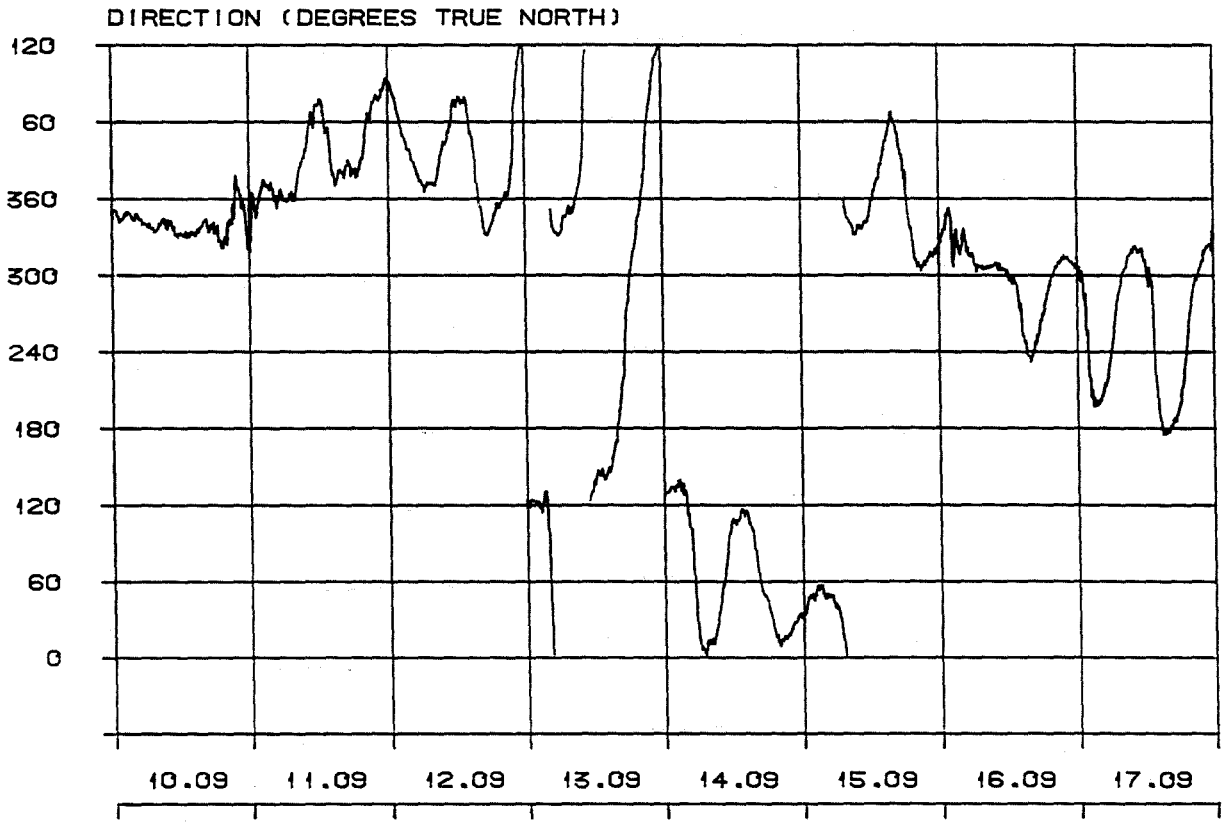


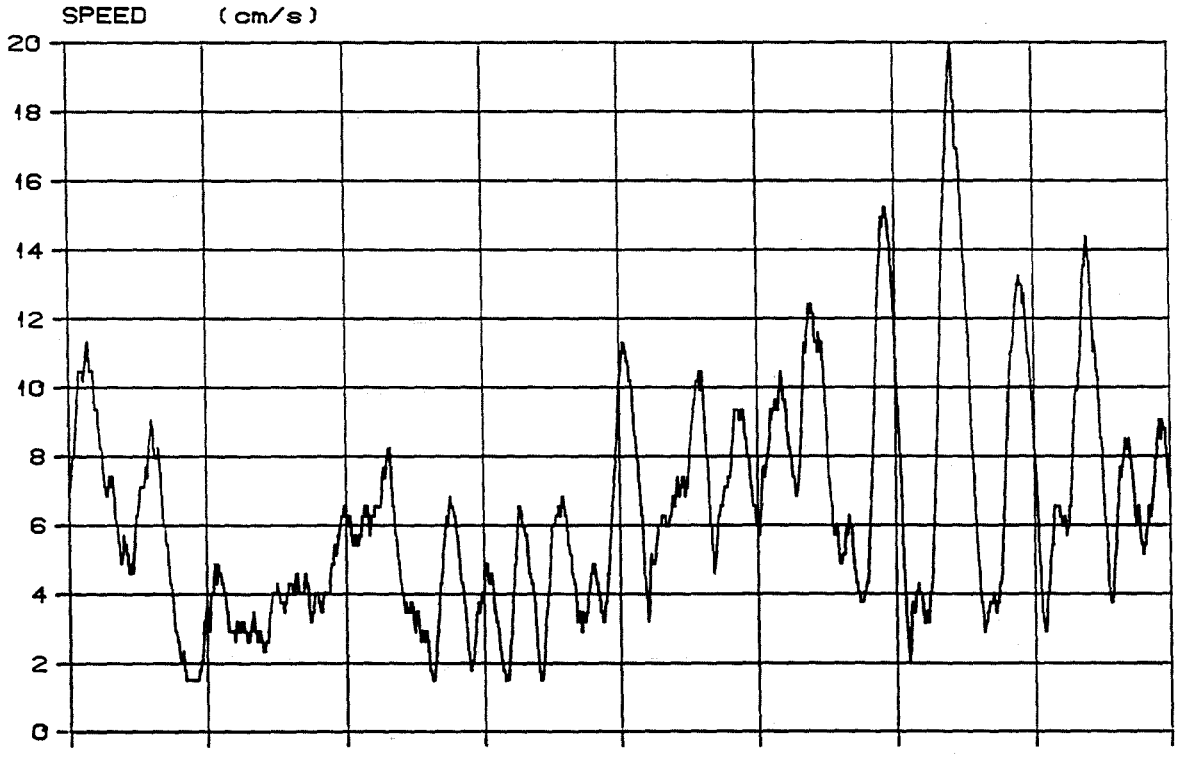
The Barents Sea

Position : N 73° 4.80' E 40° 0.00'
Instrument depth : 305.0 m Bottom depth : 315.0 m
Time interval : 10.00 minutes.
Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

Fig. 1-4-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

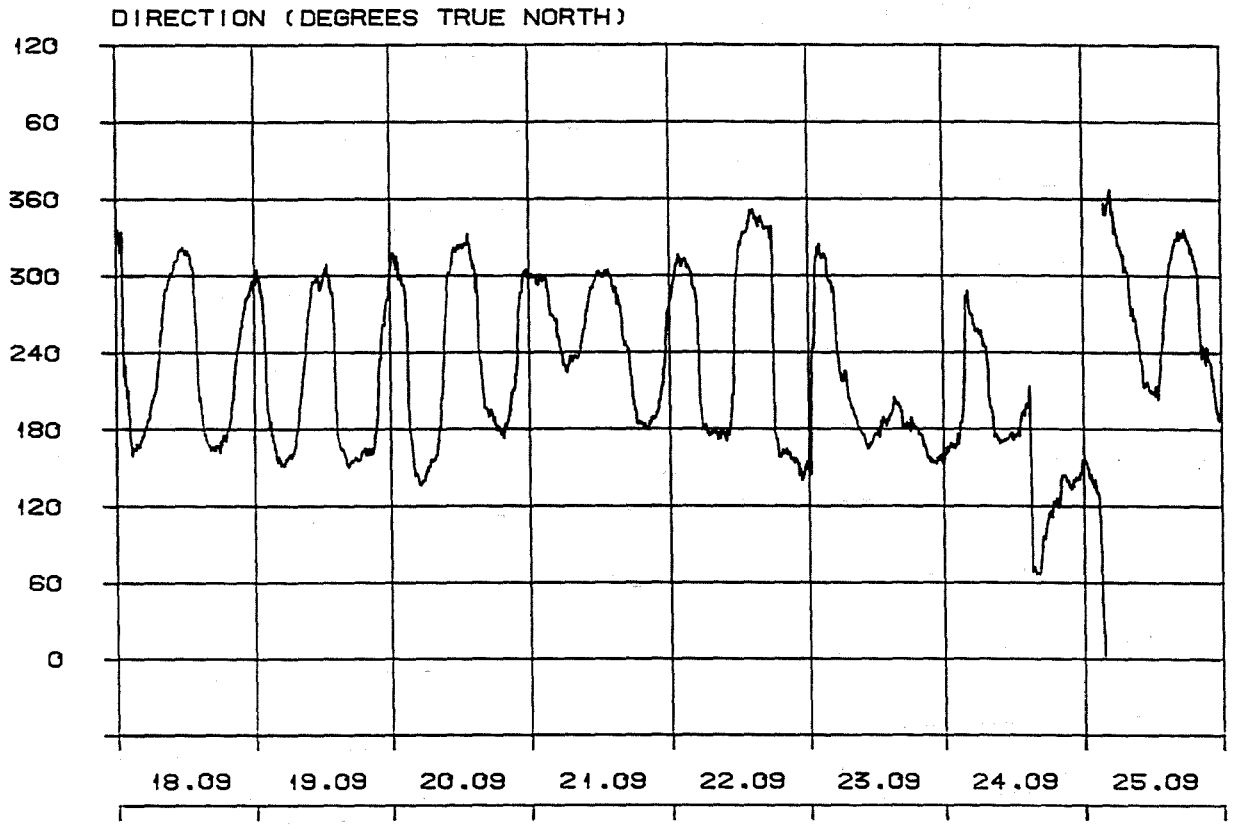
Time interval : 10.00 minutes.

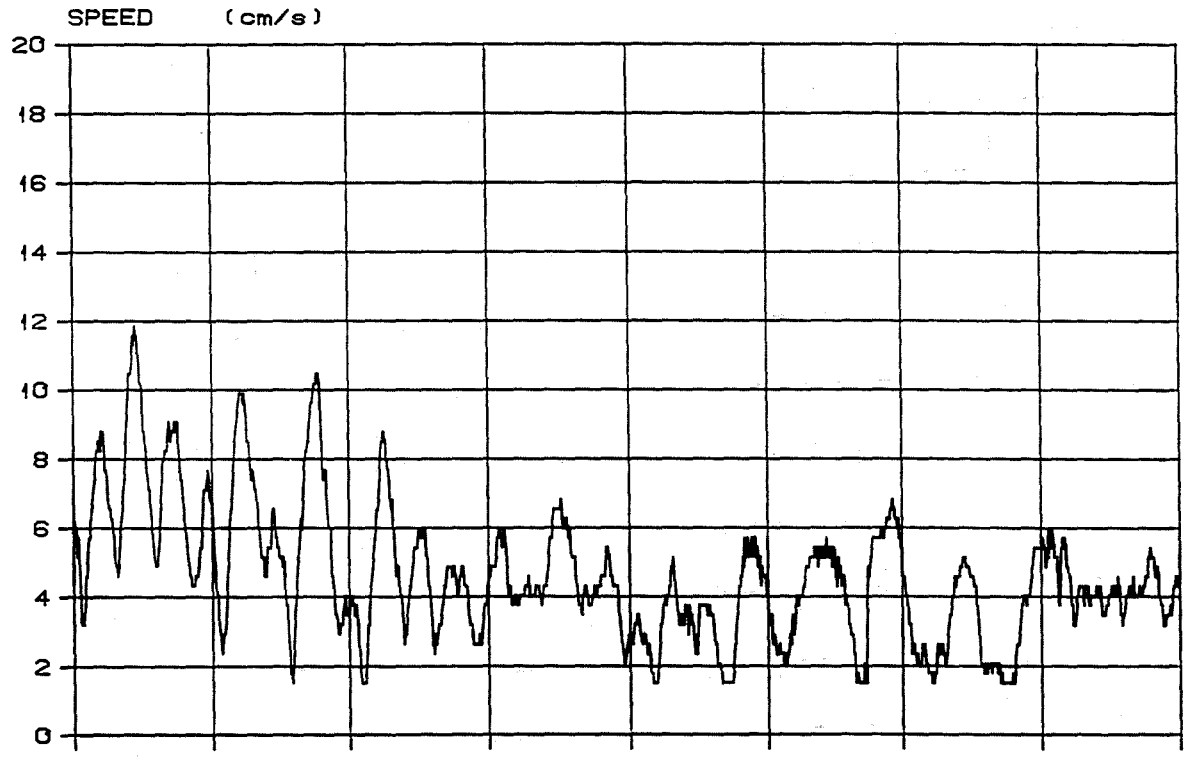
Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H 1

Fig. 1-4-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

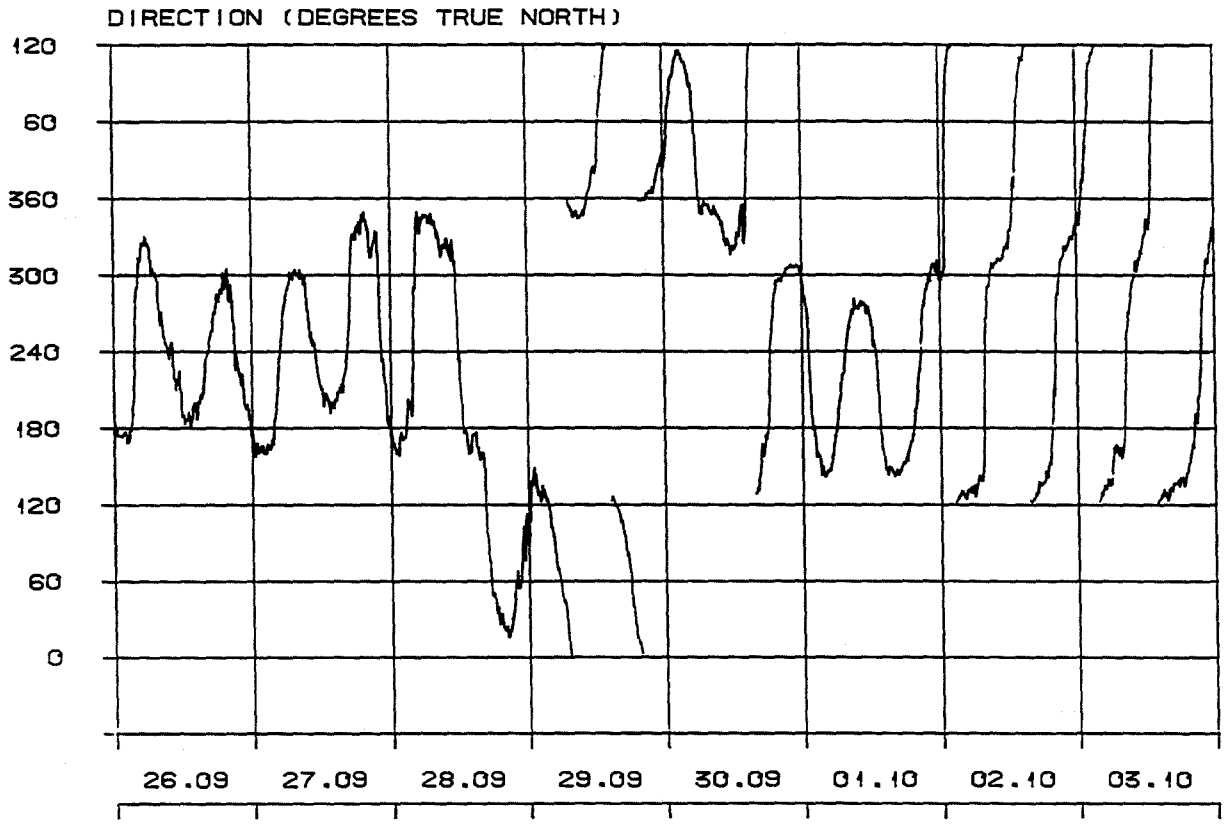
Time interval : 10.00 minutes.

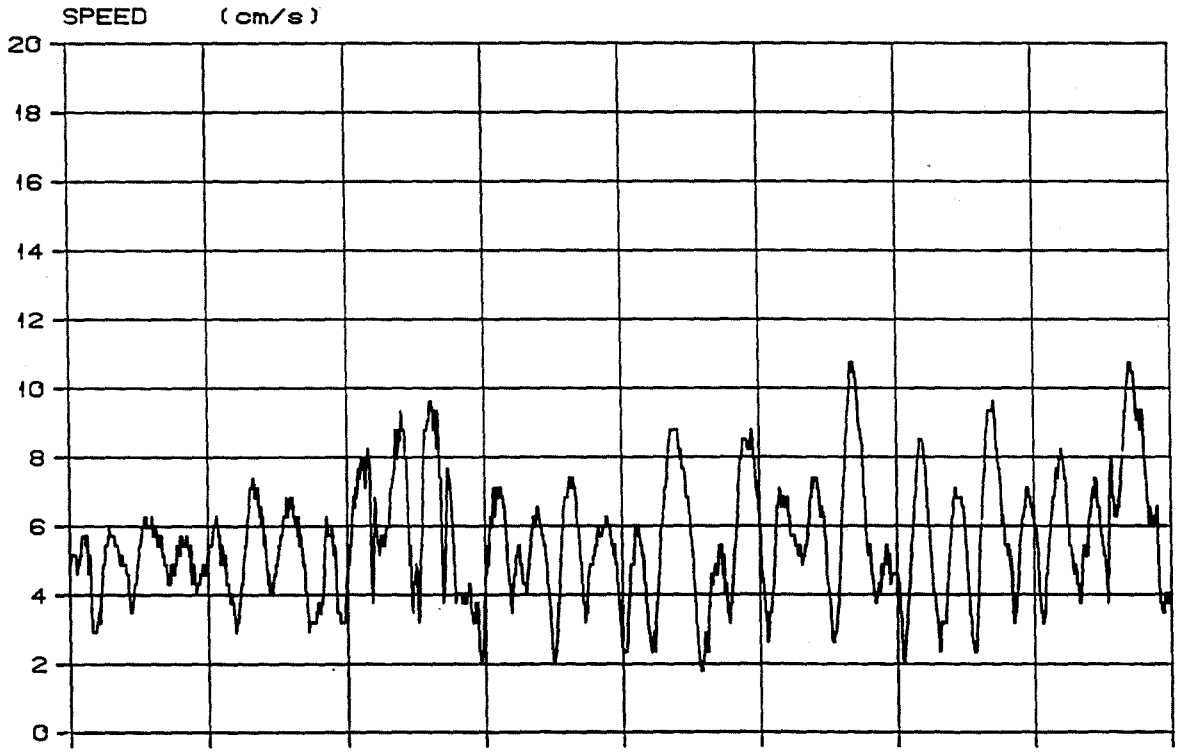
Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H I

Fig. 1-4-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

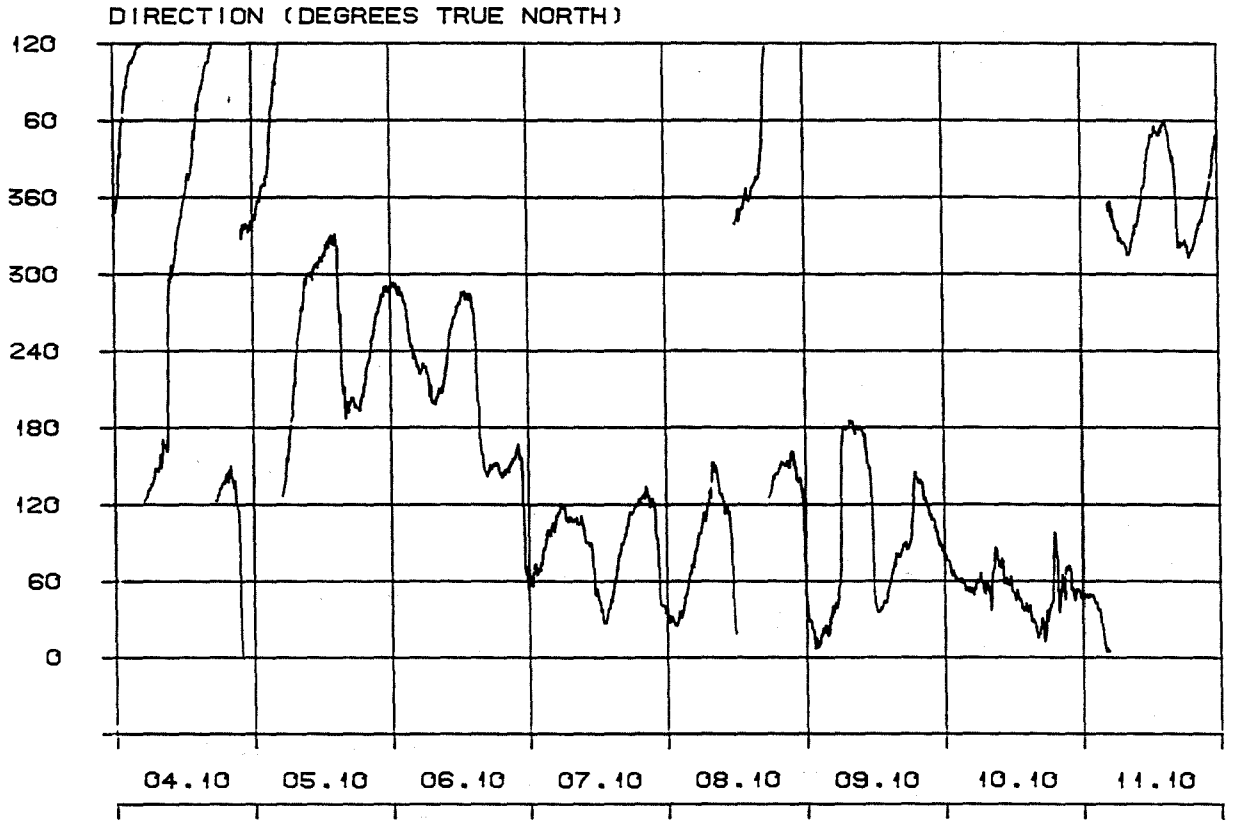
Time interval : 10.00 minutes.

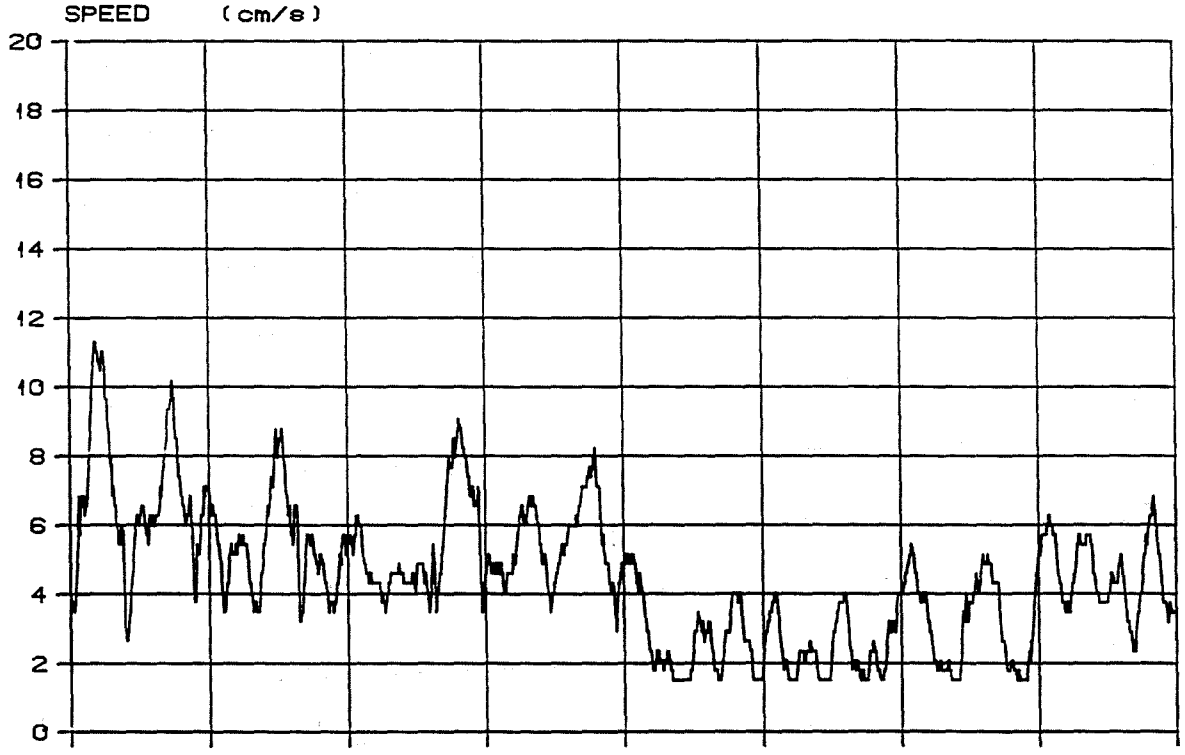
Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H 1

Fig. 1-4-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

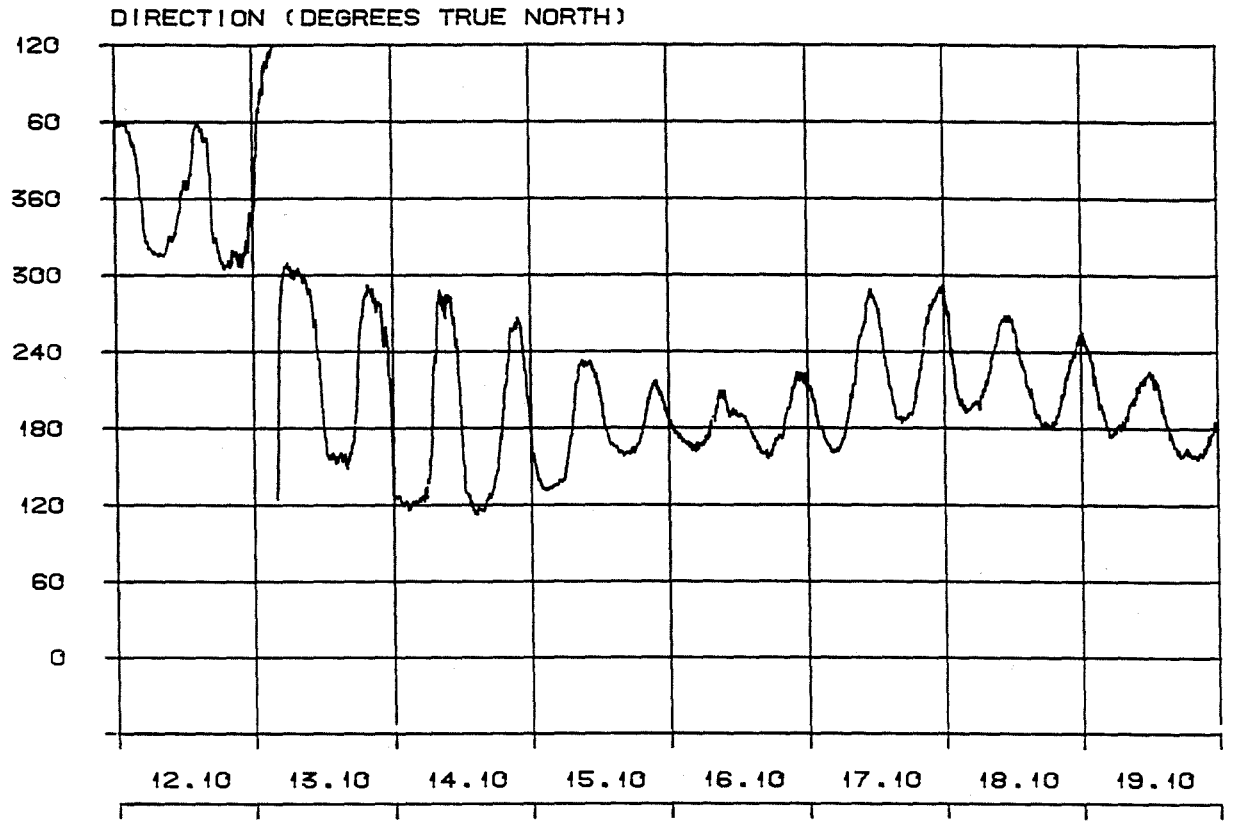
Time interval : 10.00 minutes.

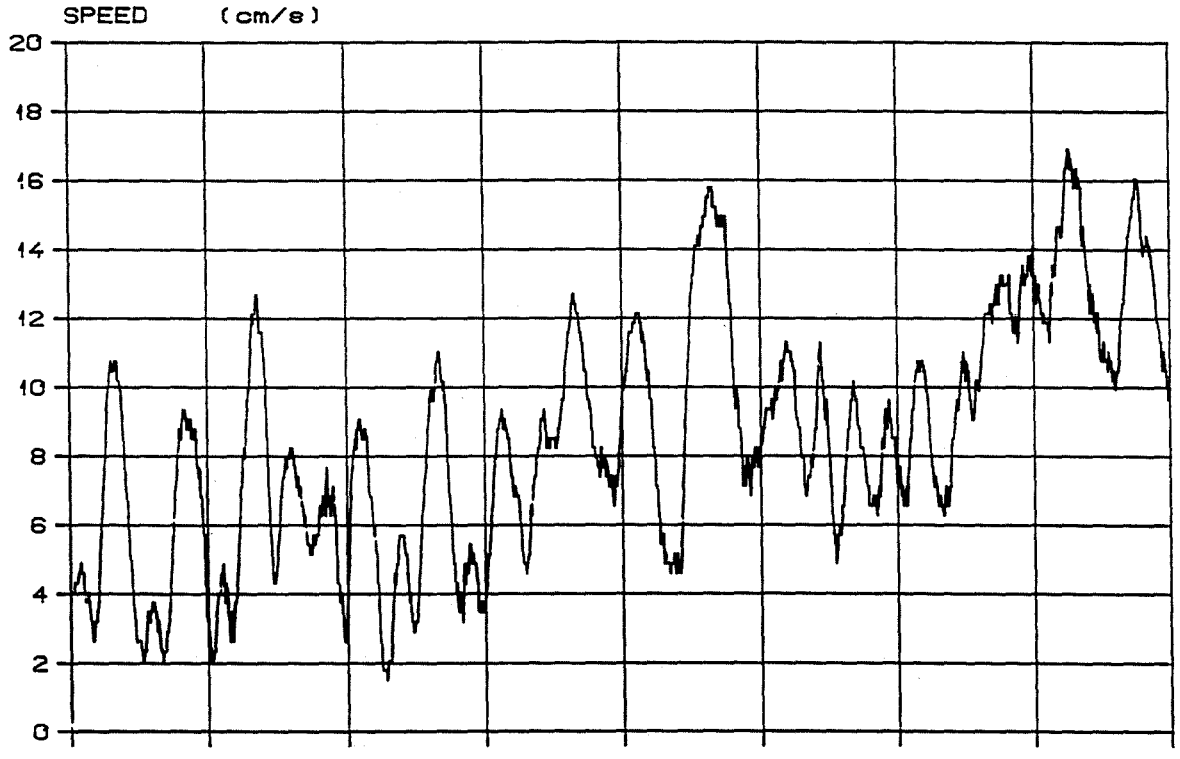
Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H I

Fig. 1-4-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

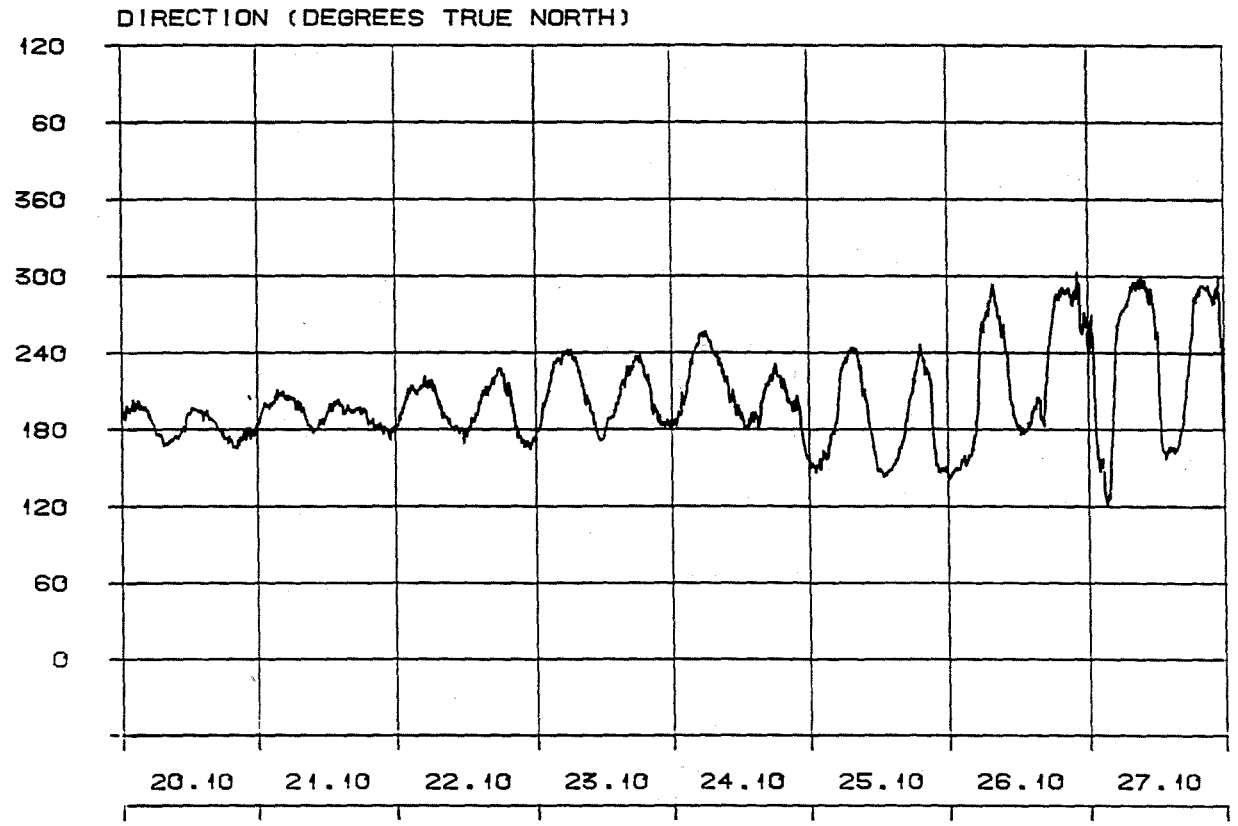
Instrument depth : 305.0 m Bottom depth : 315.0 m

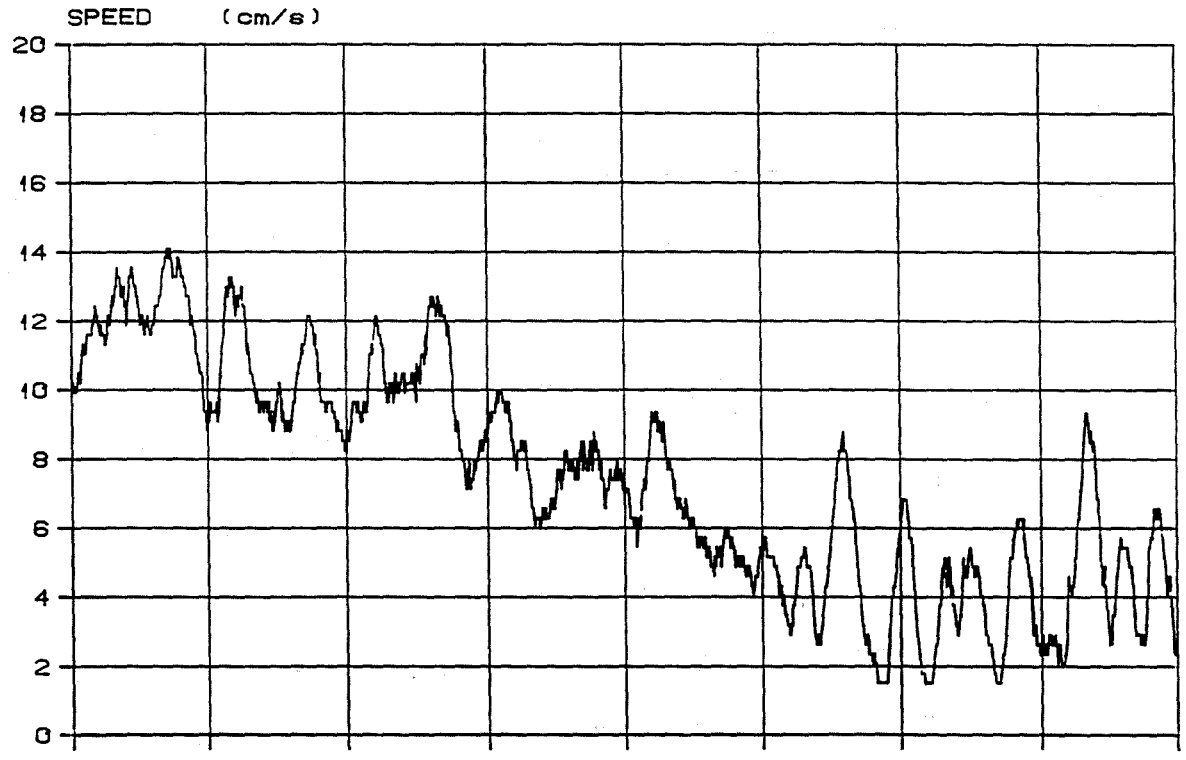
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

Fig. 1-4-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

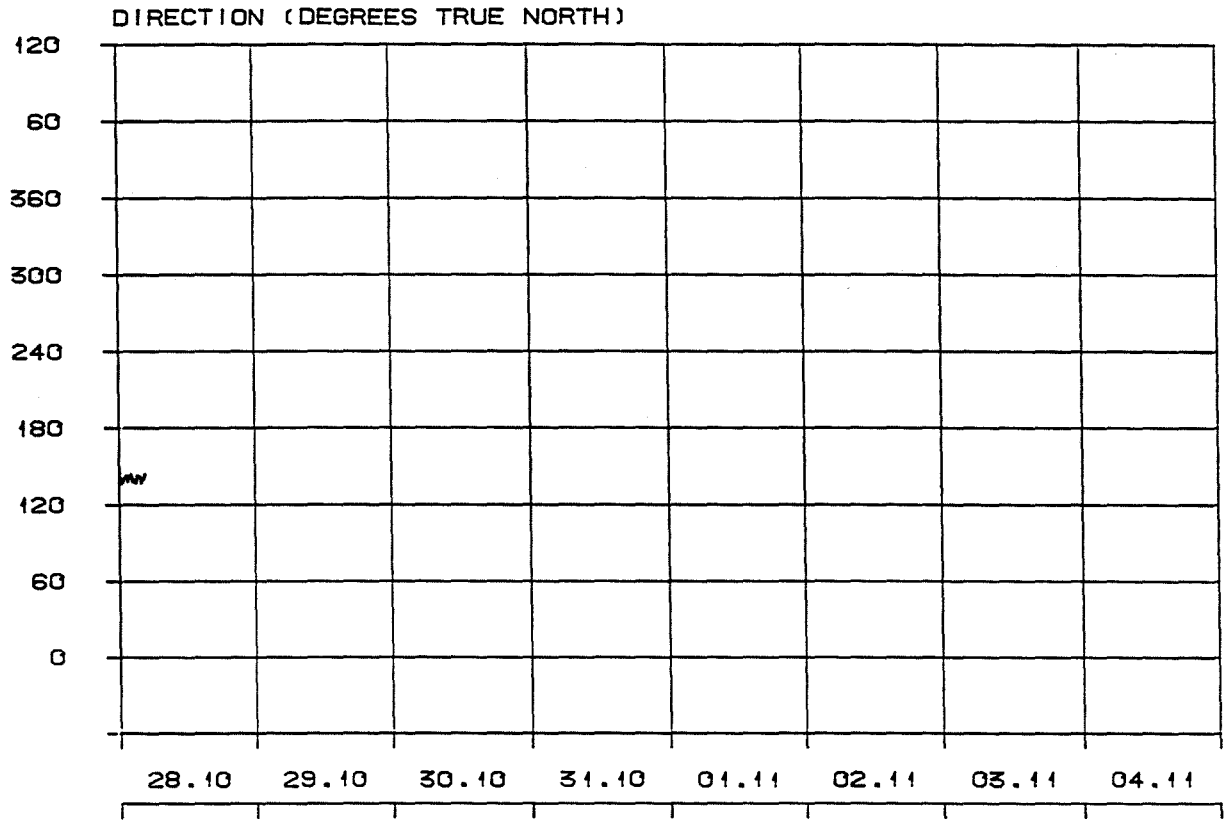
Time interval : 10.00 minutes.

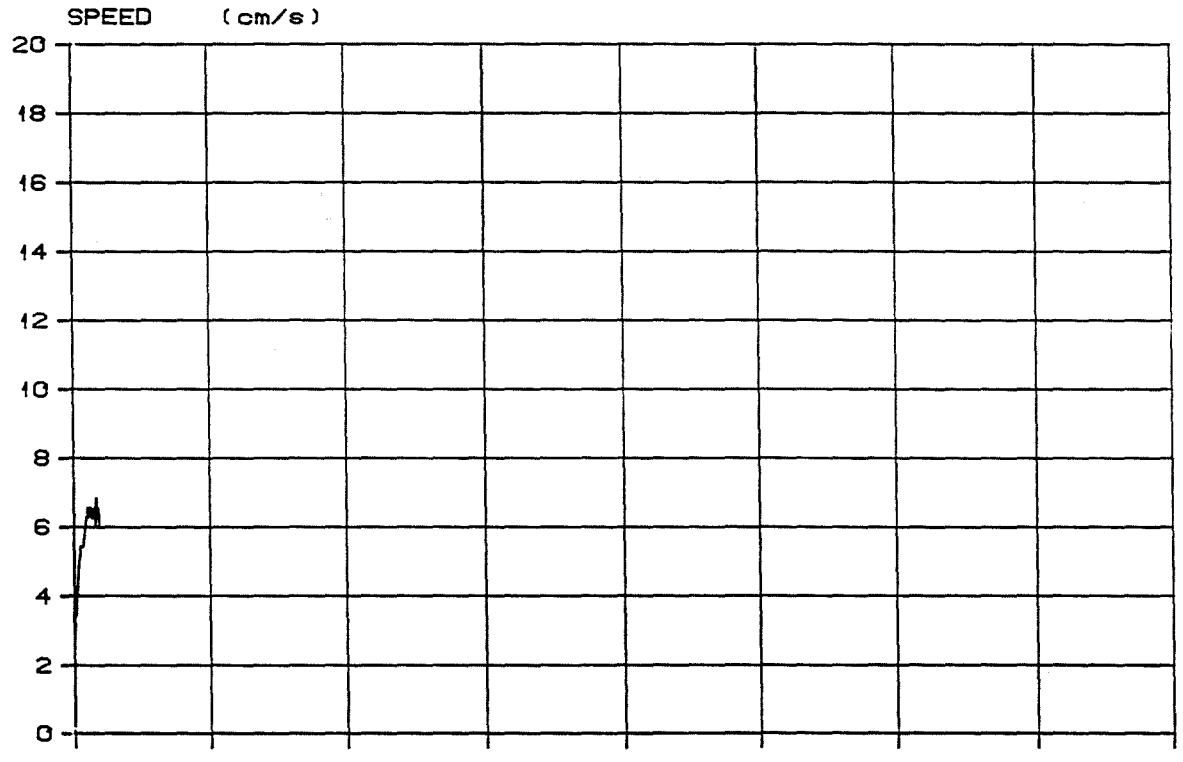
Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H 1

Fig. 1-4-7

Continues.....





The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

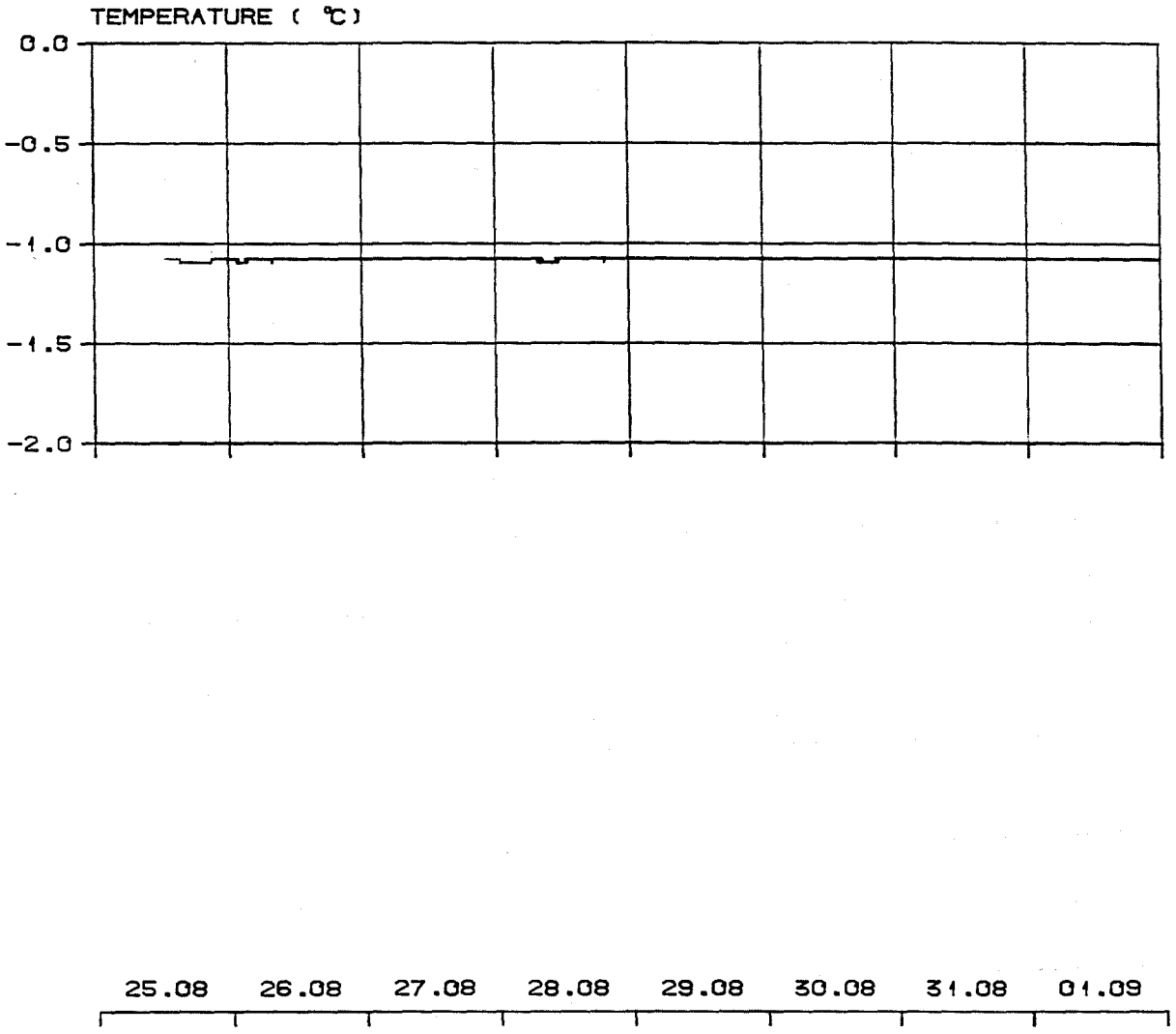
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H 1

Fig. 1-4-7

Continues.....



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

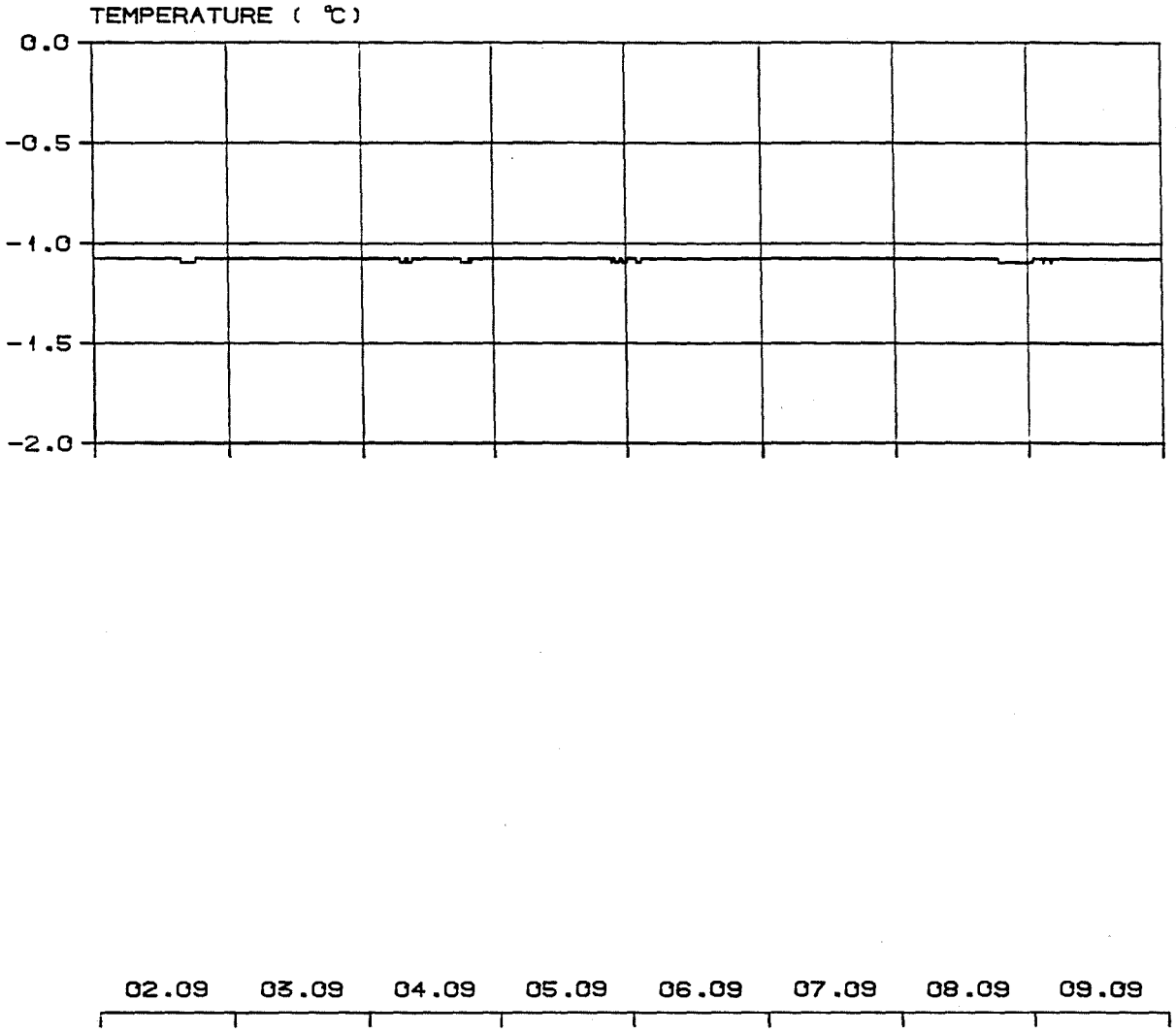
Instrument depth : 305.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H 1

Fig. 1-4-8 Temperature.



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

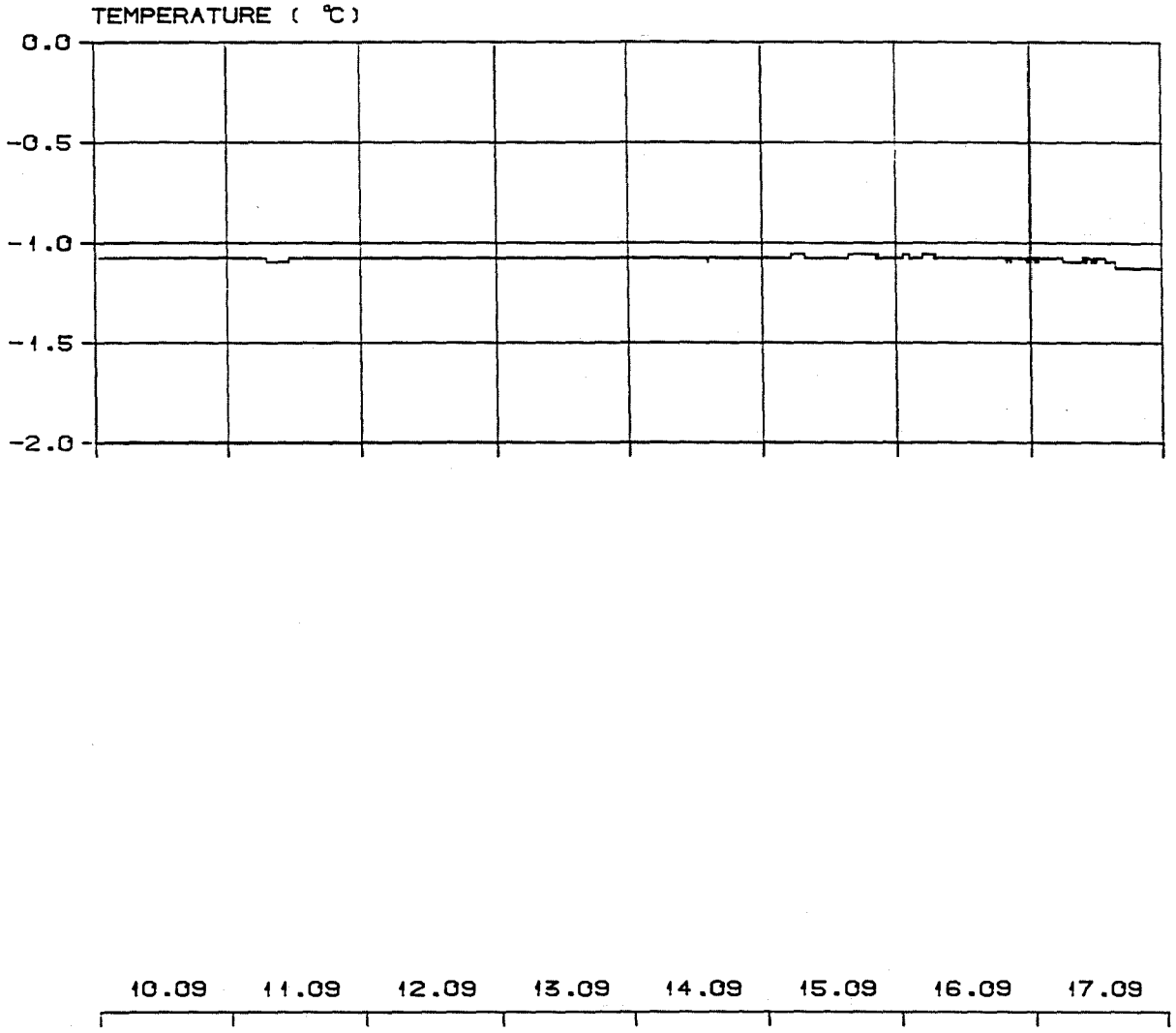
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H 1

Fig. 1-4-8

Continues.....



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

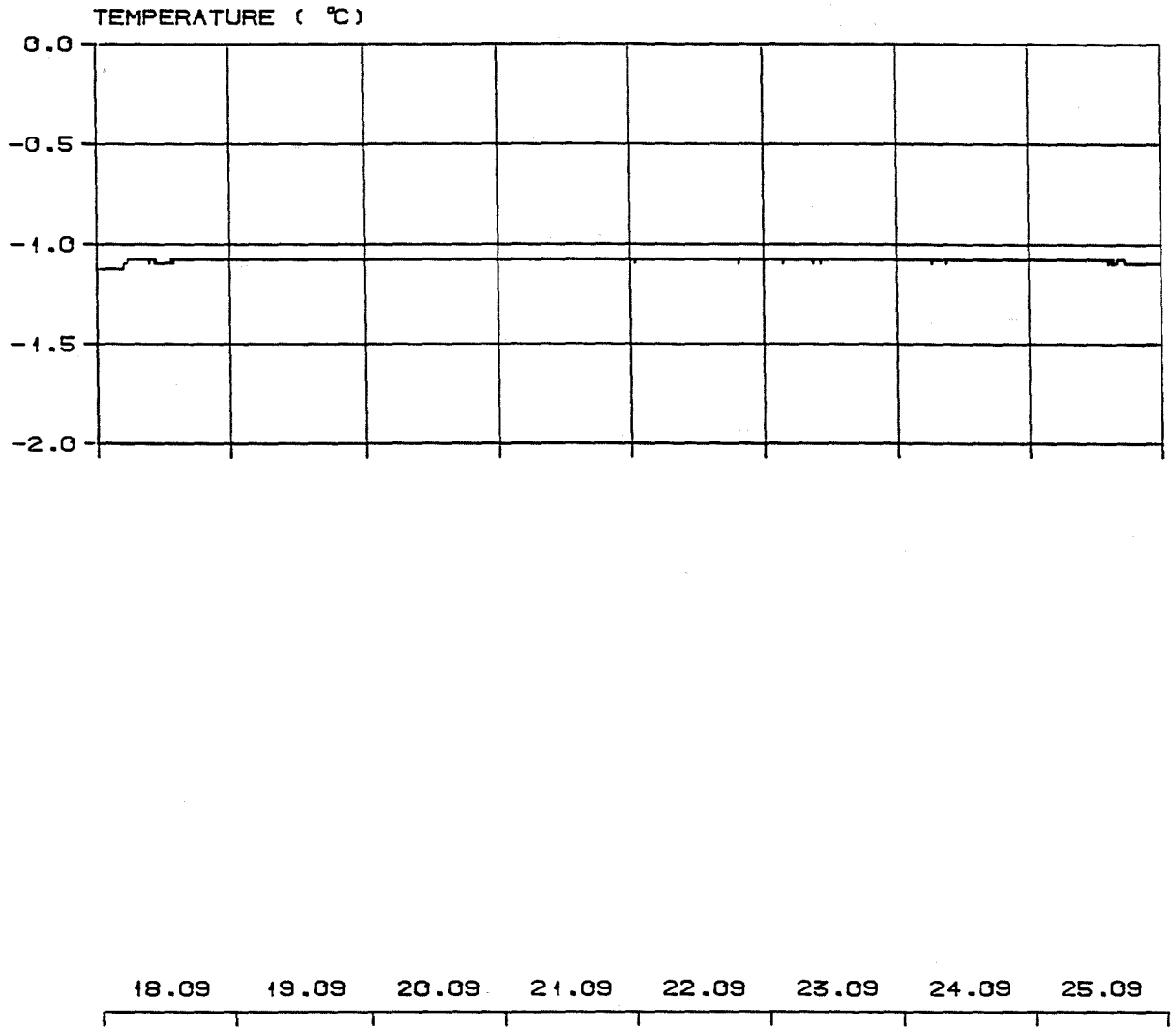
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H I

Fig. 1-4-8

Continues.....



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

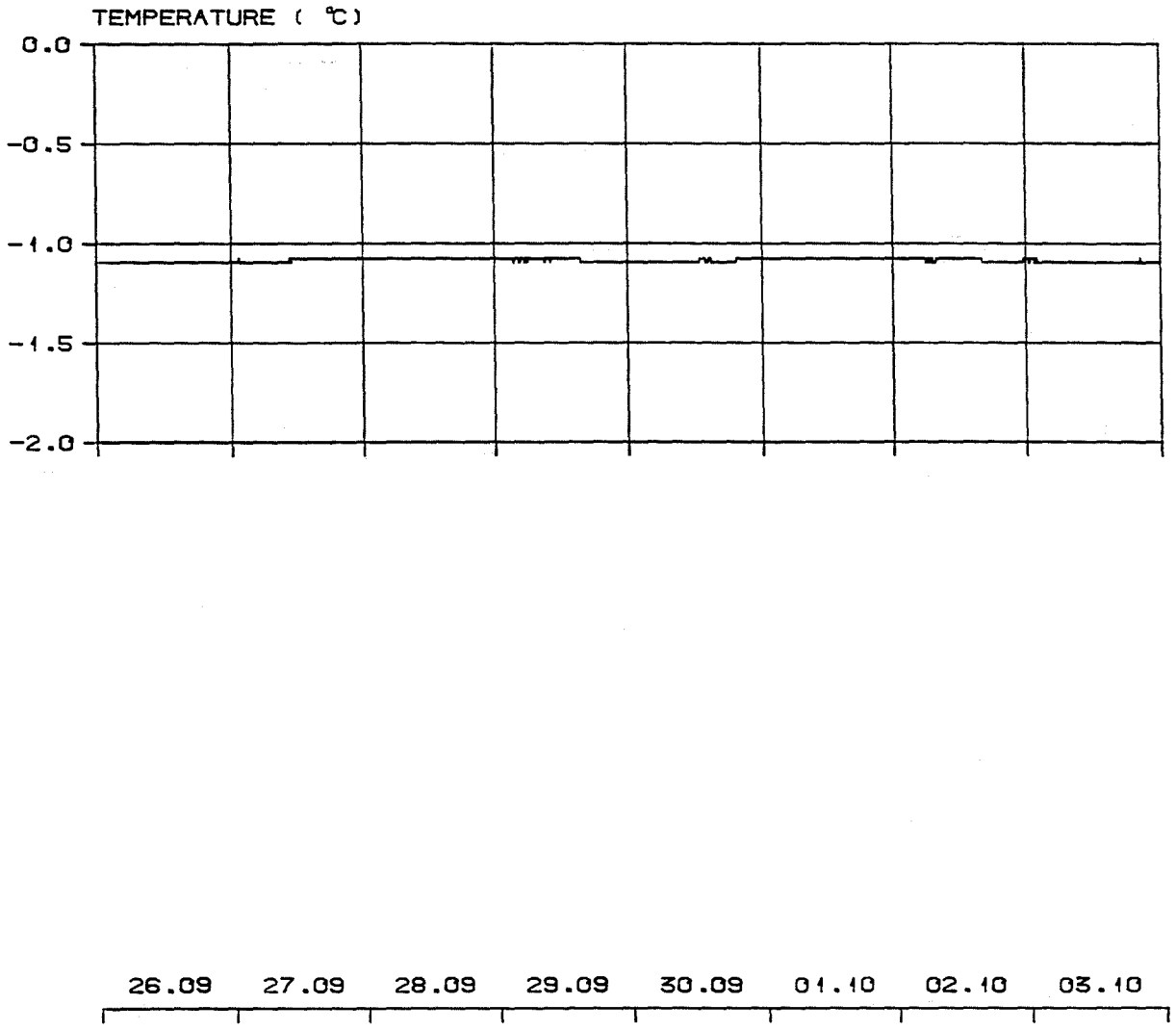
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H 1

Fig. 1-4-8

Continues.....



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

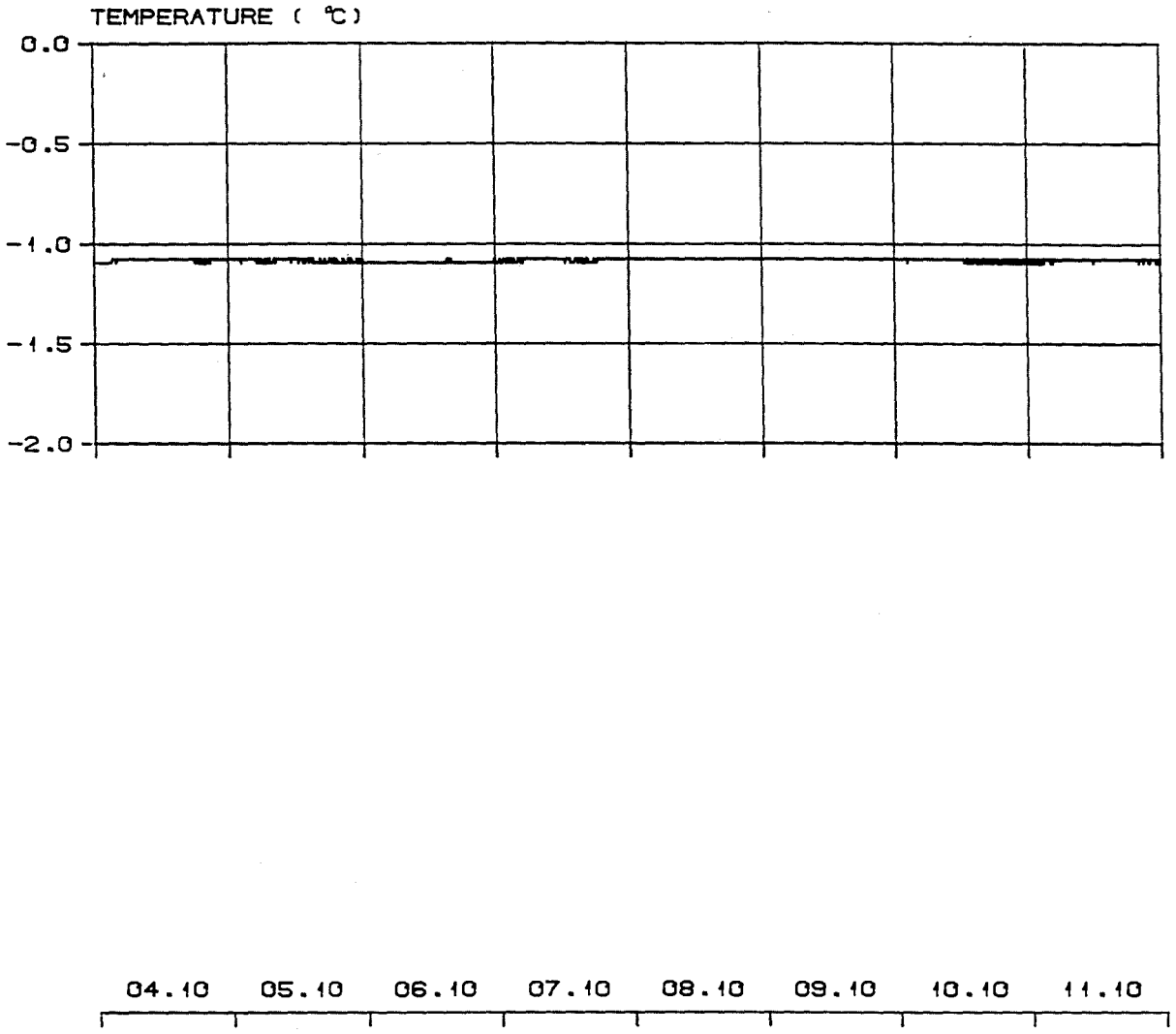
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H 1

Fig. 1-4-8

Continues.....



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

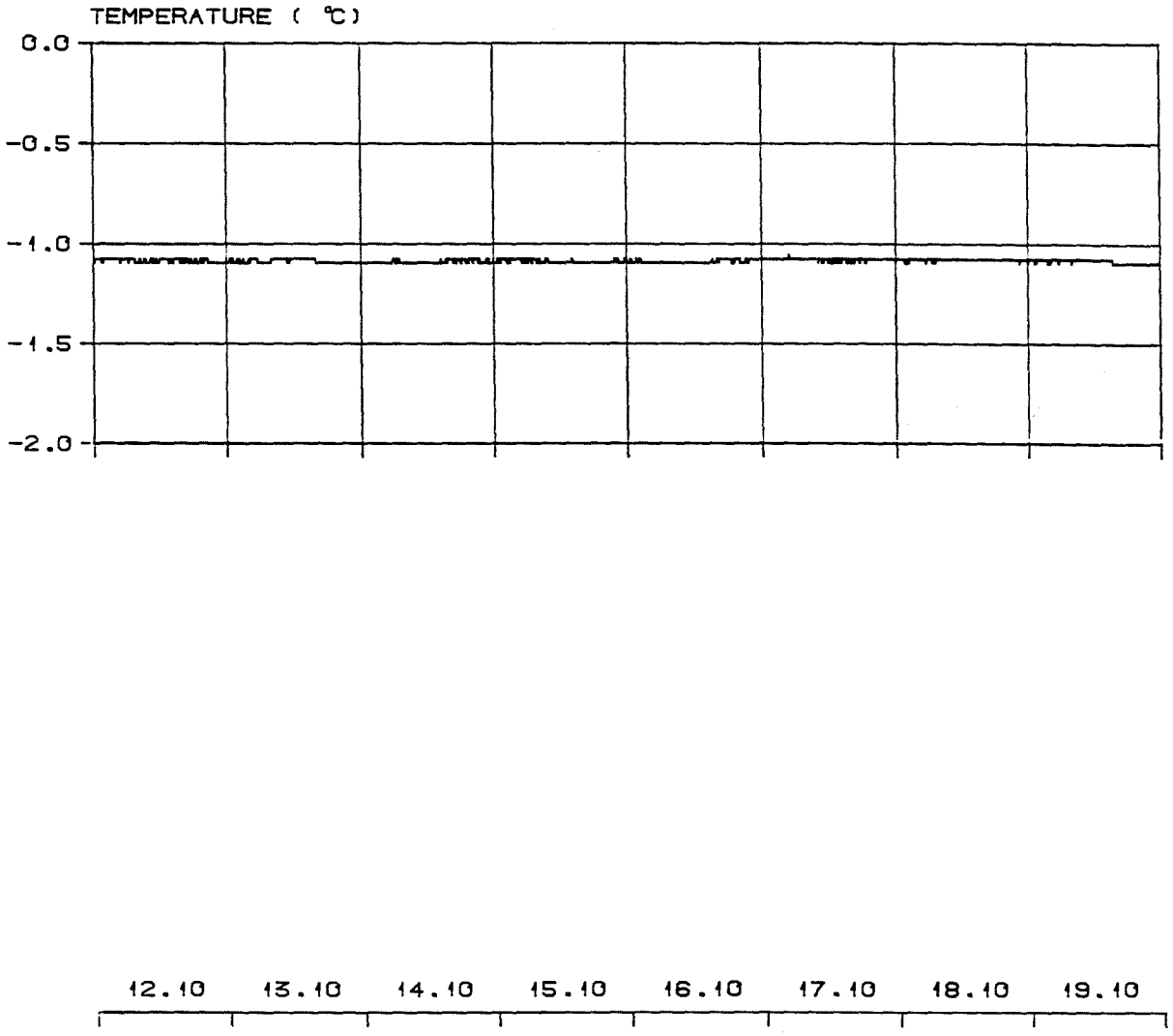
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H 1

Fig. 1-4-8

Continues.....



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

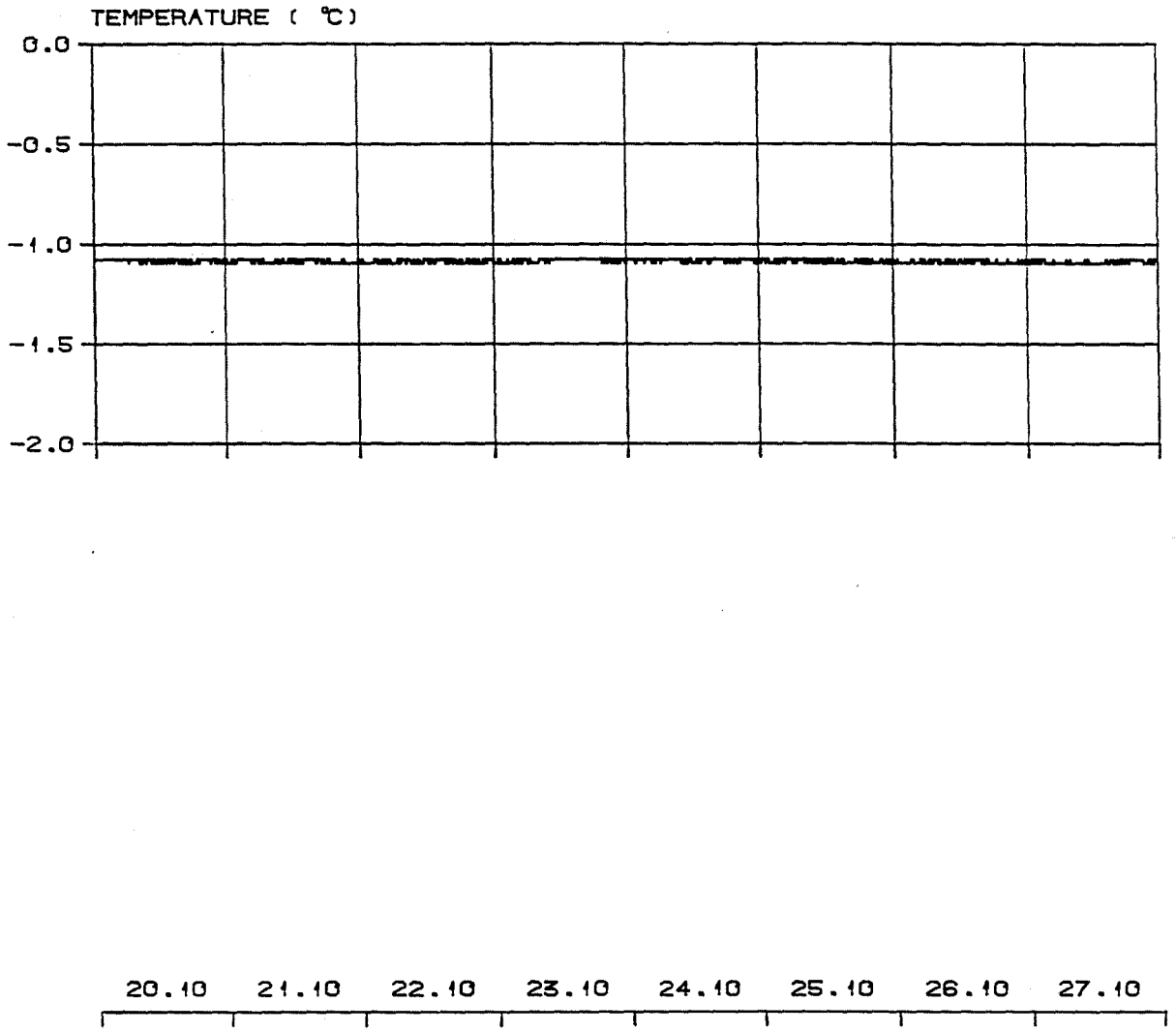
Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H I

Fig. 1-4-8

Continues.....



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

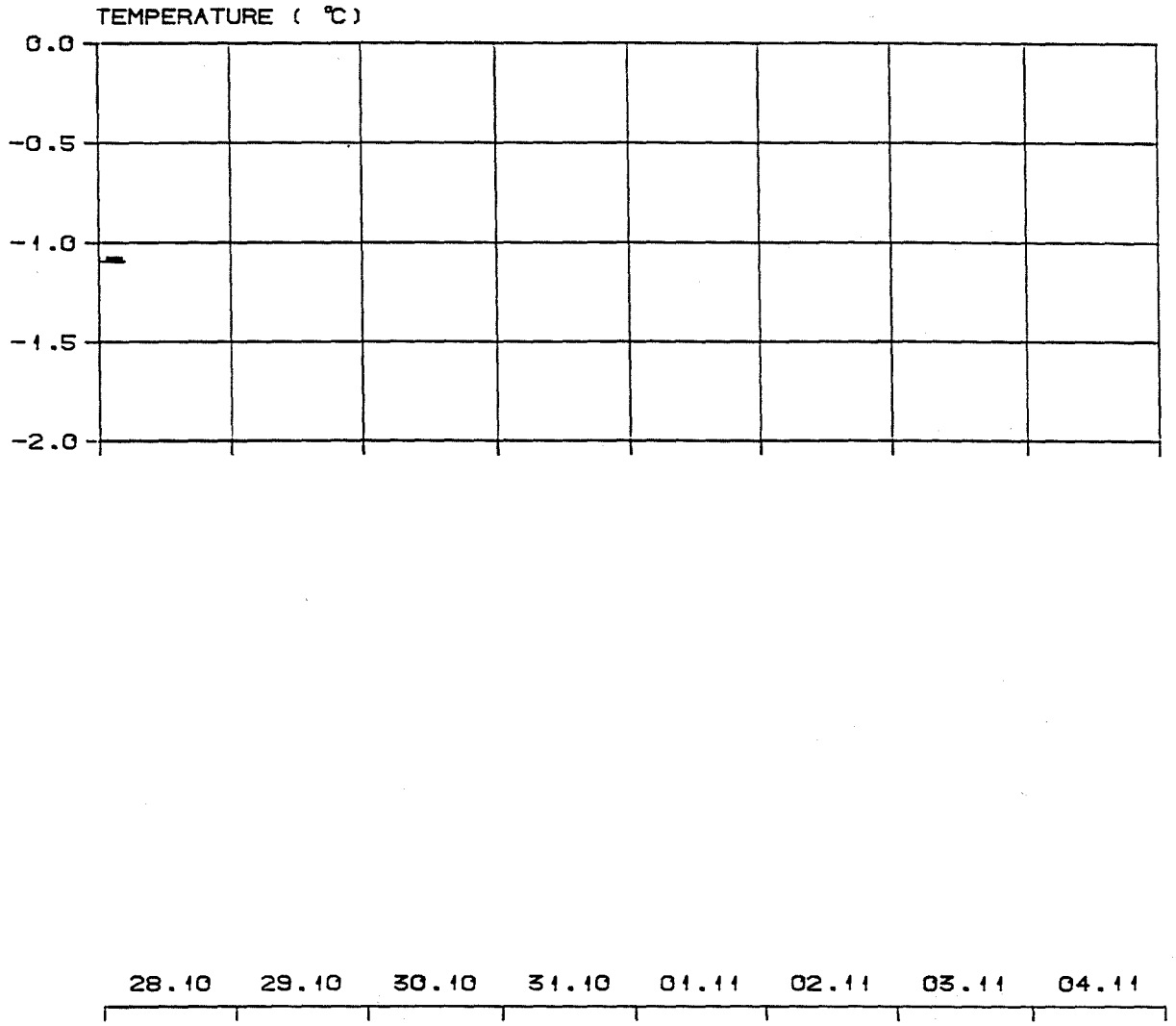
Instrument depth : 305.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Obeservation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

Fig. 1-4-8

Continues.....



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

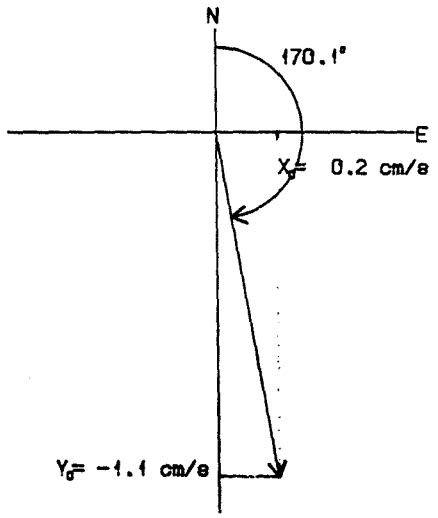
Fig. 1-4-8

Continues.....

HARMONIC ANALYSIS OF CURRENTS

CONSTITUENTS			DECOMPOSED CURRENT				TIDAL CURRENT ELLIPSE				
			E/W		N/S						
Symbol	Period hours	Frequense °/hour	X_j cm/s	g_{xj} °	Y_j cm/s	g_{yj} °	Major axis A_j cm/s	Minor axis B_j cm/s	θ_j °	g_j °	BETA. °
MM	661.31	0.5	1.8	210.7	2.6	253.2	3.0	1.0	211.1	61.2	129.0
MSF	354.37	1.0	0.8	324.1	3.1	307.8	3.2	-0.2	13.4	308.7	43.3
N2	12.66	28.4	0.8	81.6	0.7	249.7	1.1	0.1	313.6	255.9	32.0
M2	12.42	29.0	2.9	93.9	3.1	268.0	4.4	0.2	137.1	90.7	115.0
S2	12.00	30.0	1.6	118.3	1.3	320.0	2.1	-0.4	129.2	127.1	67.1

MEAN CURRENT



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Observation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H 1

Fig. 1-4-9 Harmonic analysis of current.

A discription of the model and its definitions :

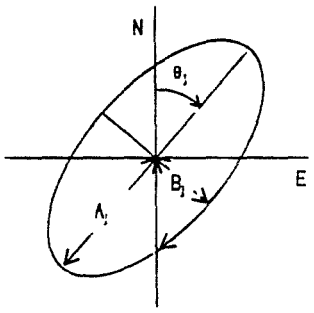
Current-vector decomposed in E/W (real) - and N/S (imaginary) - direction :

$$Z(t)=X_0+\sum_{j=1}^{n}(X_j\cos(\sigma_j t+(V_0+u)_j-g_{xj})+i(Y_0+\sum_{j=1}^{n}Y_j\cos(\sigma_j t+(V_0+u)_j-g_{yj}))$$

g_{xj} , g_{yj} : Greenwich-phase for E/W- and N/S-components of each constituent.

With ellipseparameters :

$$Z(t)=\sum_{j=1}^{n}\exp(i(90^\circ-\theta_j))(A_j\cos(\sigma_j t+(V_0+u)_j-g_j)+iB_j\sin(\sigma_j t+(V_0+u)_j-g_j))$$



g_j : Greenwich phase of the current-vector for each constituent.

Rotationdirection : anticlockwise when $B_j > 0$, clockwise when $B_j < 0$

BETA : The angle between t=0 and major halv axis in the ellipse.

Common for both modles :

σ_j : Frequence in degrees/hour.

$(V_0+u)_j$: Astronomic argument relative to Greenwich-meridian.

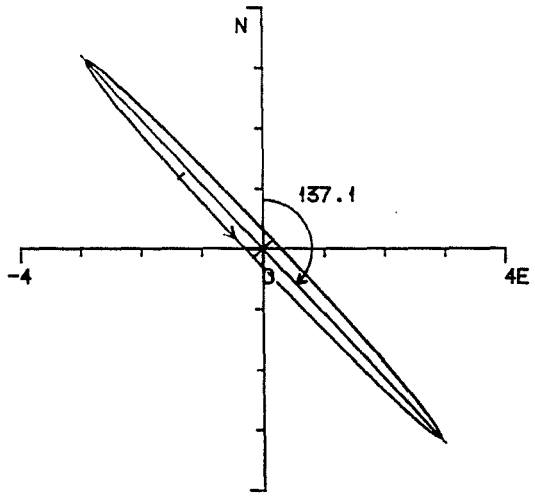
During the calculation of Z(t) will V_0+u be put into the formulas at the time t=0.

The time t is in houres; the same timezone as the analysed data.

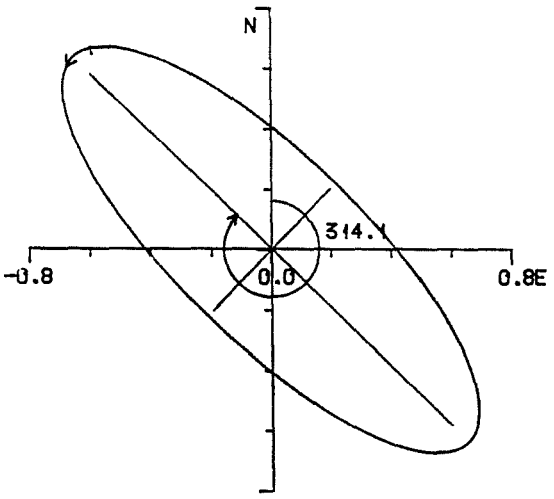
t=0 in the midle of the measurement series : 1989 26.09 H. 0800 ,

marked with a line on the ellipse.

M2-ellipse



K1-ellipse



The Barents Sea

Position : N 73° 4.80' E 40° 0.00'

Instrument depth : 305.0 m Bottom depth : 315.0 m

Time interval : 10.00 minutes.

Obeervation period: 1989 25.08 H. 1240 - 1989 28.10 H. 0430

H 1

Fig. 1-4-10 M2 and K1 ellipse.

Appendix C

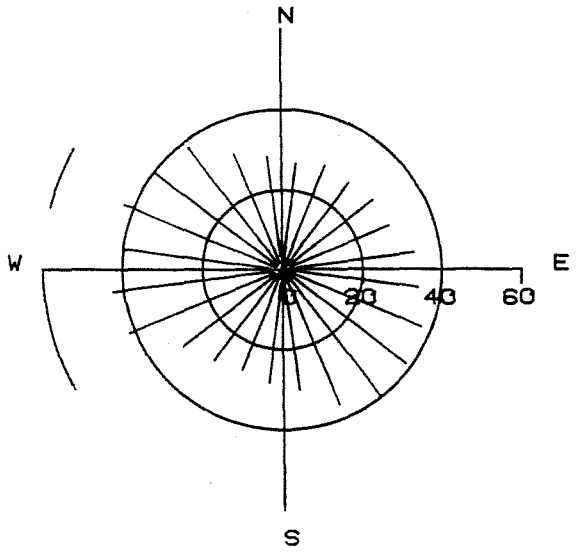
AANDERAA RCM CURRENT DATA

Mooring : 2

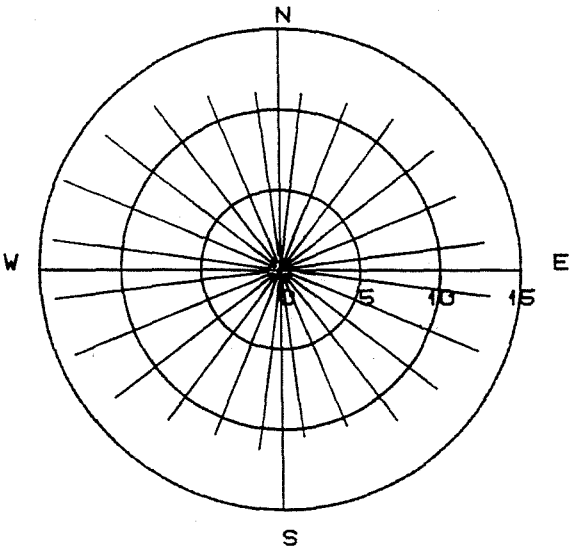
Position : N 74° 29.99' E 39° 57.97'

Instrument depths : 20, 45 and 150 m.

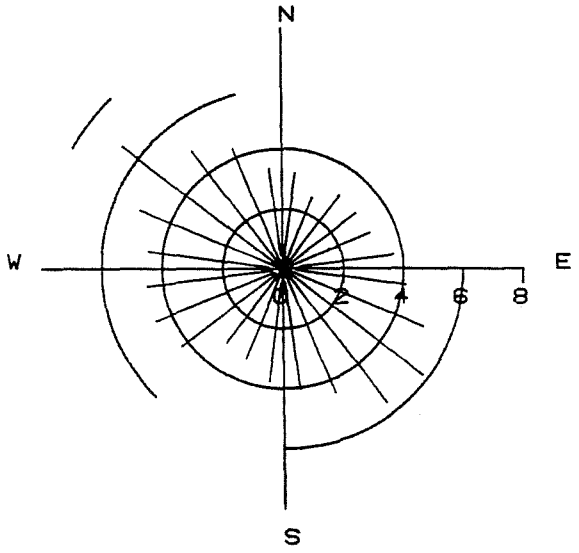
CURRENT VELOCITY DISTRIBUTION



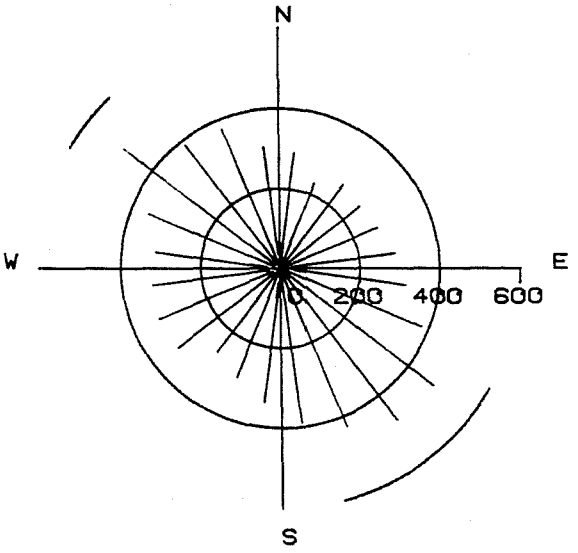
Maksimum velocity (cm/s)



Mean velocity (cm/s)



Relative flux in %



Number measured

Number of obeervations : 8156

The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 20.0 m Bottom depth : 186.0 m

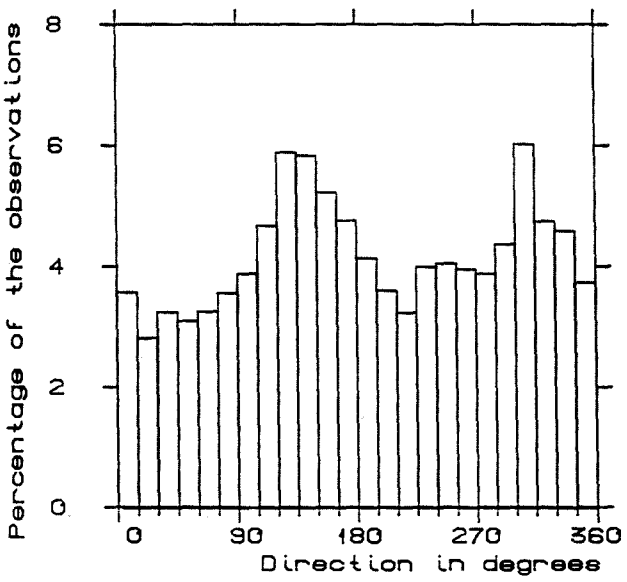
Time interval : 10.00 minutes.

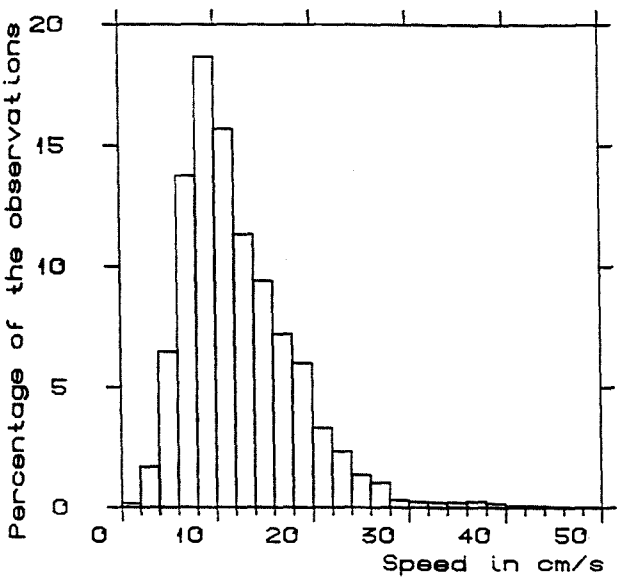
Obeervation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H 1

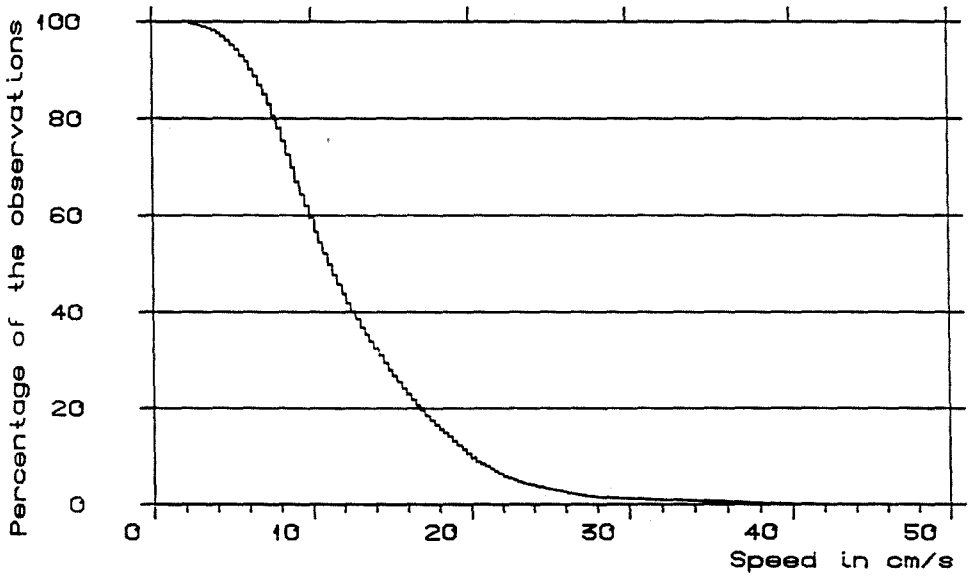
Fig. 2-1-1 Current velocity distribution.

HISTOGRAM





CURRENT SPEED DISTRIBUTION



Number of observations : 8156

The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 20.0 m Bottom depth : 186.0 m

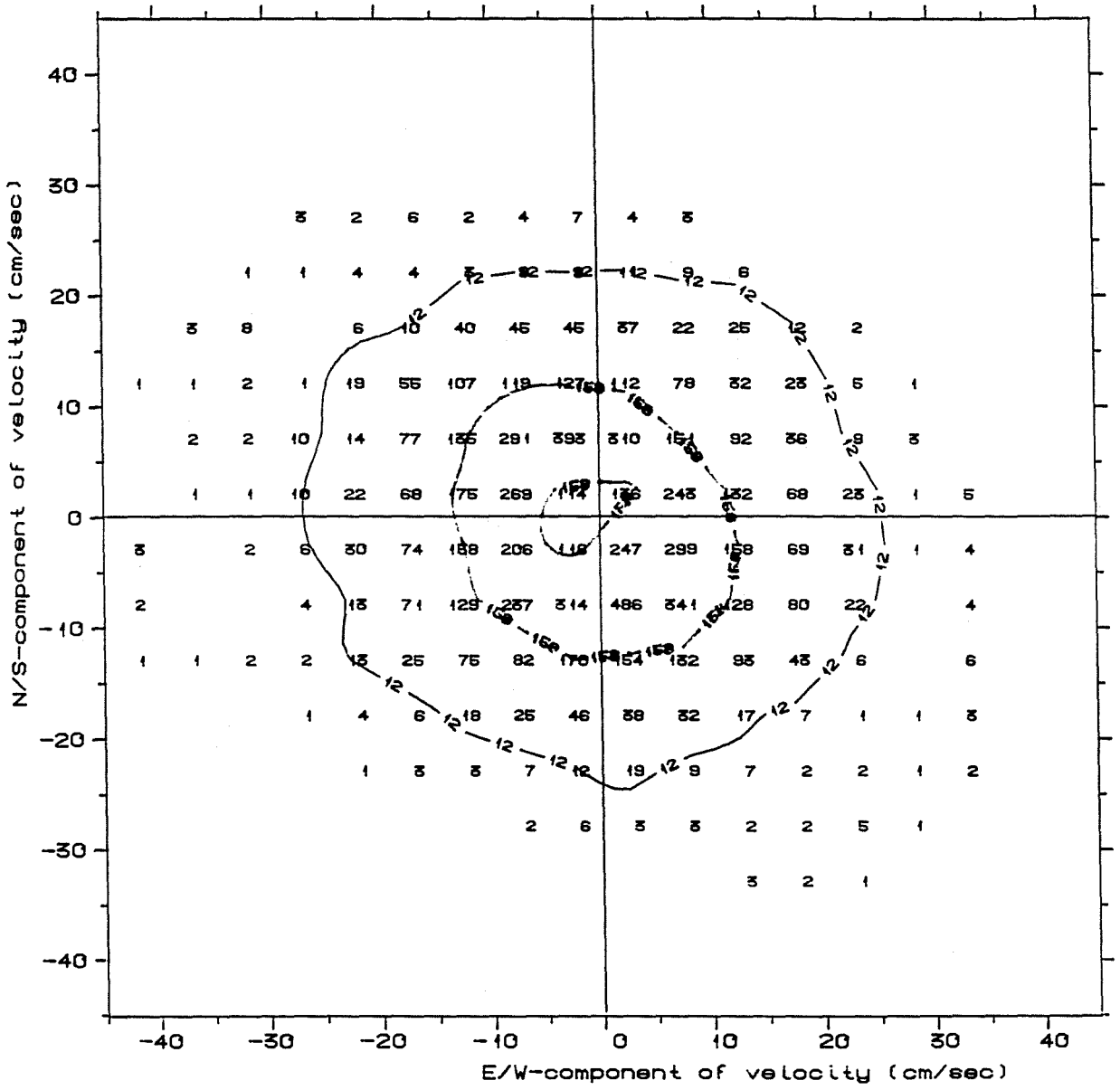
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H 1

Fig. 2-1-2 Histogram of speed and direction. Current speed distribution.

VELOCITY DISTRIBUTION DIAGRAM



Number of obeervatione : 8156

Isoline for 50% and 96%

Number of obeervatione : 8156

The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 20.0 m Bottom depth : 186.0 m

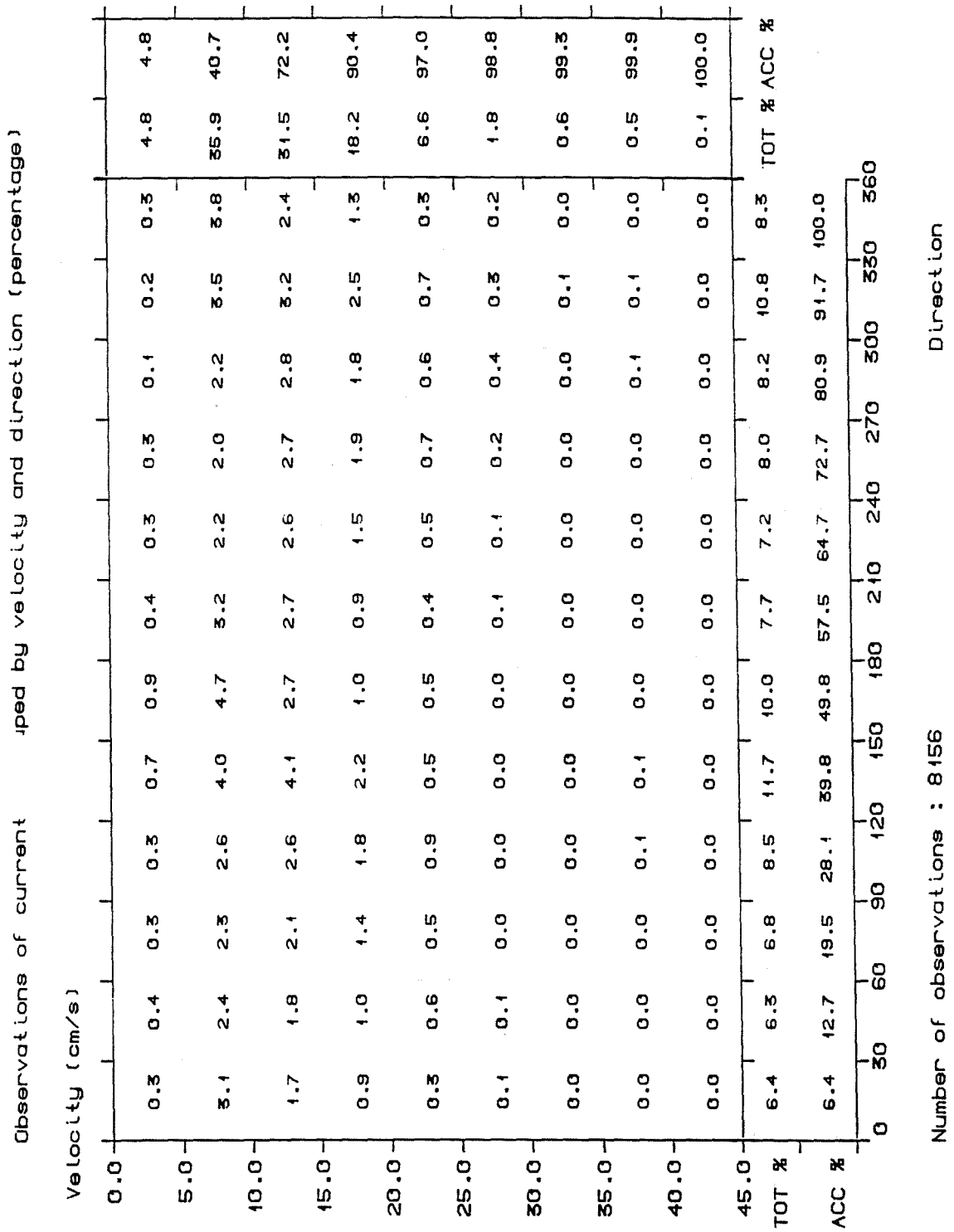
Time interval : 10.00 minutes.

Obeervation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H 1

Fig. 2-1-3 Velocity distribution diagram.

DIRECTION DISTRIBUTION OF CURRENT VELOCITY



Number of obeservations : 8156

The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

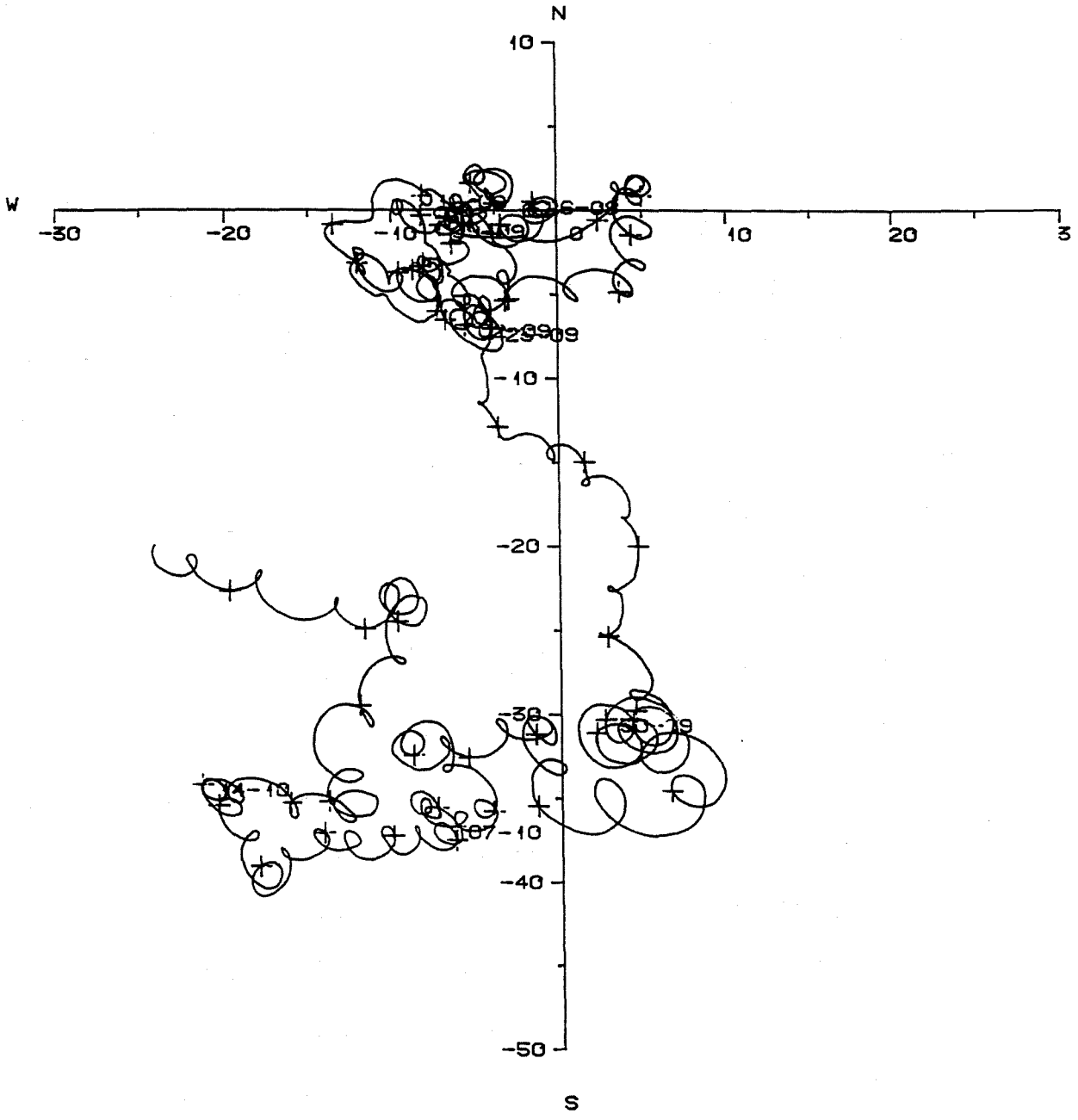
Instrument depth : 20.0 m Bottom depth : 186.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

Fig. 2-1-4 Velocity distribution table.

PROGRESSIVE VECTOR DIAGRAM



Units in km

Number of obeervations : 8156

The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

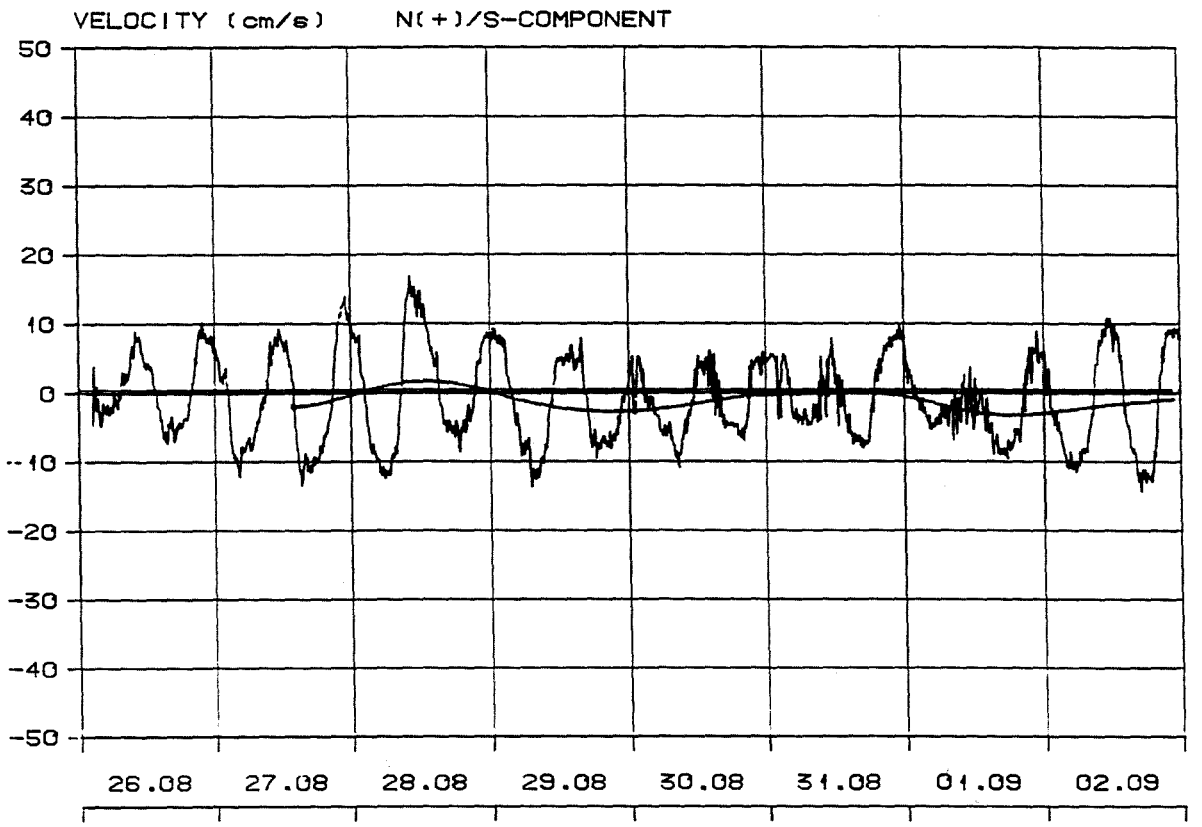
Instrument depth : 20.0 m Bottom depth : 186.0 m

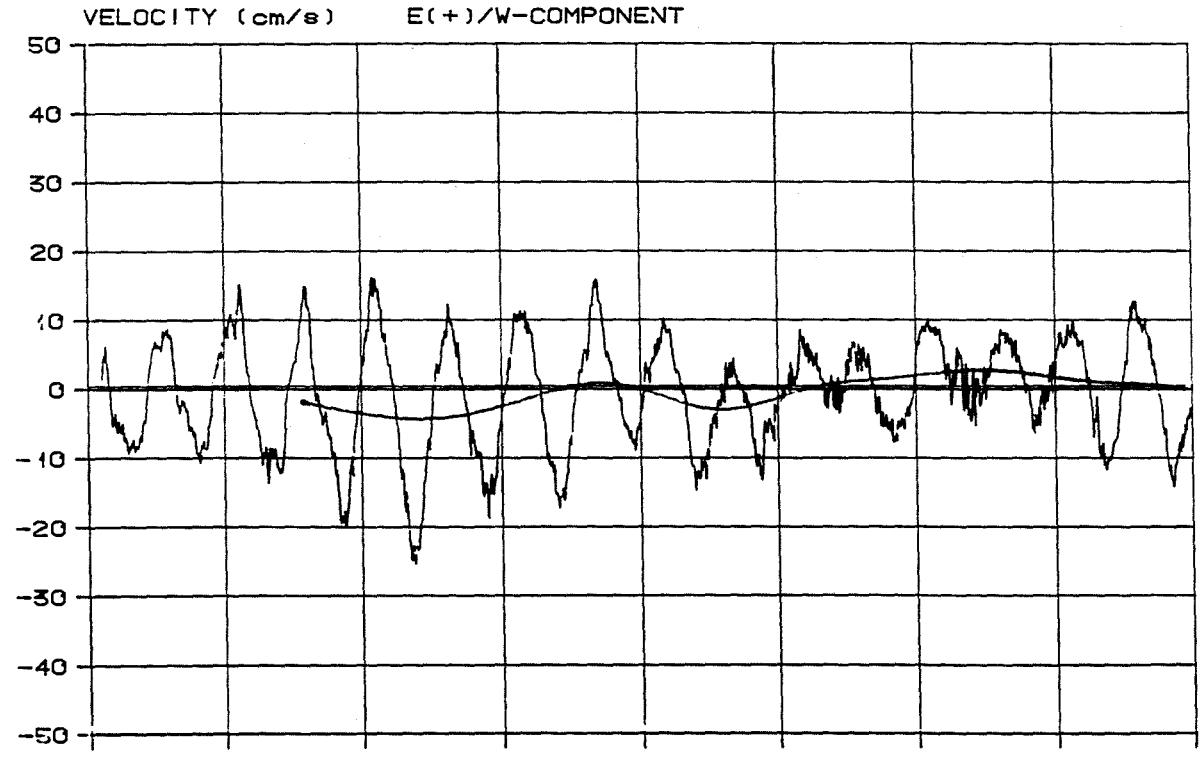
Time interval : 10.00 minutes.

Obeervation period: 1989 26.08 H. 0230 - 1989 11.10 H. 1740

H 1

Fig. 2-1-5 Progressive vector diagram.





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

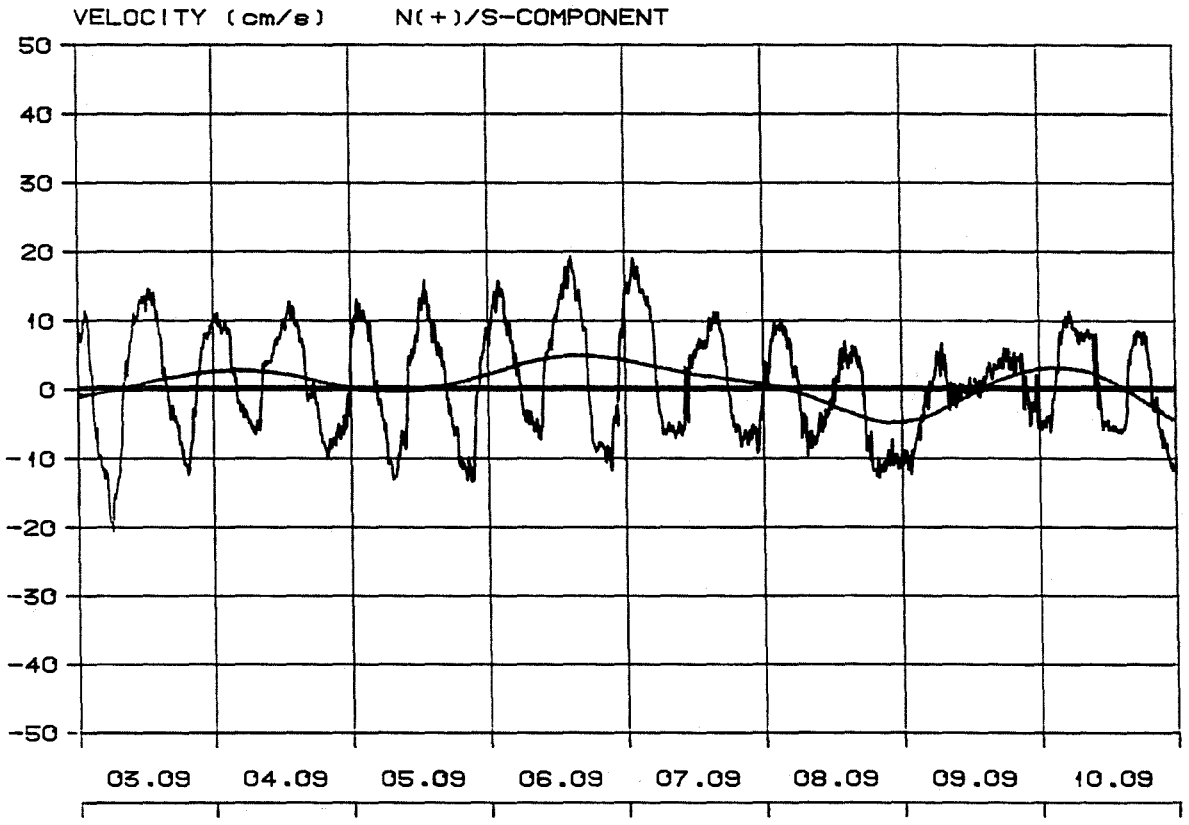
Instrument depth : 20.0 m Bottom depth : 186.0 m

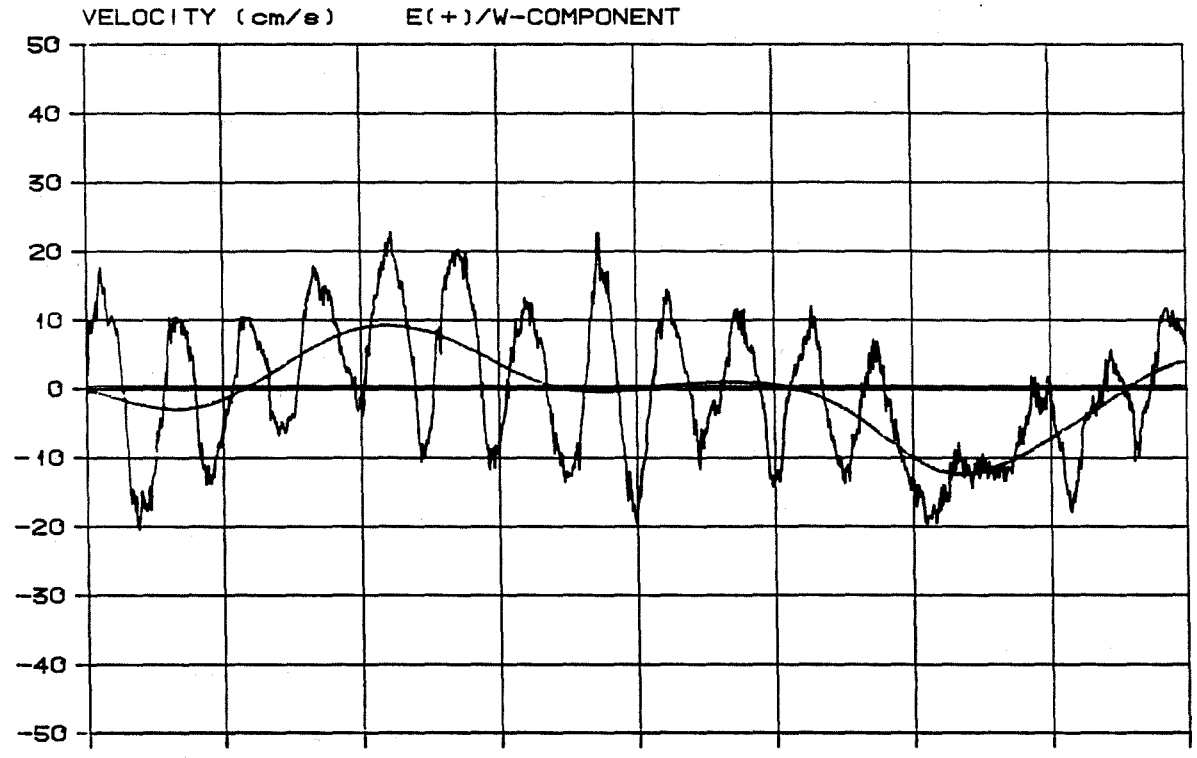
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H 1

Fig. 2-1-6 N/S and E/W components of current.





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 20.0 m Bottom depth : 186.0 m

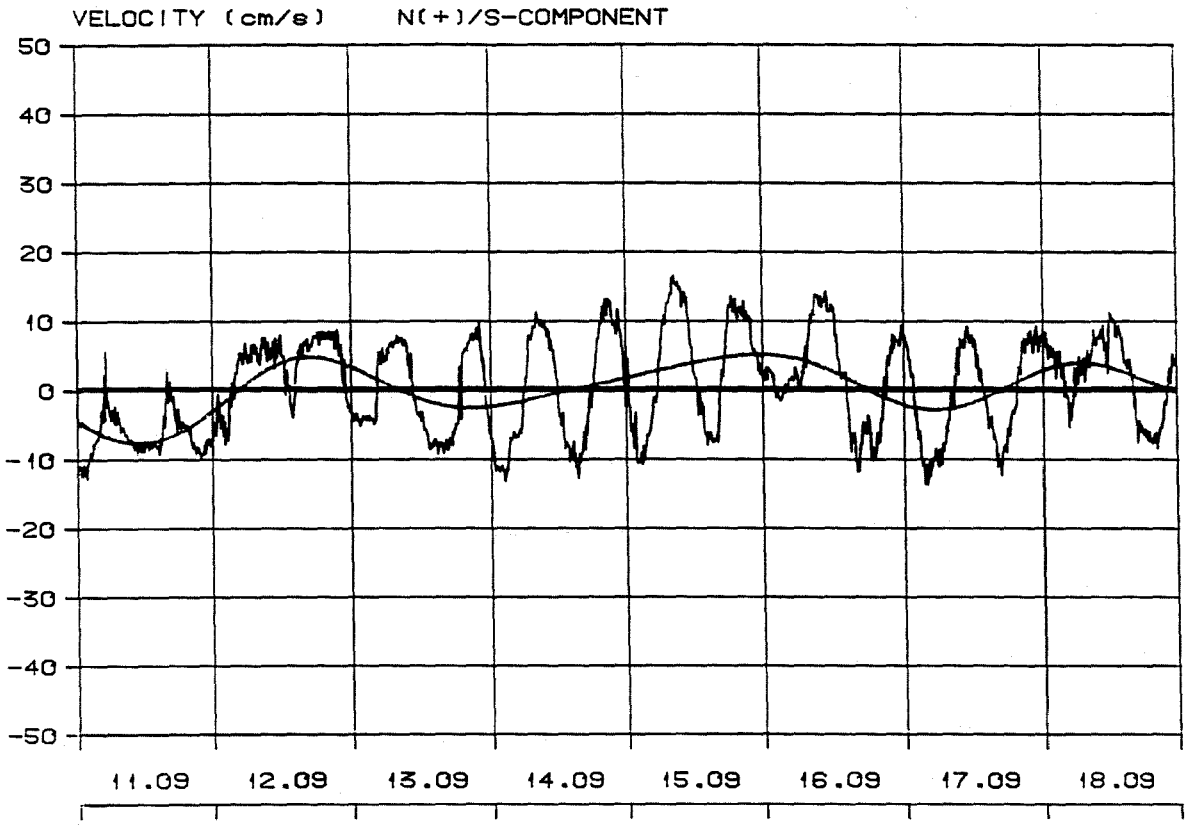
Time interval : 10.00 minutes.

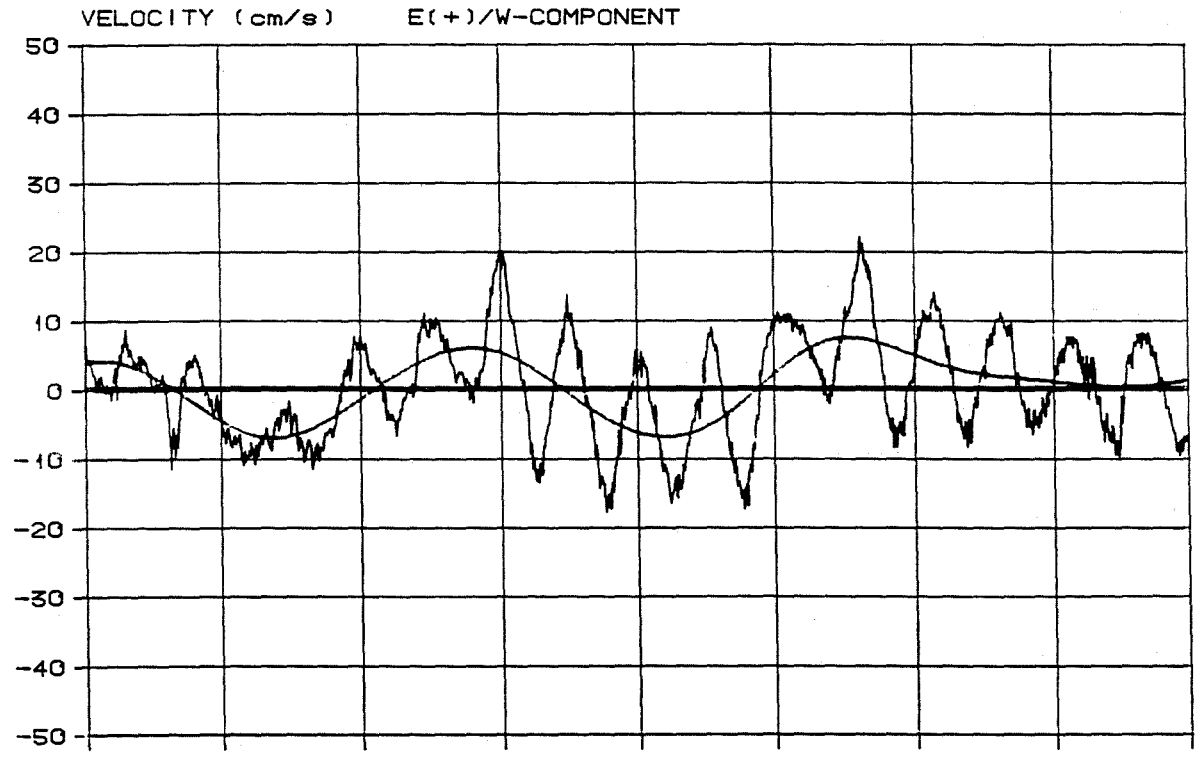
Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H 1

Fig. 2-1-6

Continues.....





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 20.0 m Bottom depth : 186.0 m

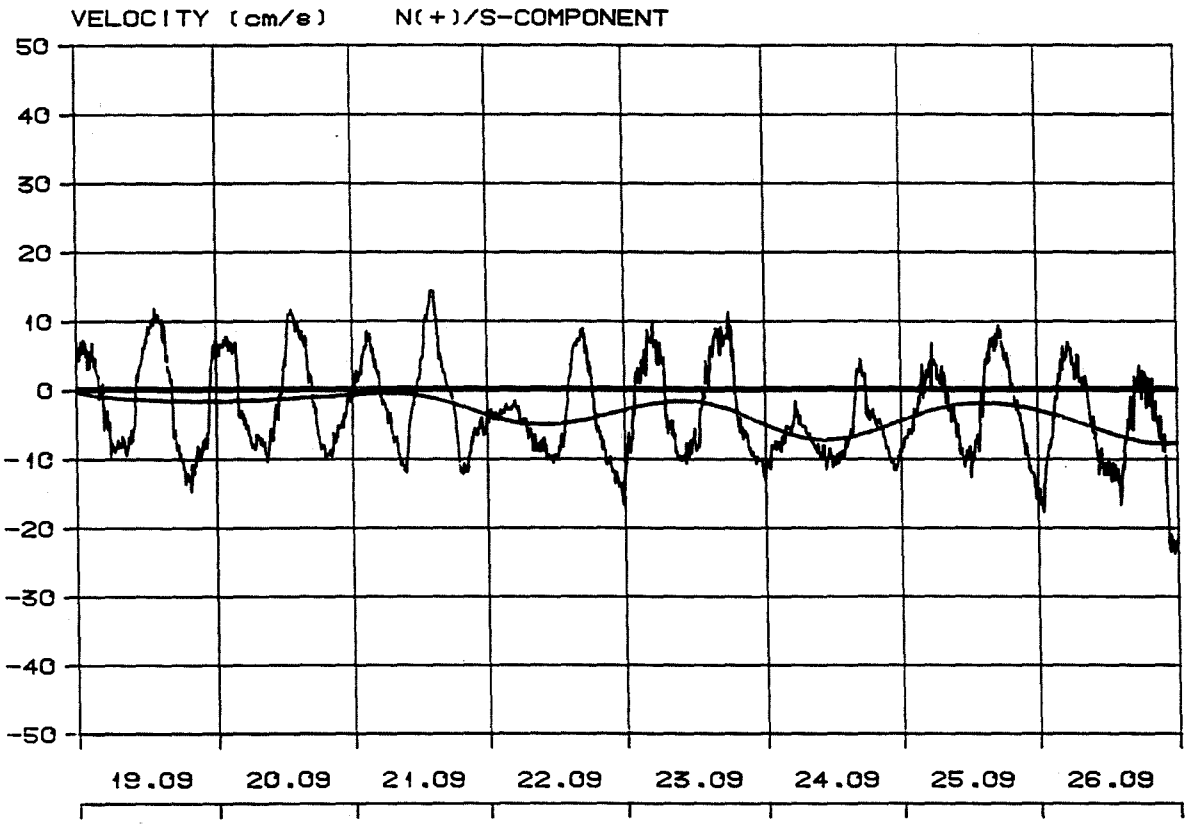
Time interval : 10.00 minutes.

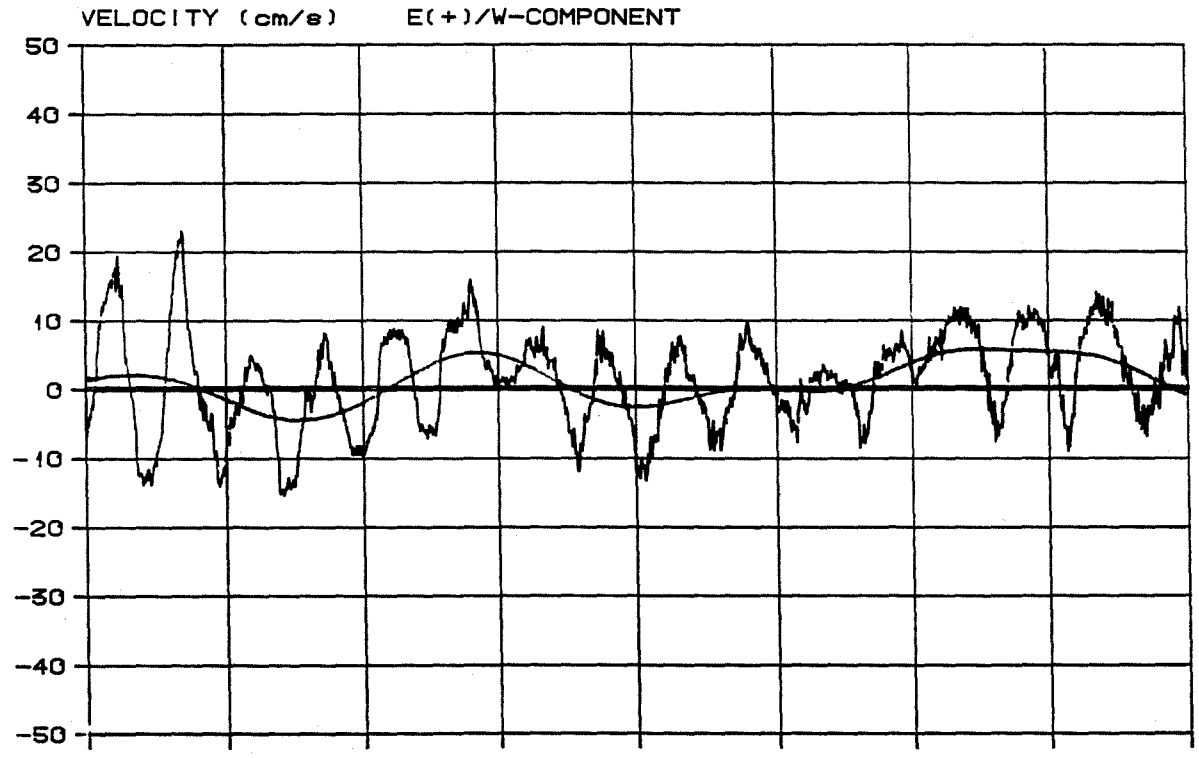
Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H 1

Fig. 2-1-6

Continues,,,,,





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 20.0 m Bottom depth : 186.0 m

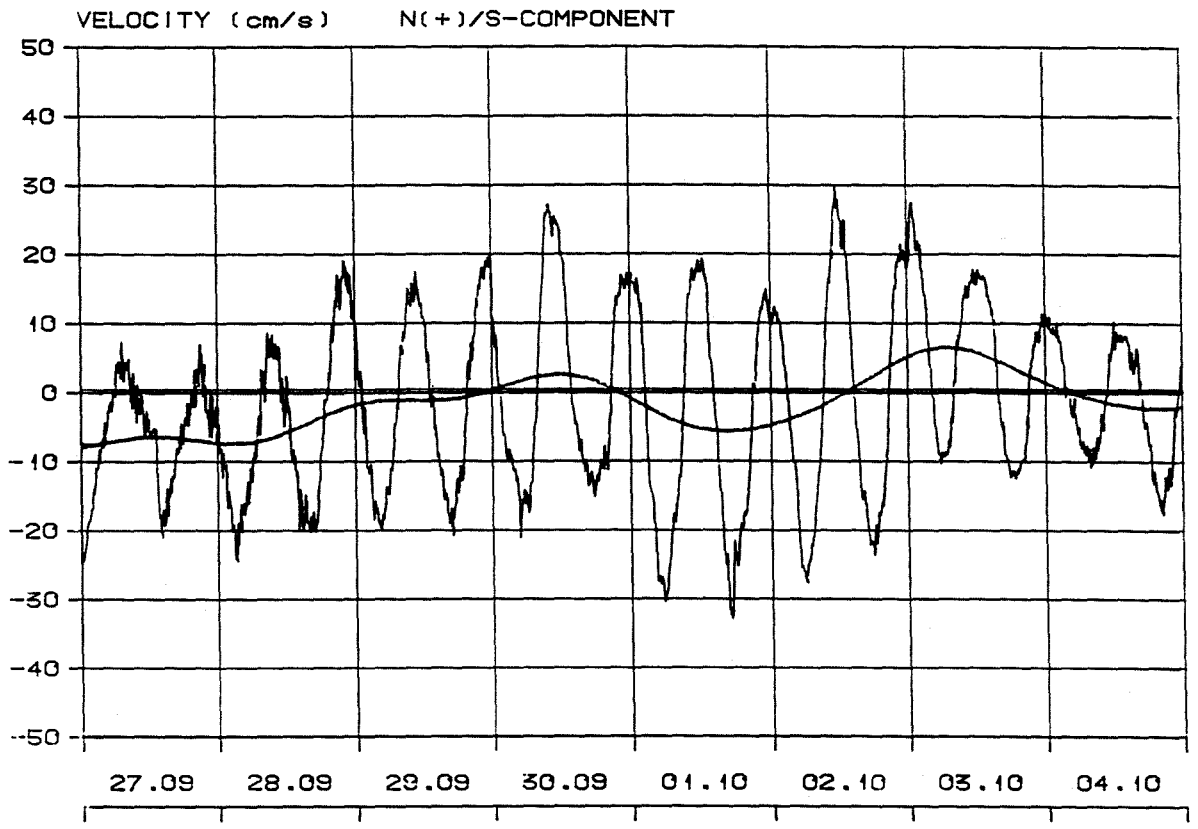
Time interval : 10.00 minutes.

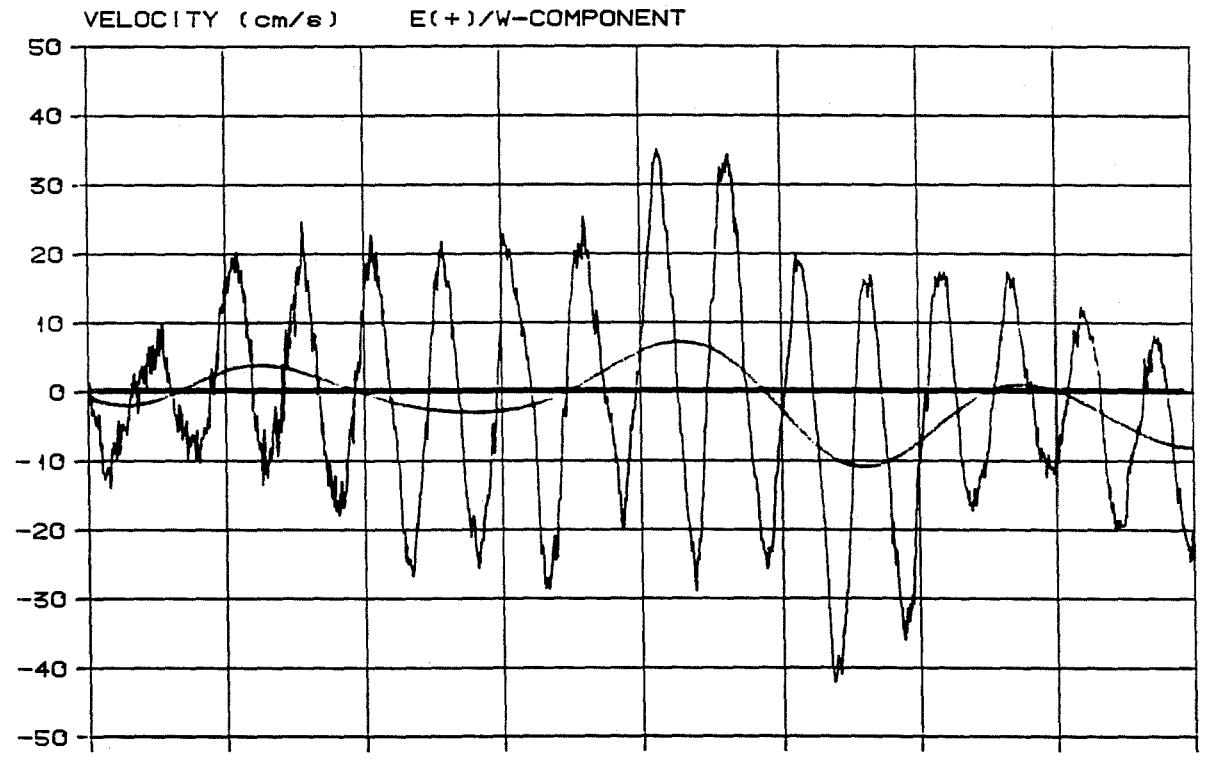
Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H 1

Fig. 2-1-6

Continues.....





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

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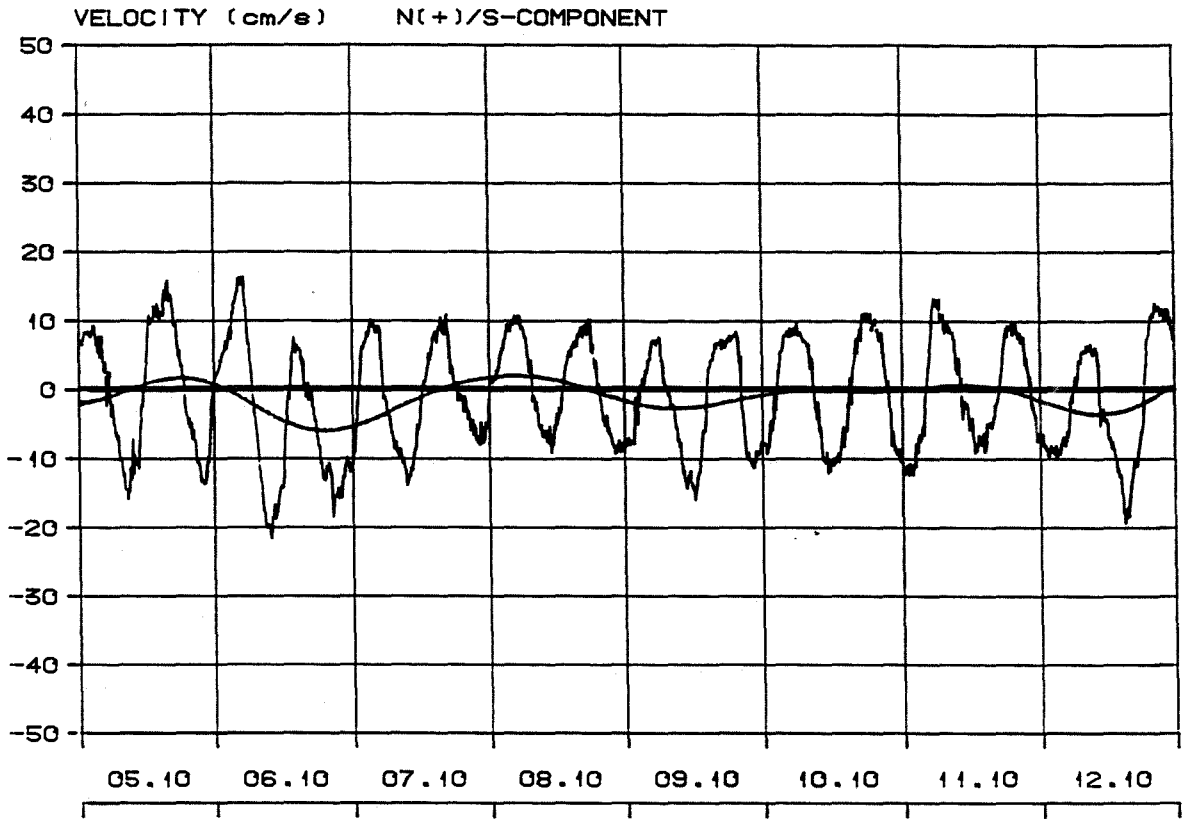
Time interval : 10.00 minutes.

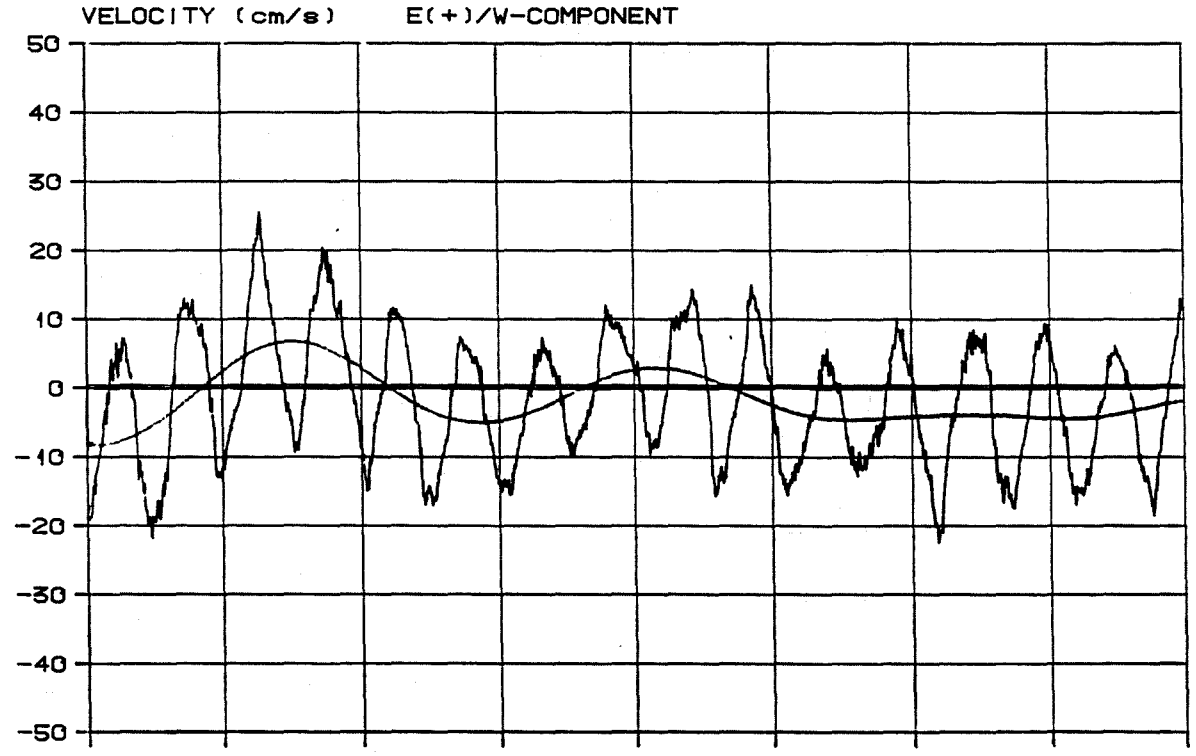
Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H 1

Fig. 2-1-6

Continues.....





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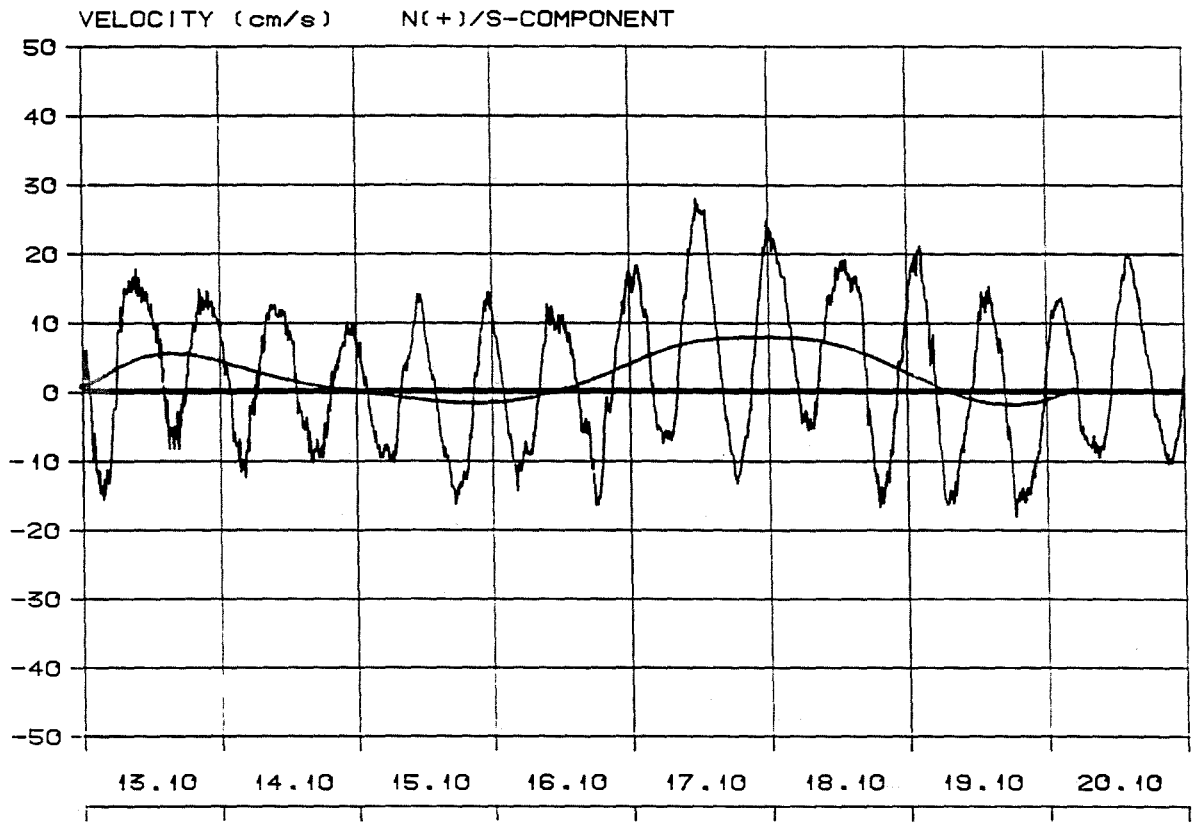
Time interval : 10.00 minutes.

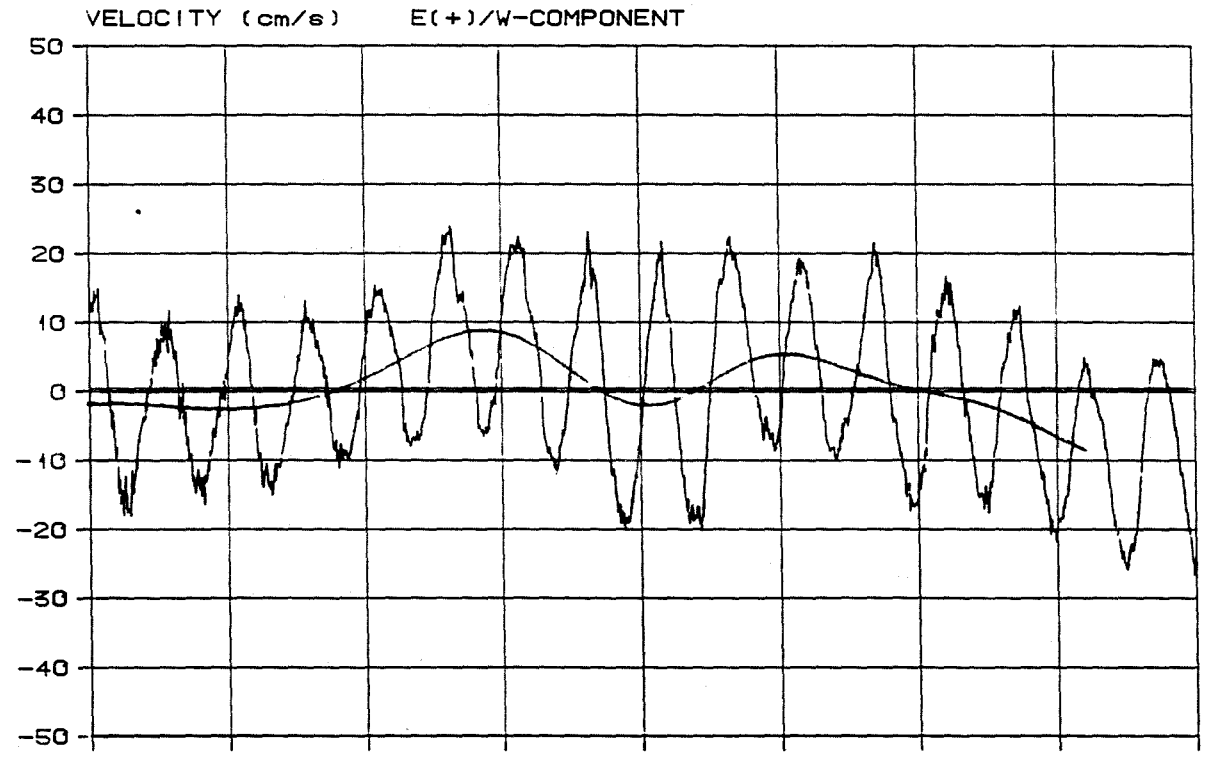
Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H 1

Fig. 2-1-6

Continues.....





The Barents Sea

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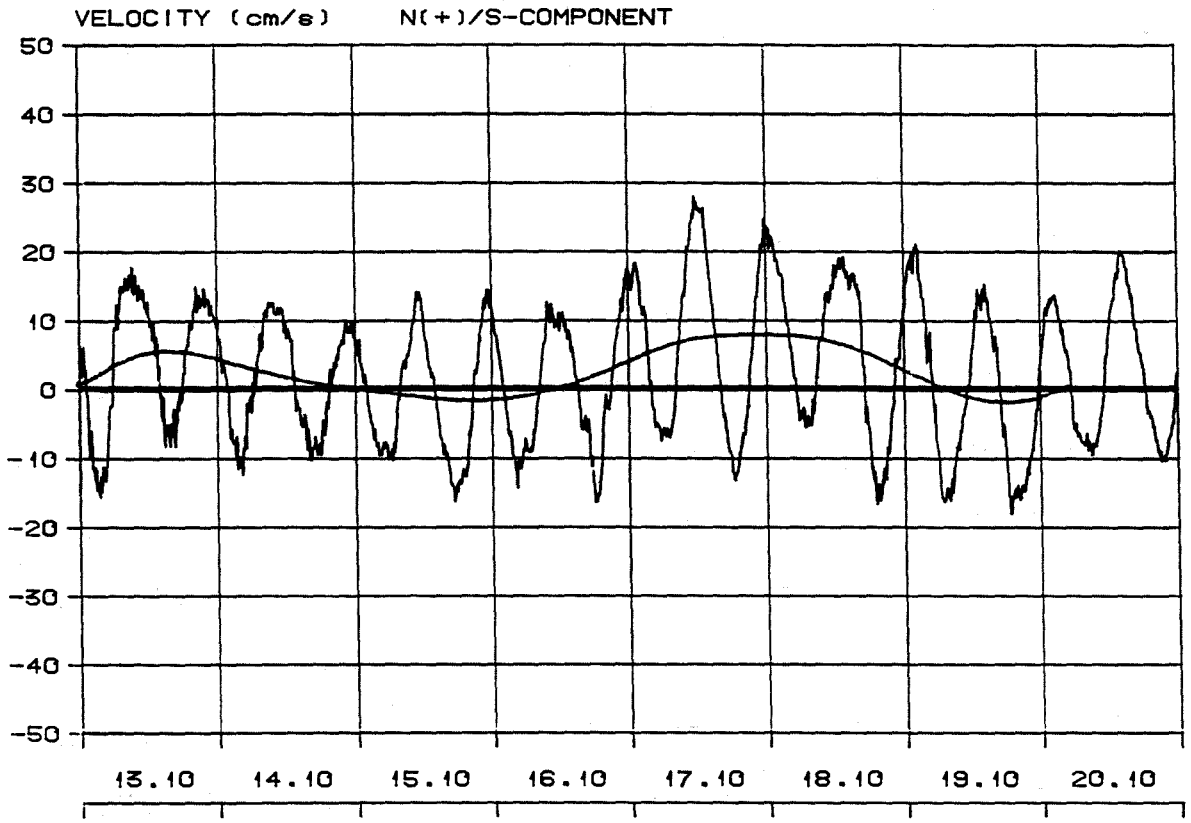
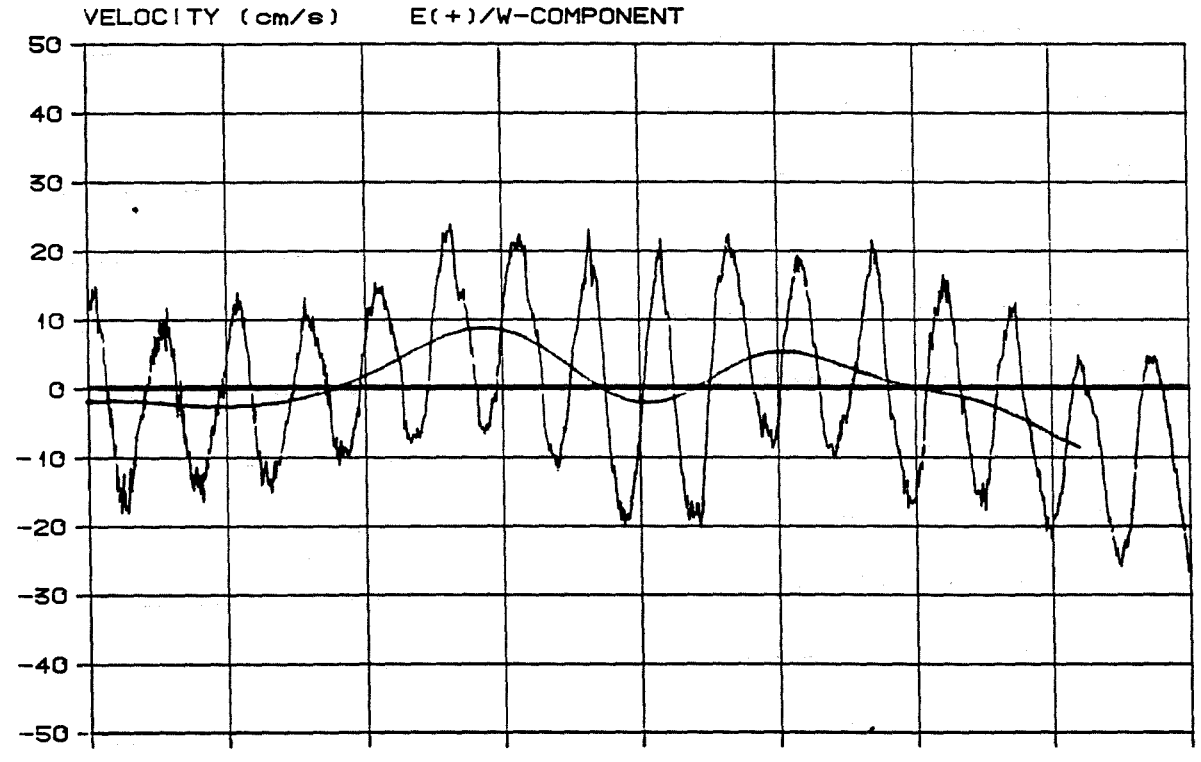
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

Fig. 2-1-6

Continues.....





The Barents Sea

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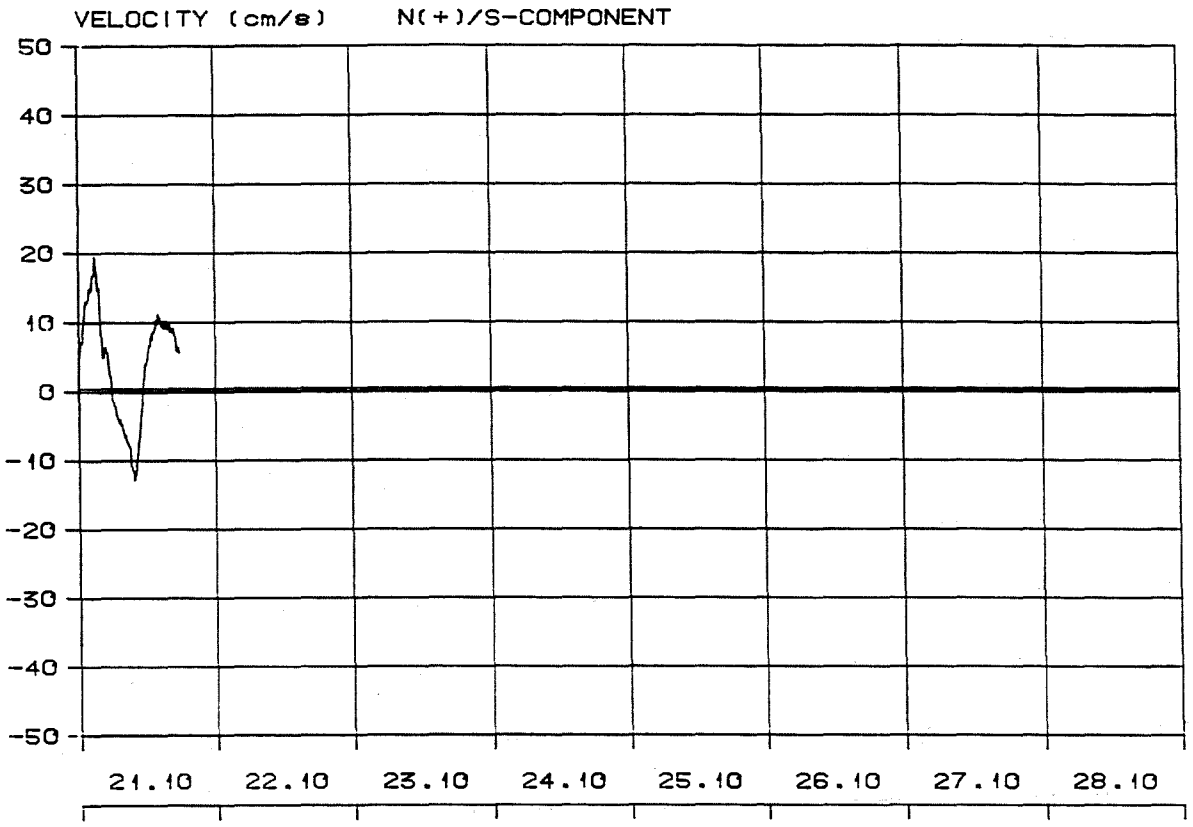
Time interval : 10.00 minutes.

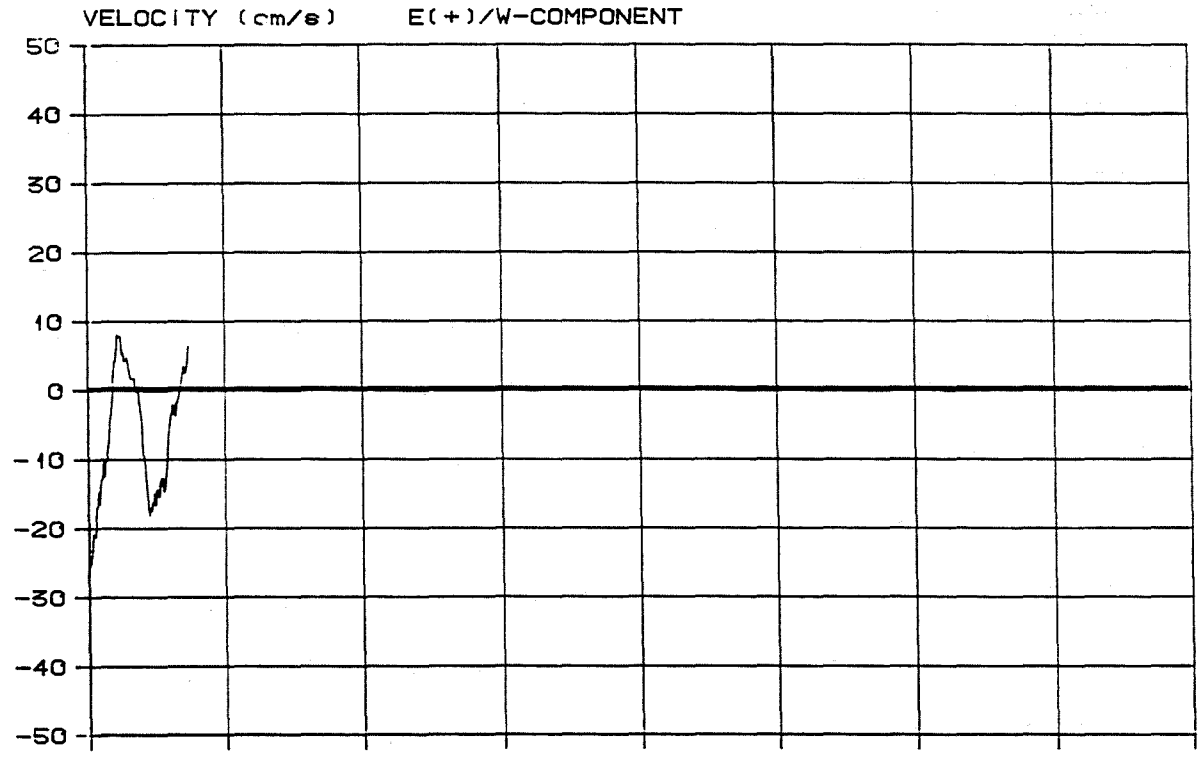
Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H 1

Fig. 2-1-6

Continues.....





The Barents Sea

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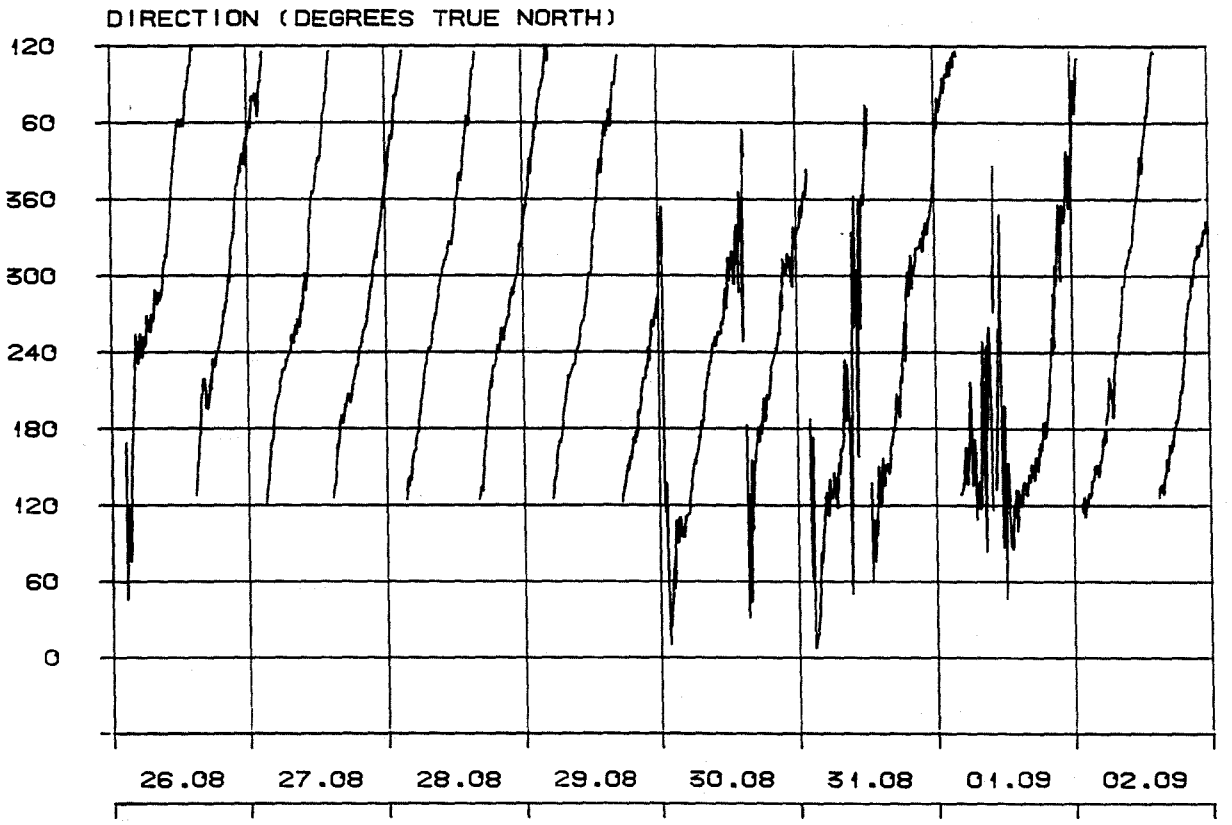
Time interval : 10.00 minutes.

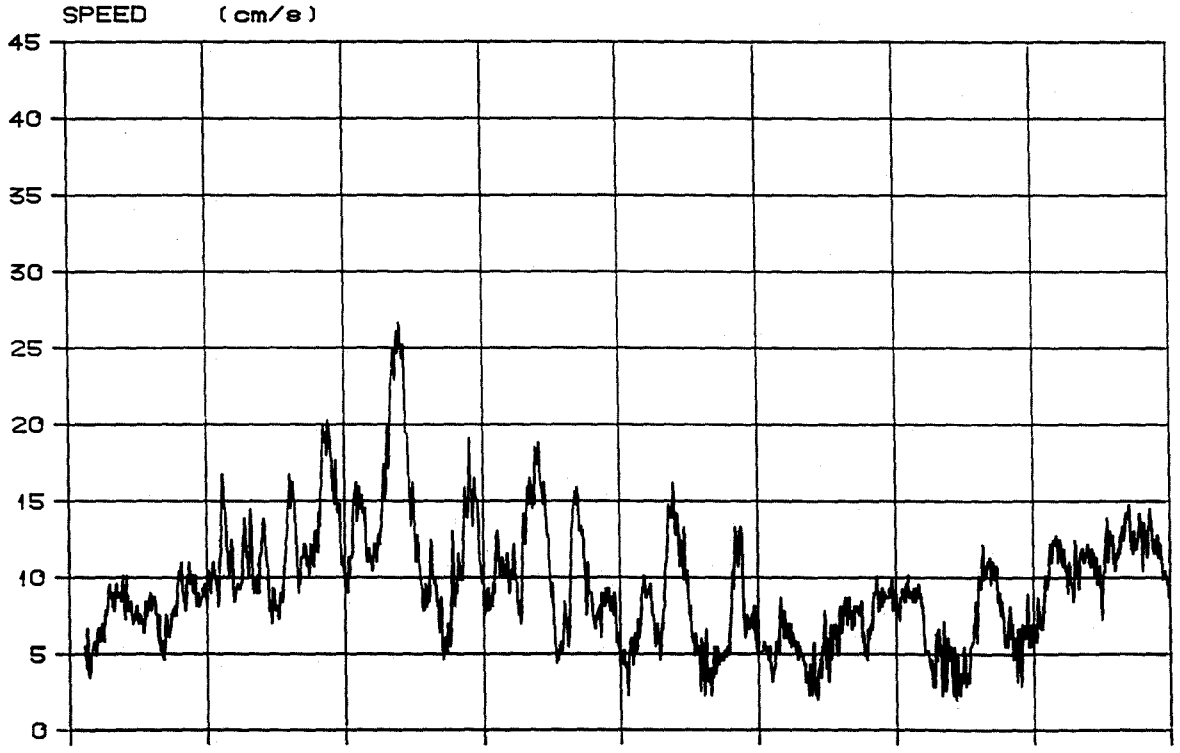
Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H 1

Fig. 2-1-6

Continues.....





The Barents Sea

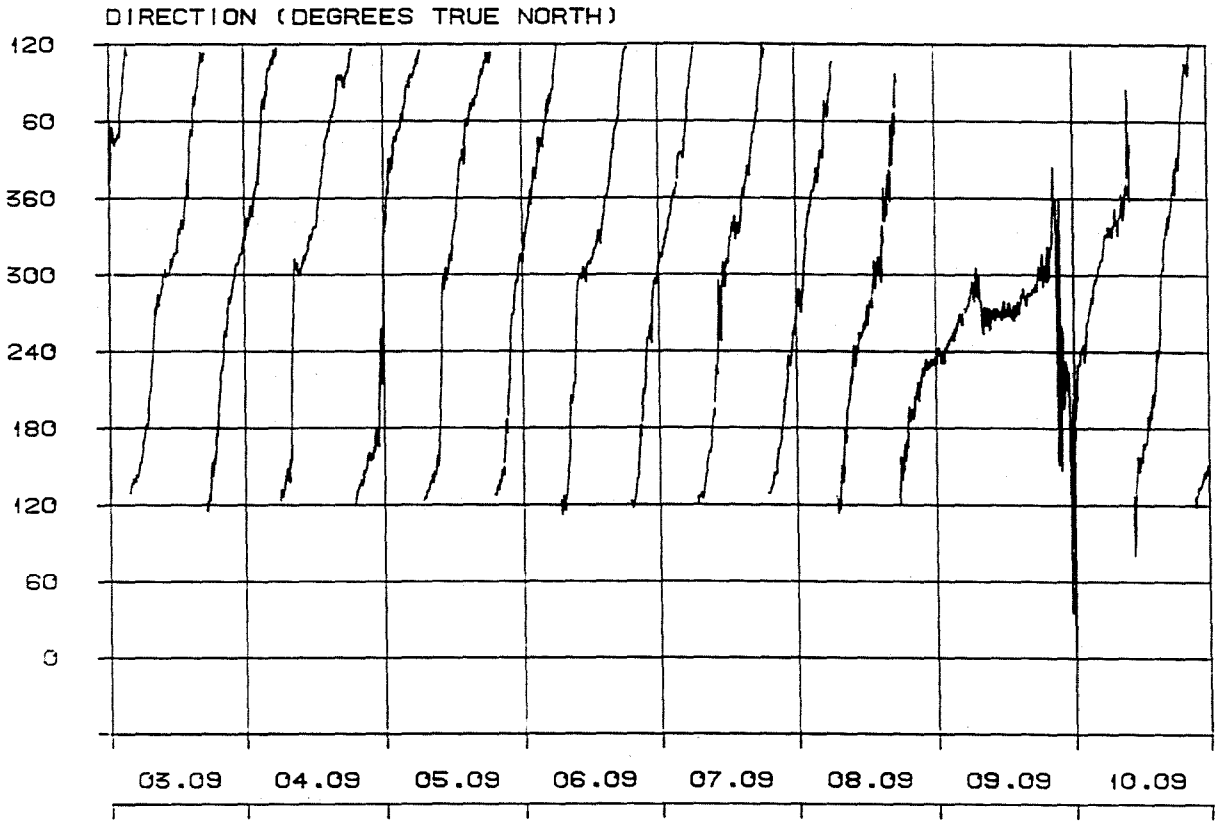
Position : N 74° 29.90' E 39° 57.90'

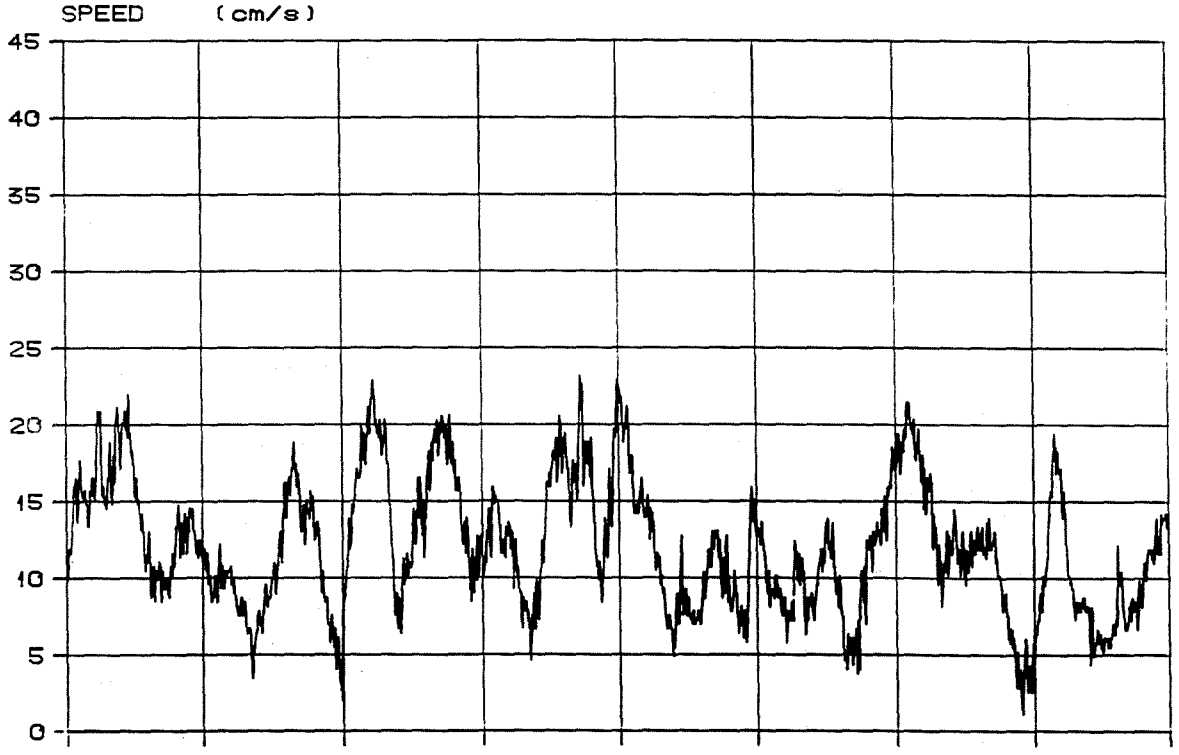
Instrument depth : 20.0 m Bottom depth : 186.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

Fig. 2-1-7 Speed and direction of current.





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

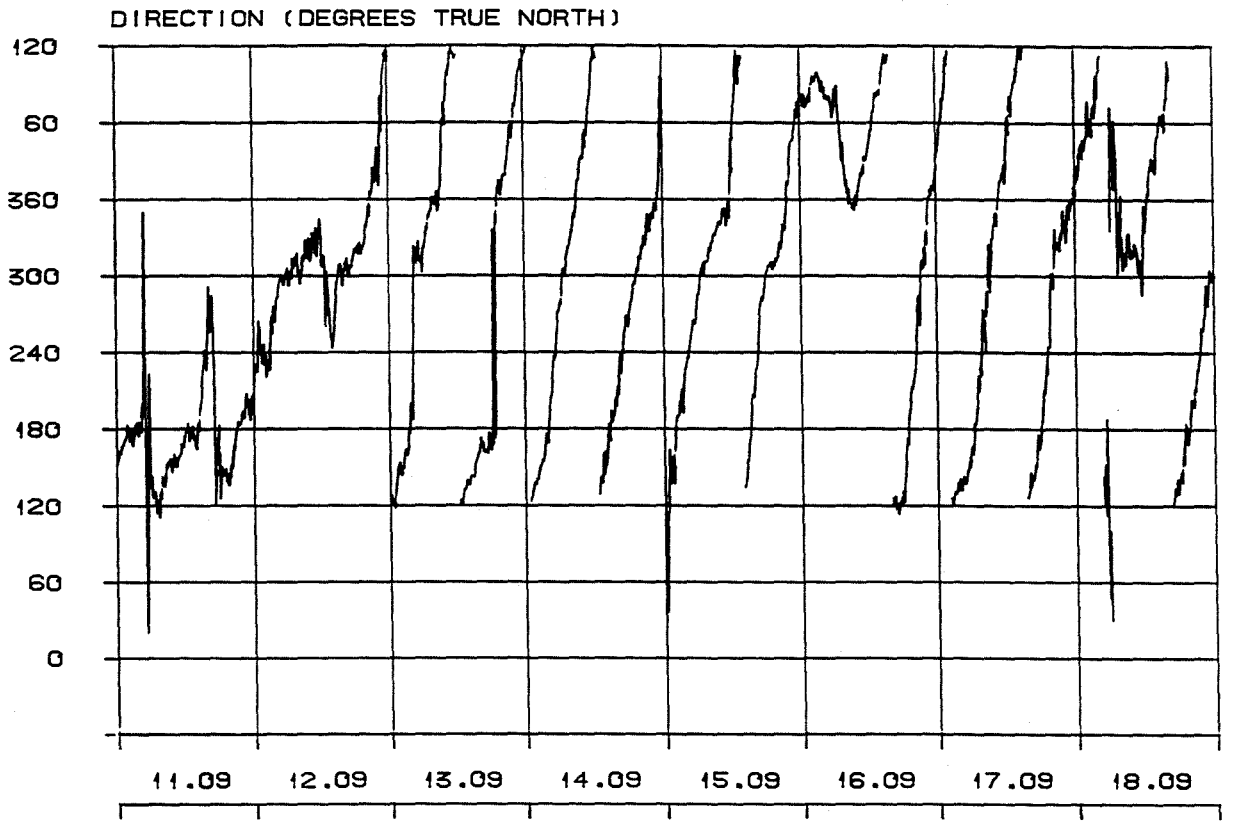
Instrument depth : 20.0 m Bottom depth : 186.0 m

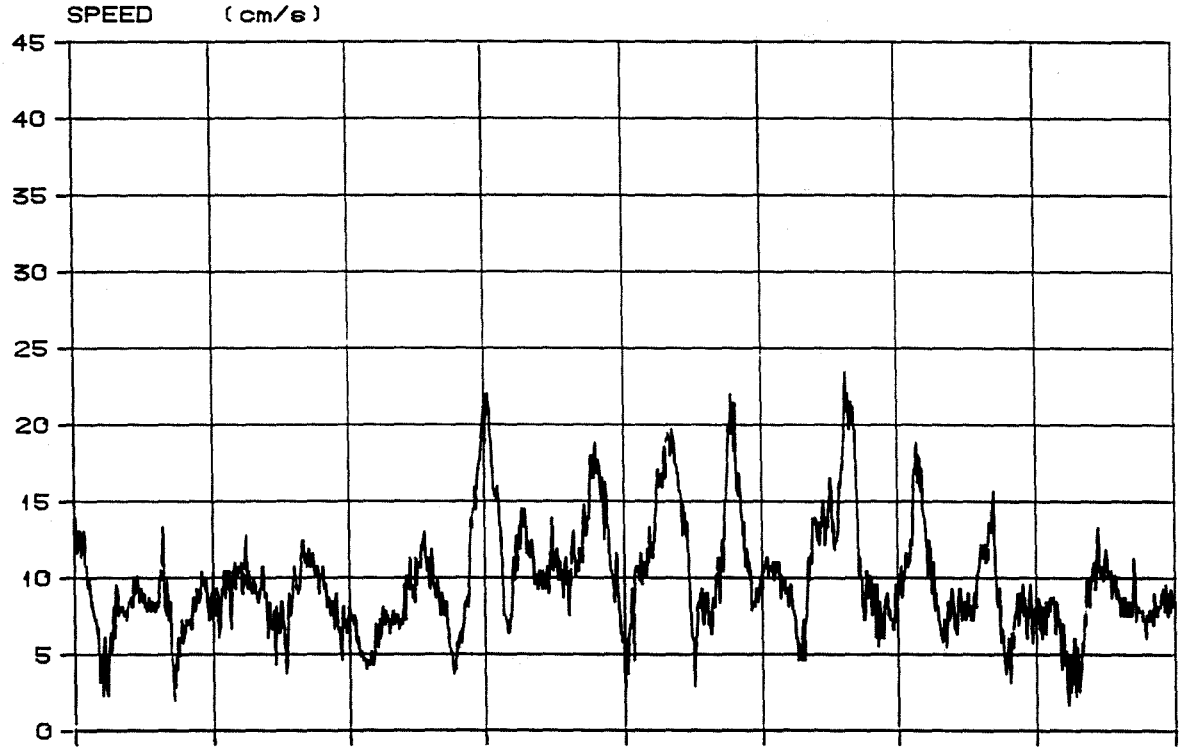
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

Fig. 2-1-7

Continues.....





The Barents Sea

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Instrument depth : 20.0 m Bottom depth : 186.0 m

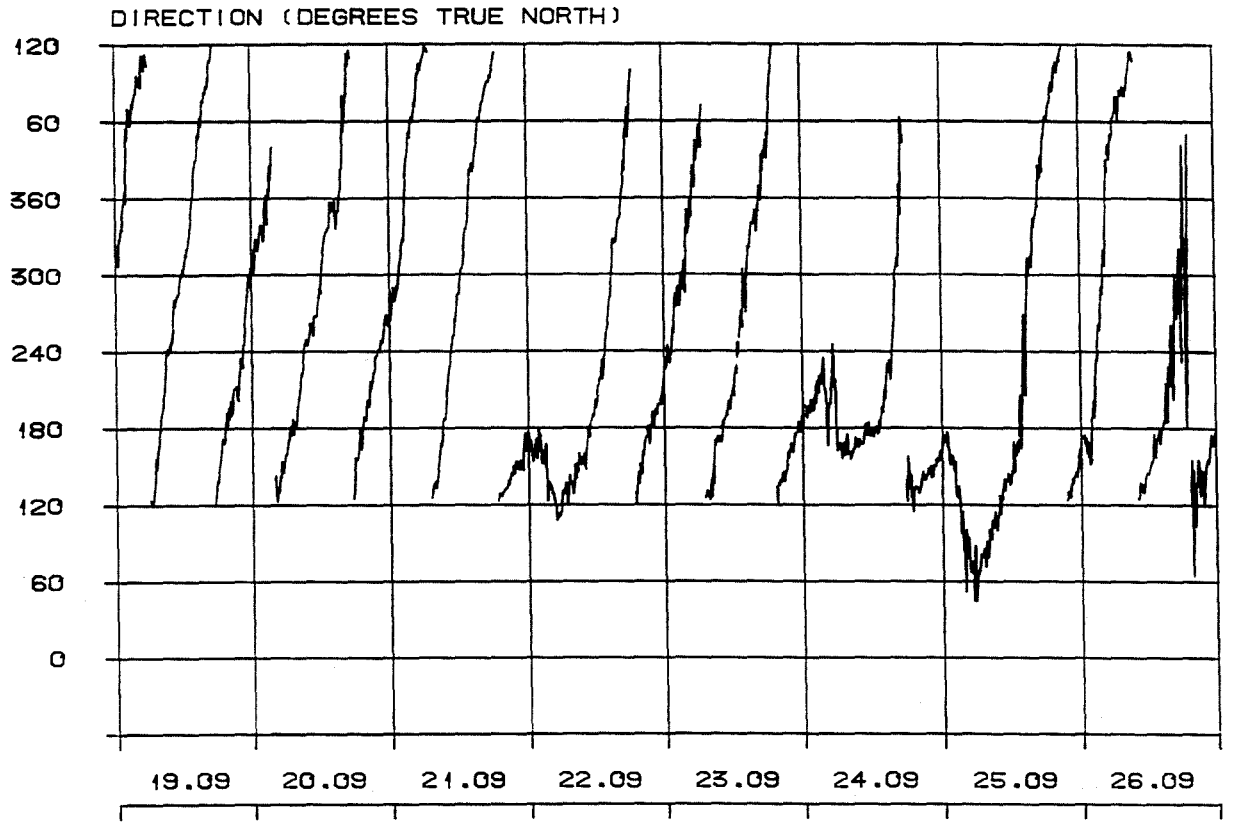
Time interval : 10.00 minutes.

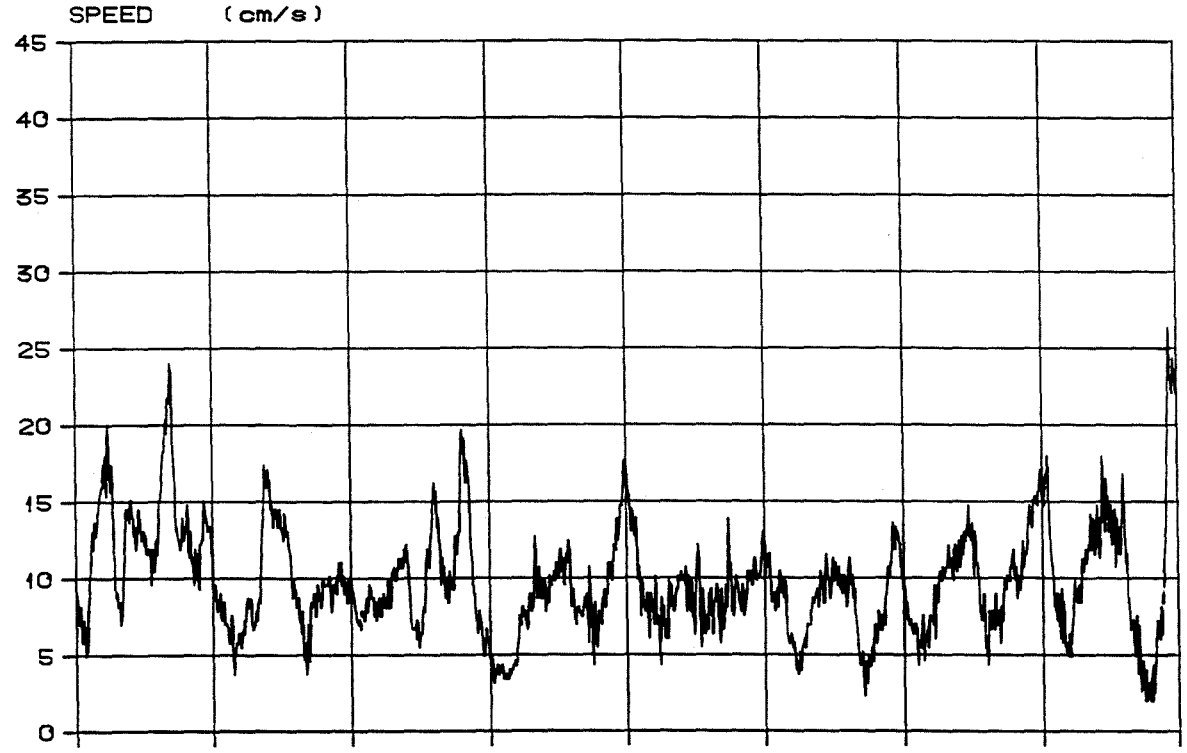
Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H 1

Fig. 2-1-7

Continues.....





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 20.0 m Bottom depth : 186.0 m

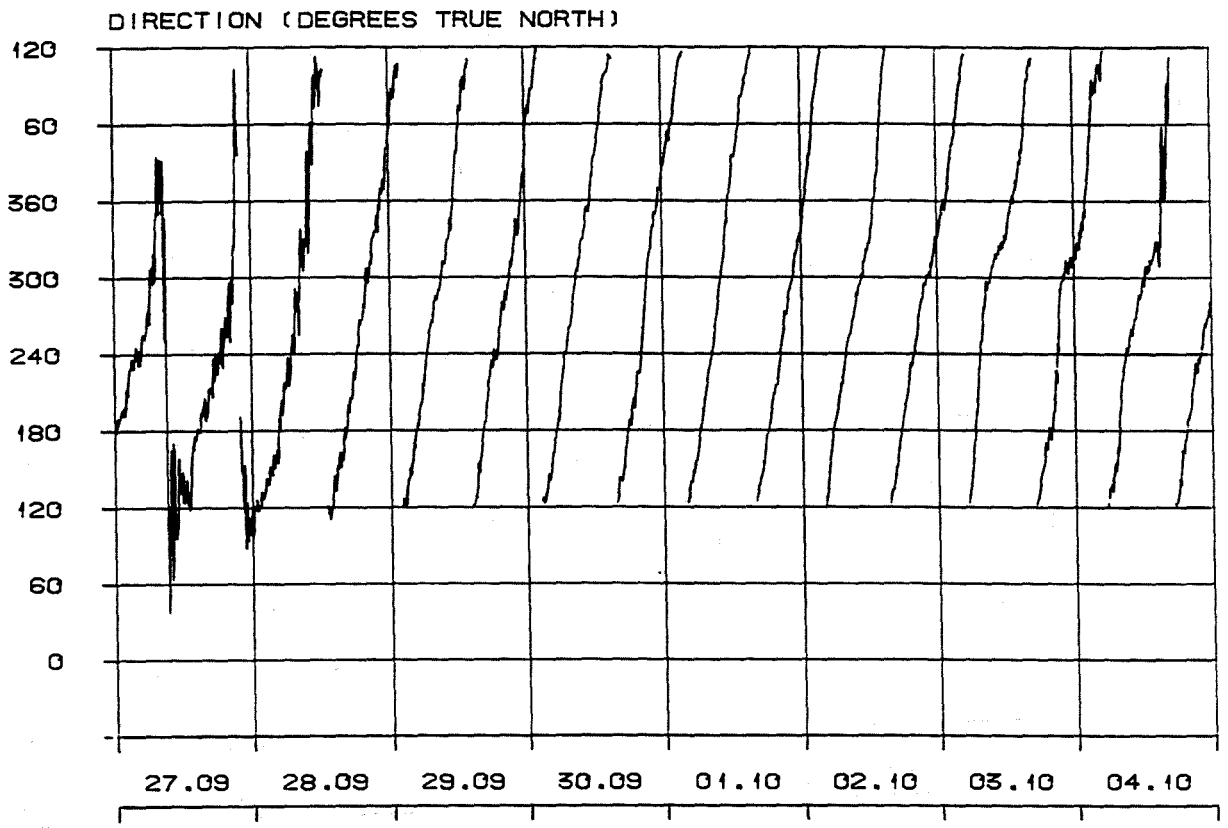
Time interval : 10.00 minutes.

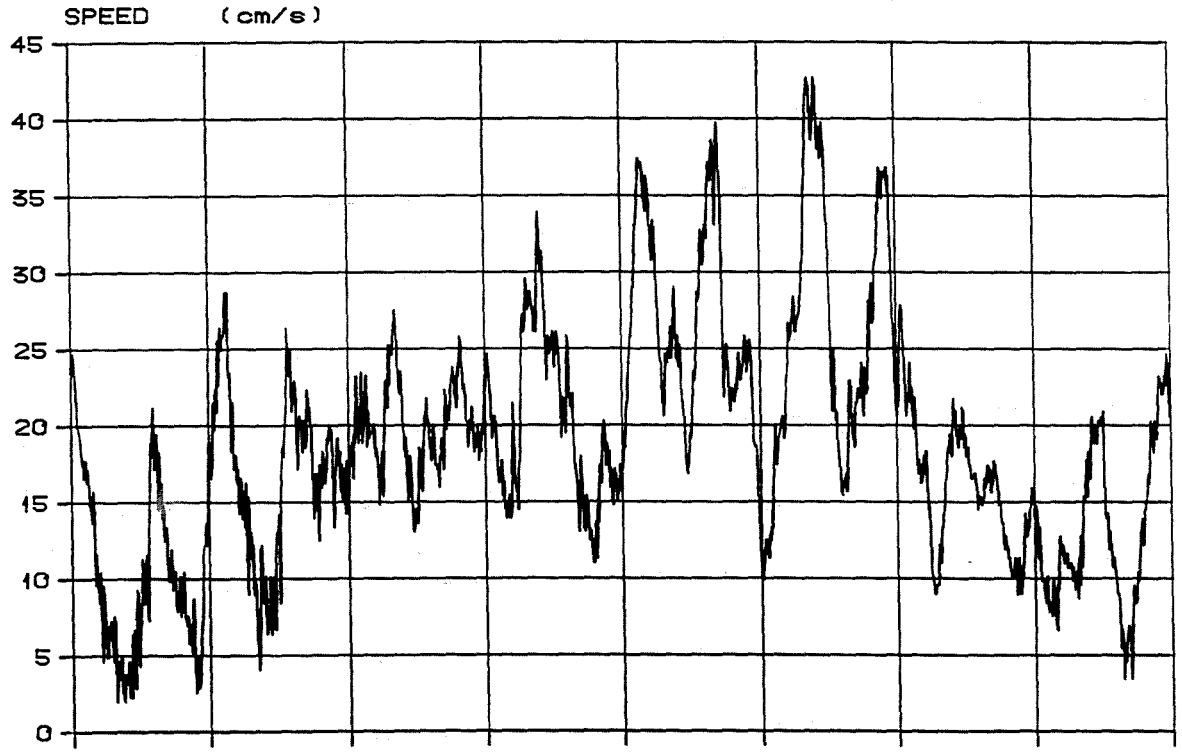
Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H I

Fig. 2-1-7

Continues.....





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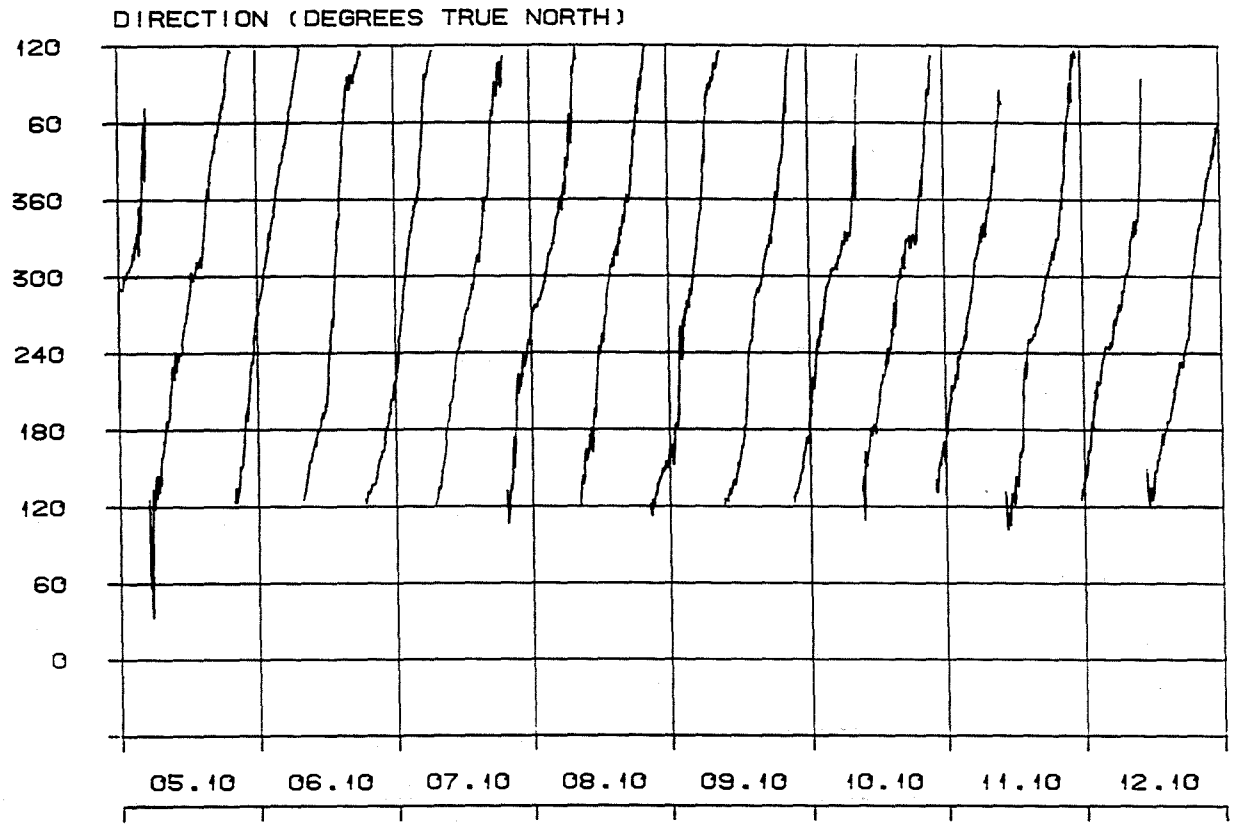
Time interval : 10.00 minutes.

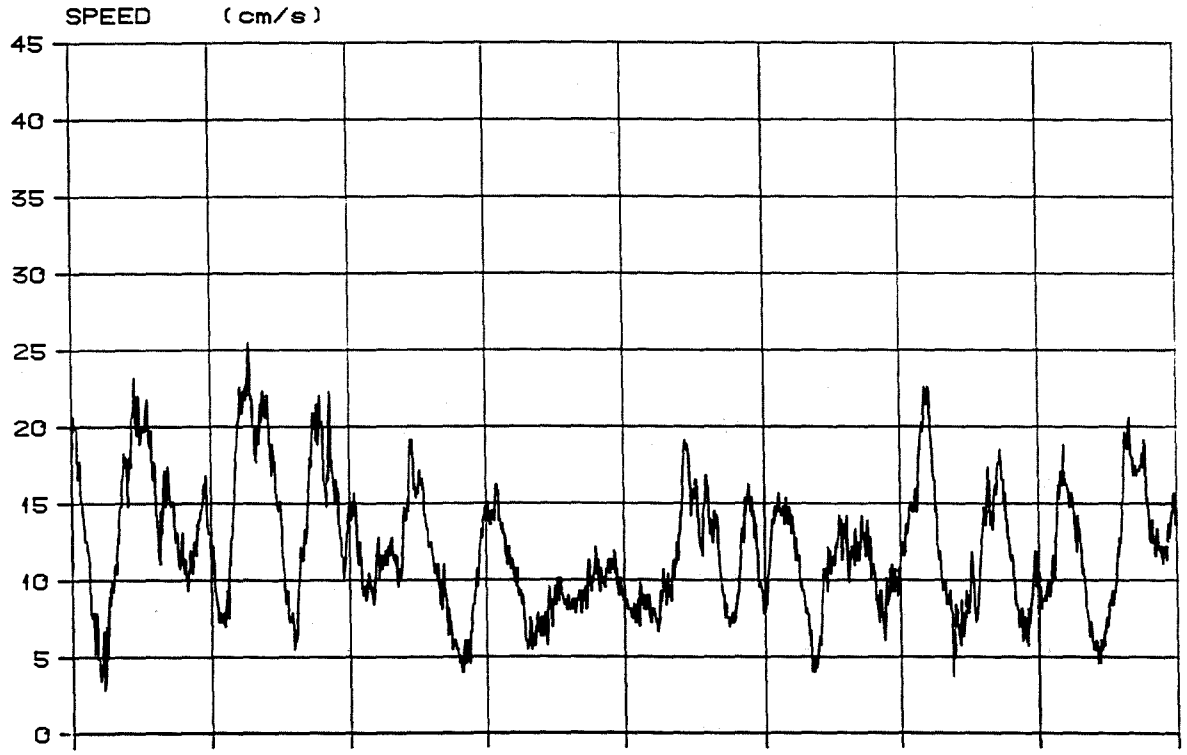
Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H 1

Fig. 2-1-7

Continues.....





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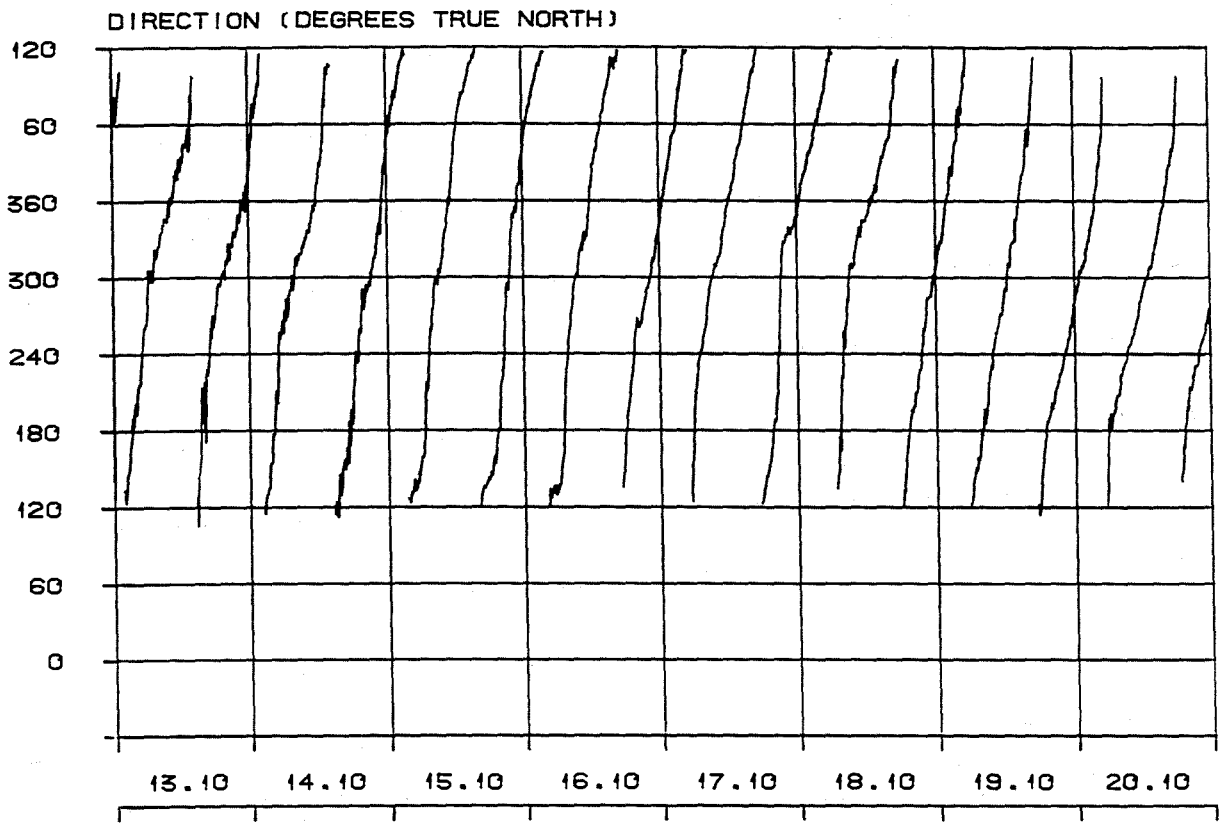
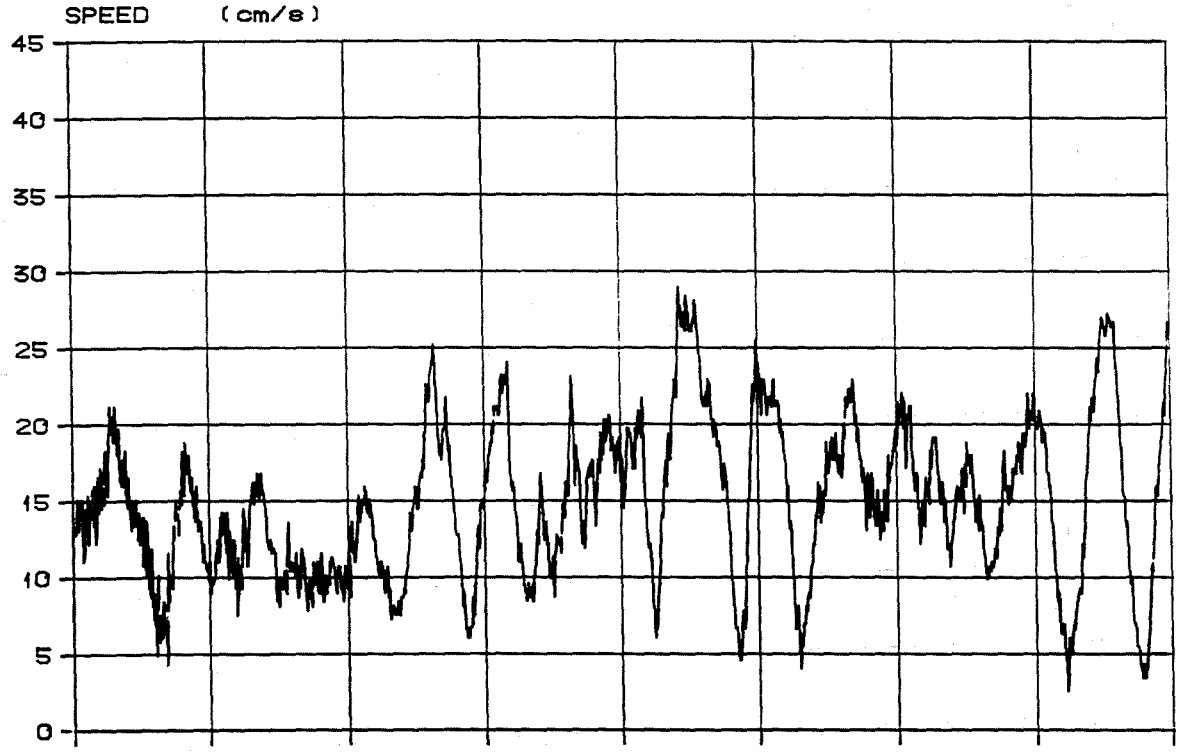
H 1

Fig. 2-1-7

Continues.....





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

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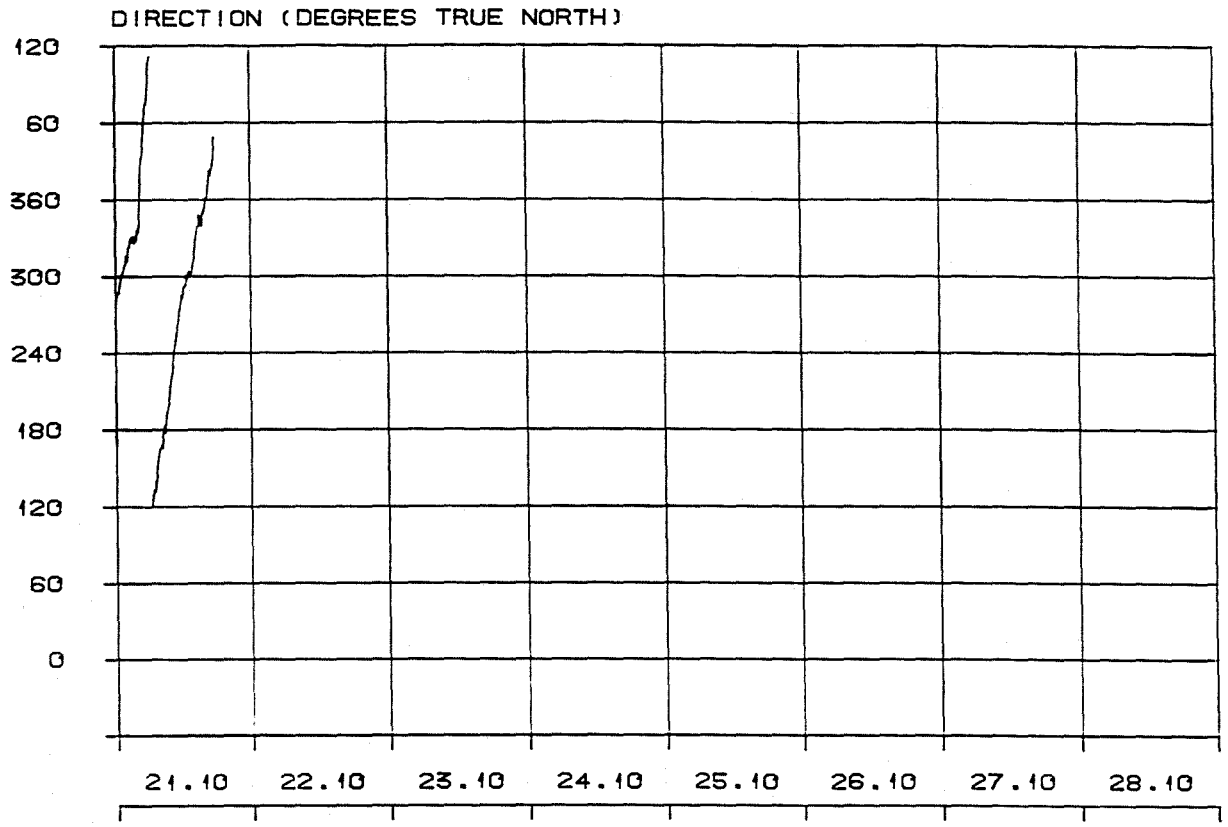
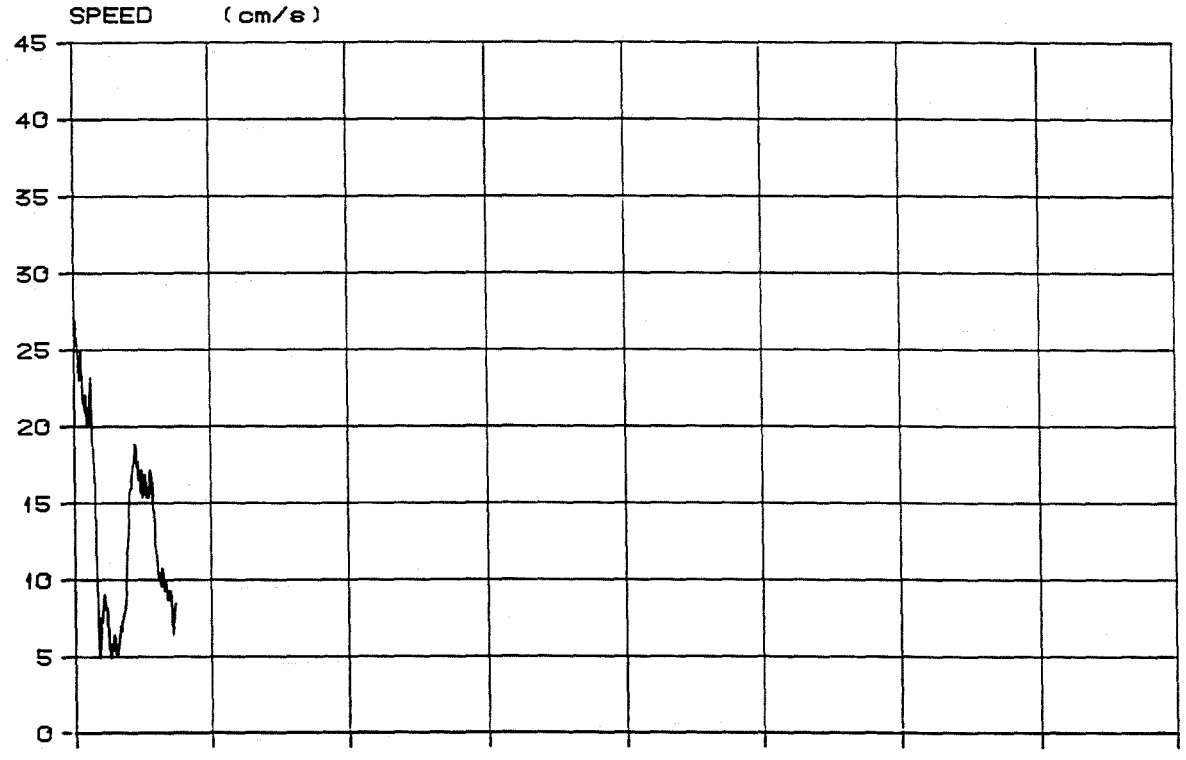
Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H 1

Fig. 2-1-7

Continues.....





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 20.0 m Bottom depth : 186.0 m

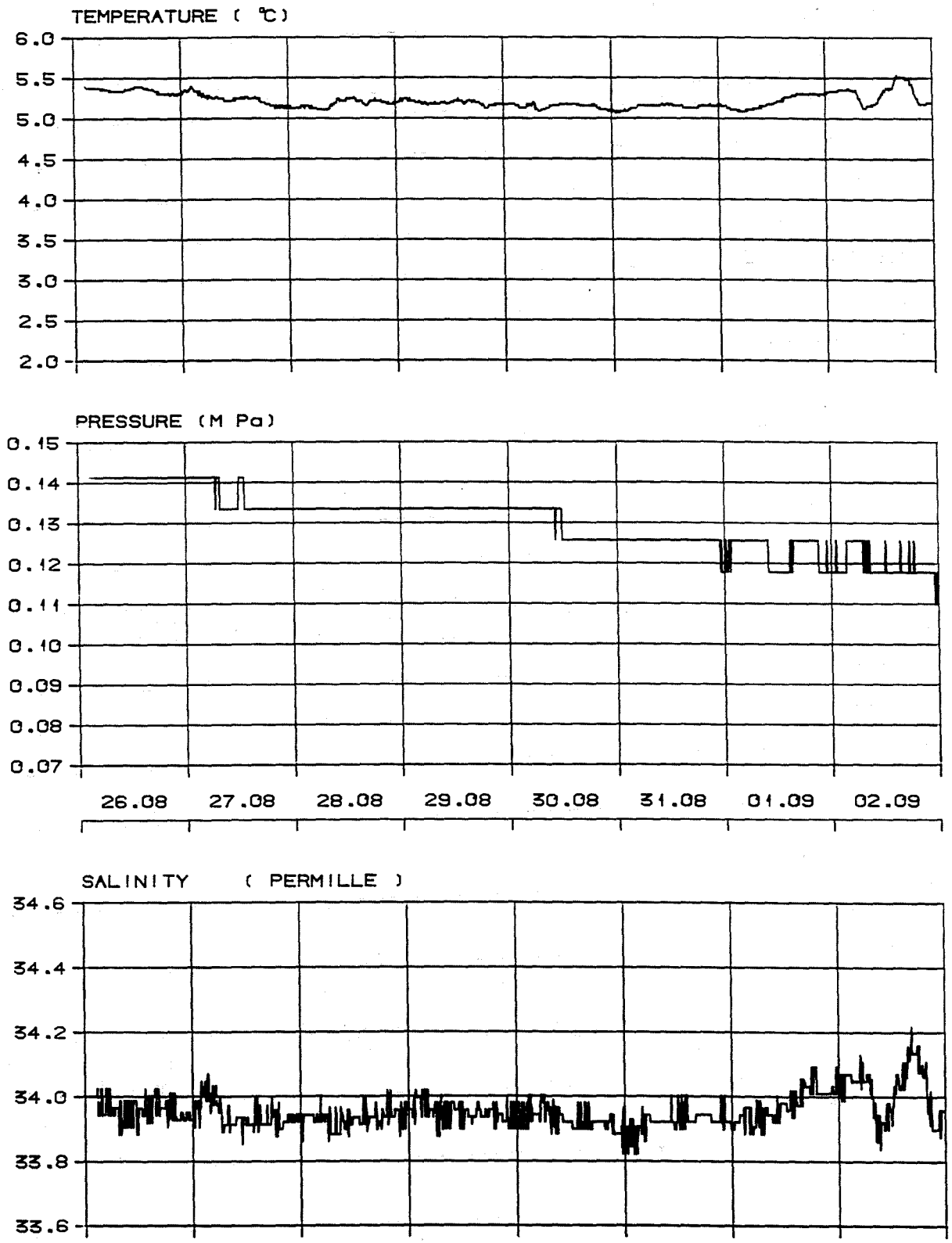
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H I

Fig. 2-1-7

Continues.....



The Barents Sea

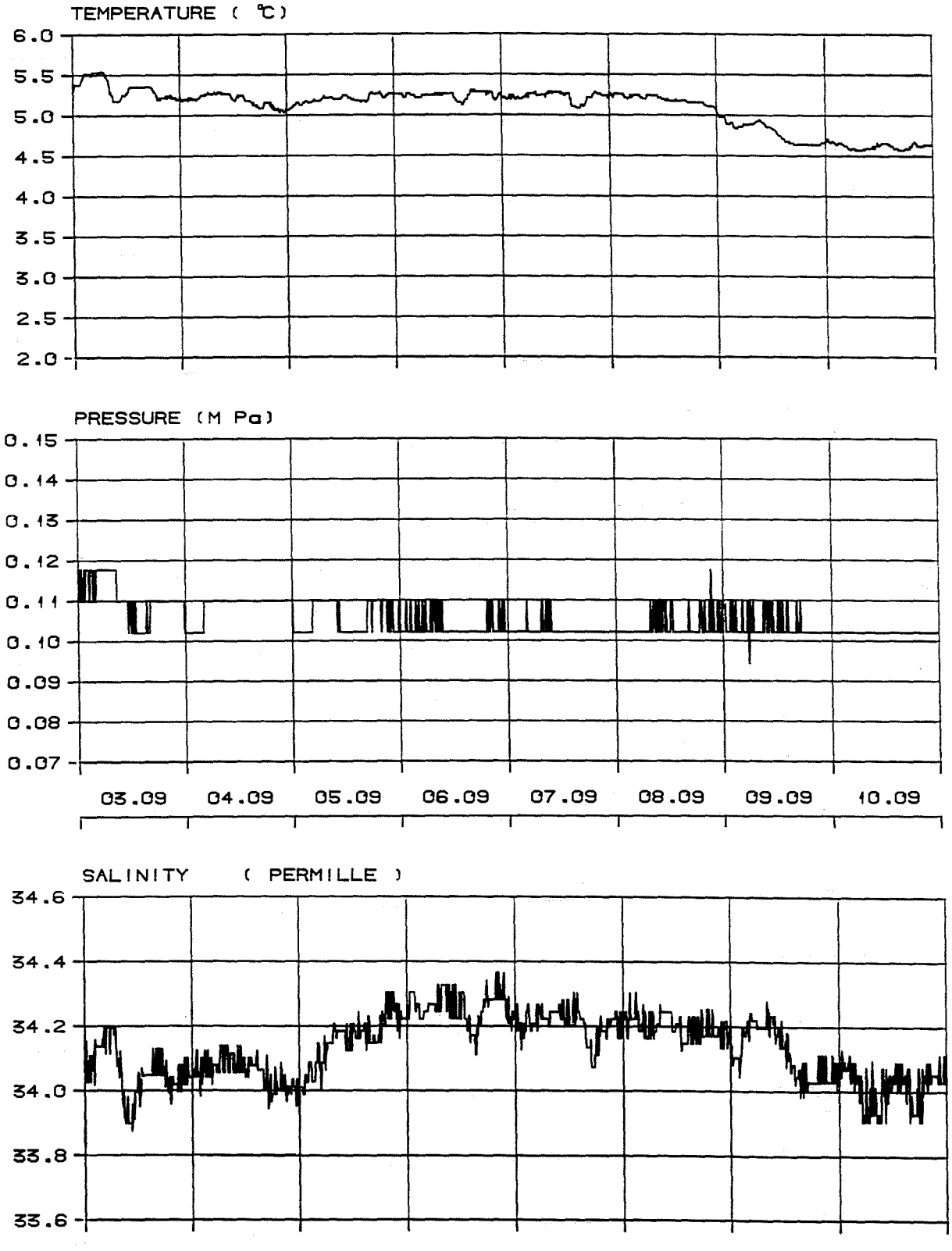
Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 20.0 m Bottom depth : 186.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

Fig. 2-1-8 Temperature, pressure and salinity.



The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 20.0 m Bottom depth : 186.0 m

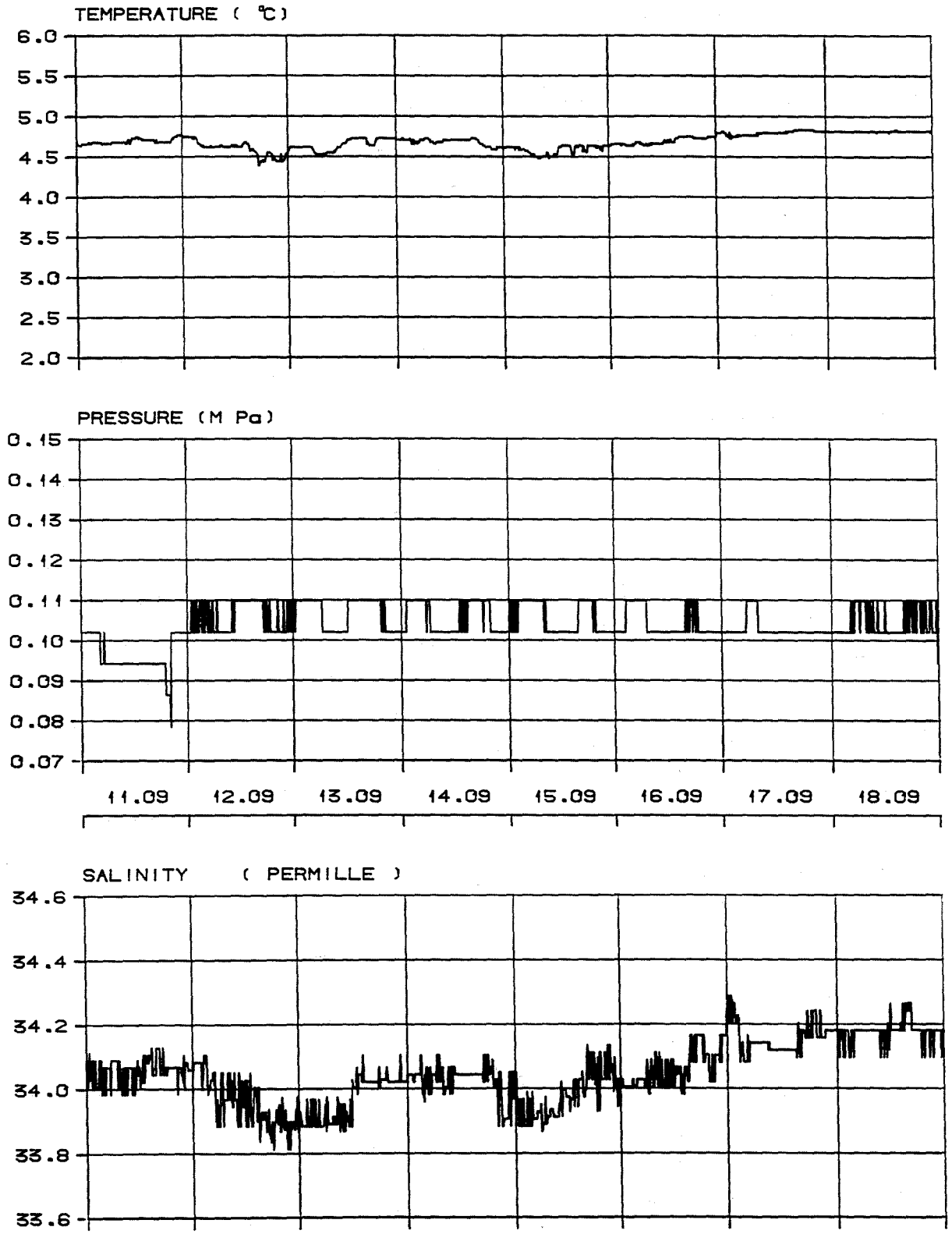
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H 1

Fig. 2-1-8

Continues.....



The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 20.0 m Bottom depth : 186.0 m

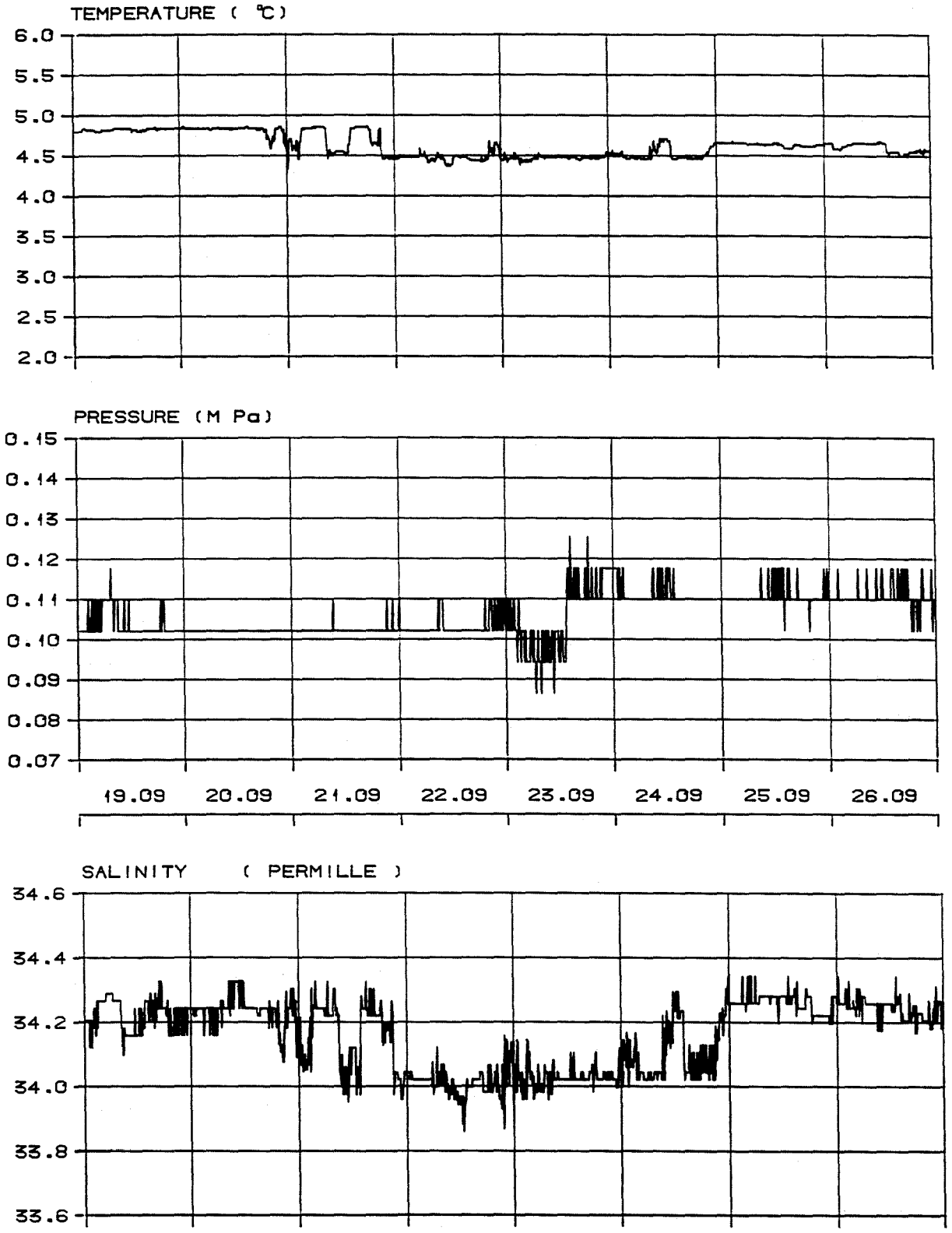
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H 1

Fig. 2-1-8

Continues.....



The Barents Sea

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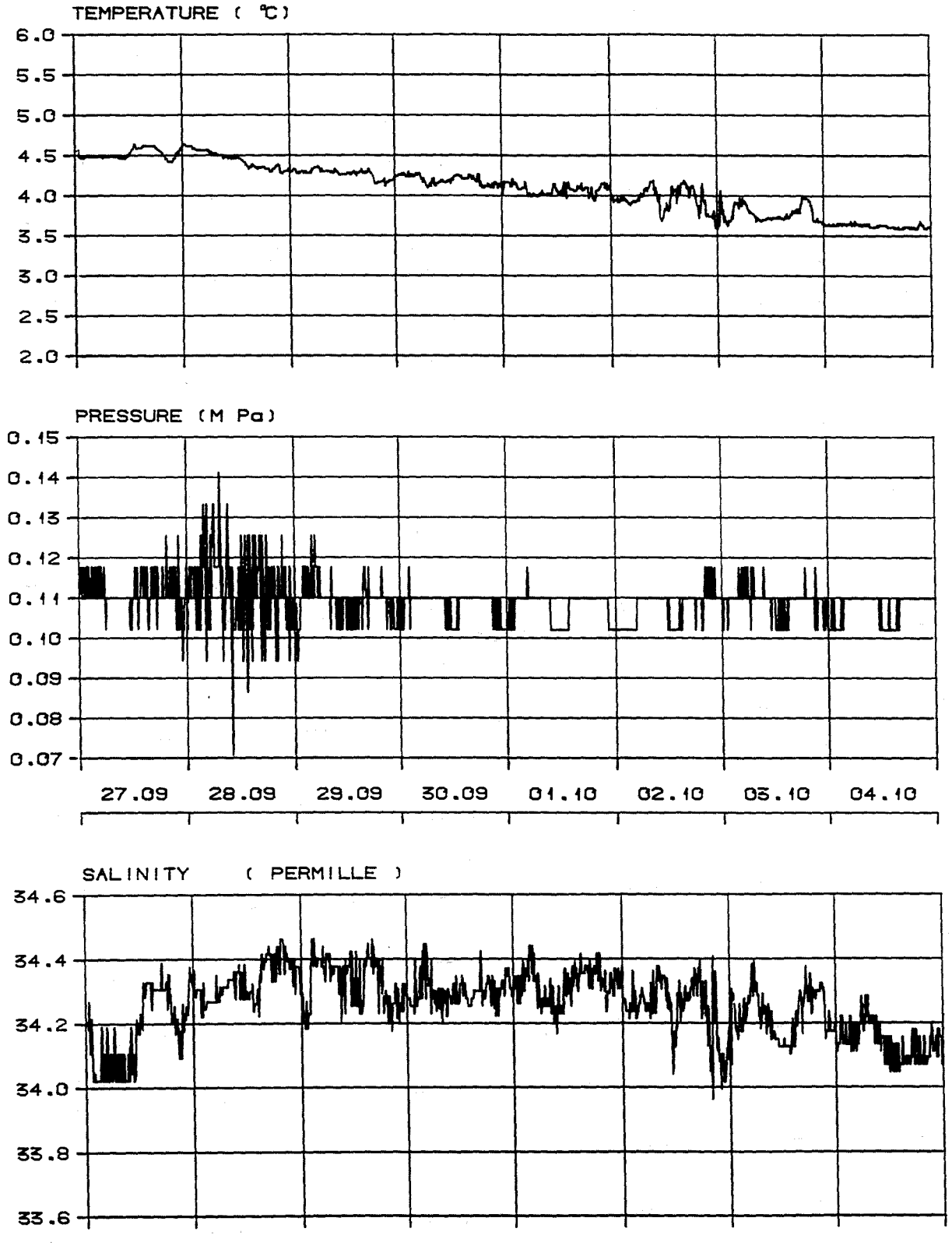
Instrument depth : 20.0 m Bottom depth : 186.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

Fig. 2-1-8

Continues.....



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Instrument depth : 20.0 m Bottom depth : 186.0 m

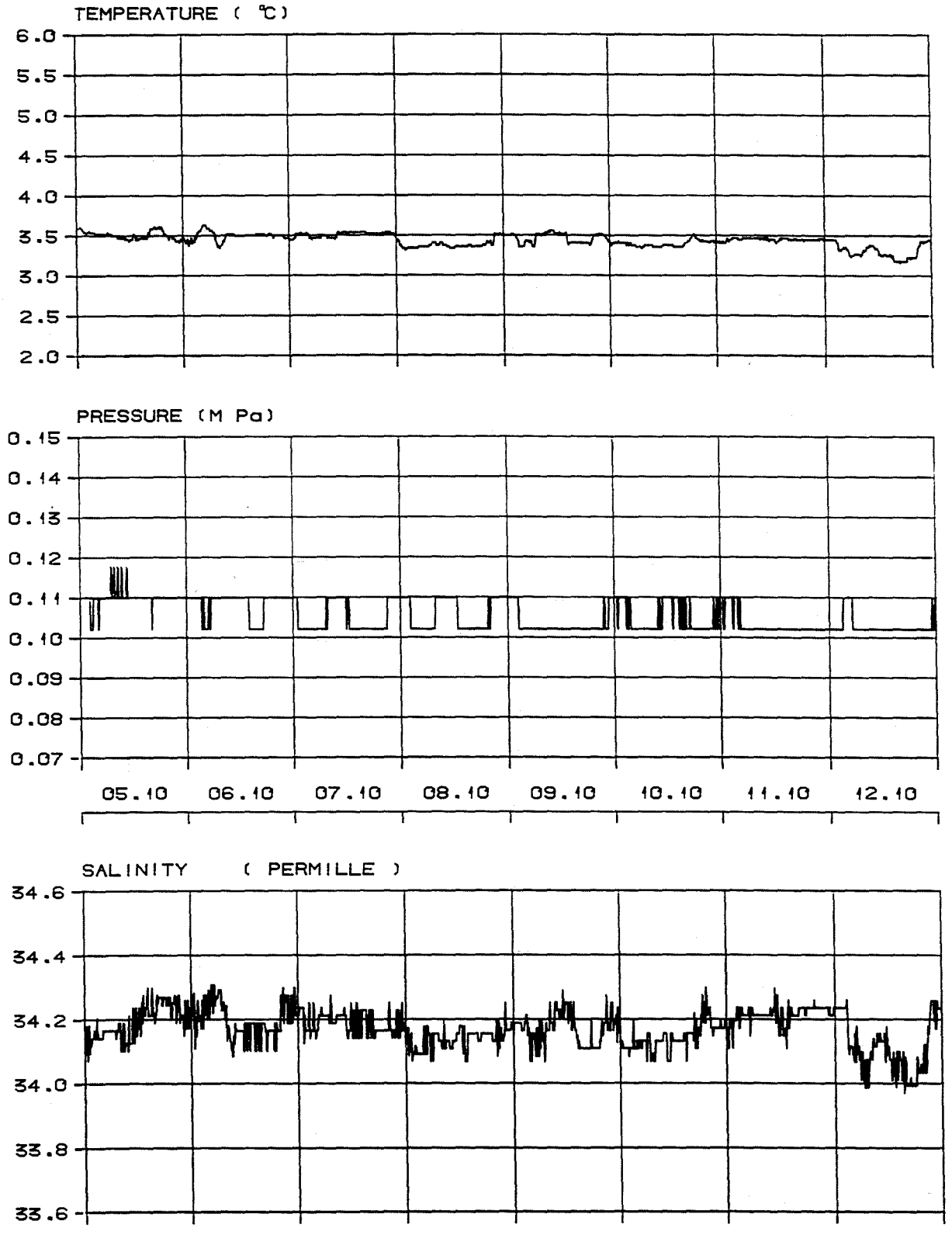
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H 1

Fig. 2-1-8

Continues.....



The Barents Sea

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Instrument depth : 20.0 m Bottom depth : 186.0 m

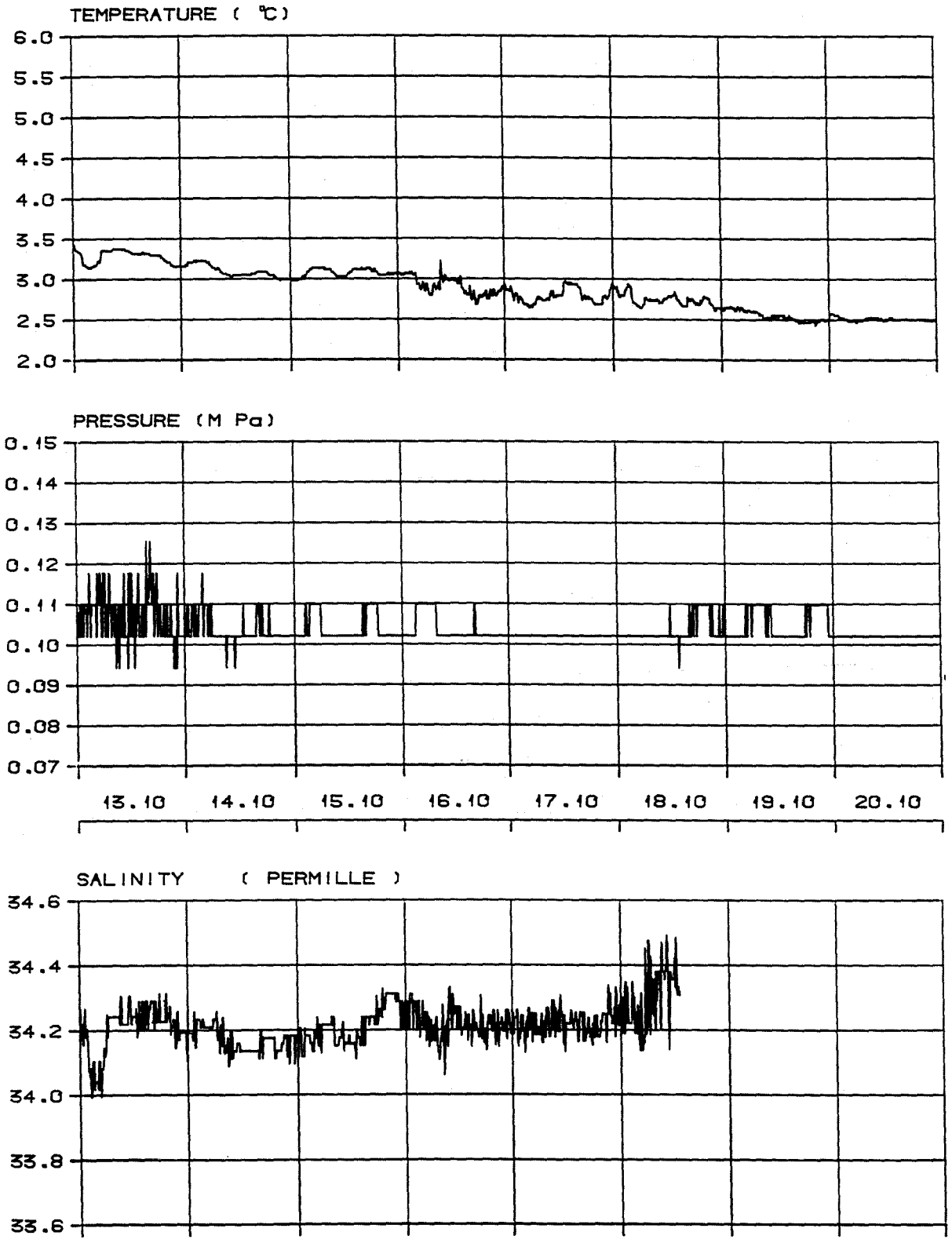
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H I

Fig. 2-1-8

Continues.....



The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

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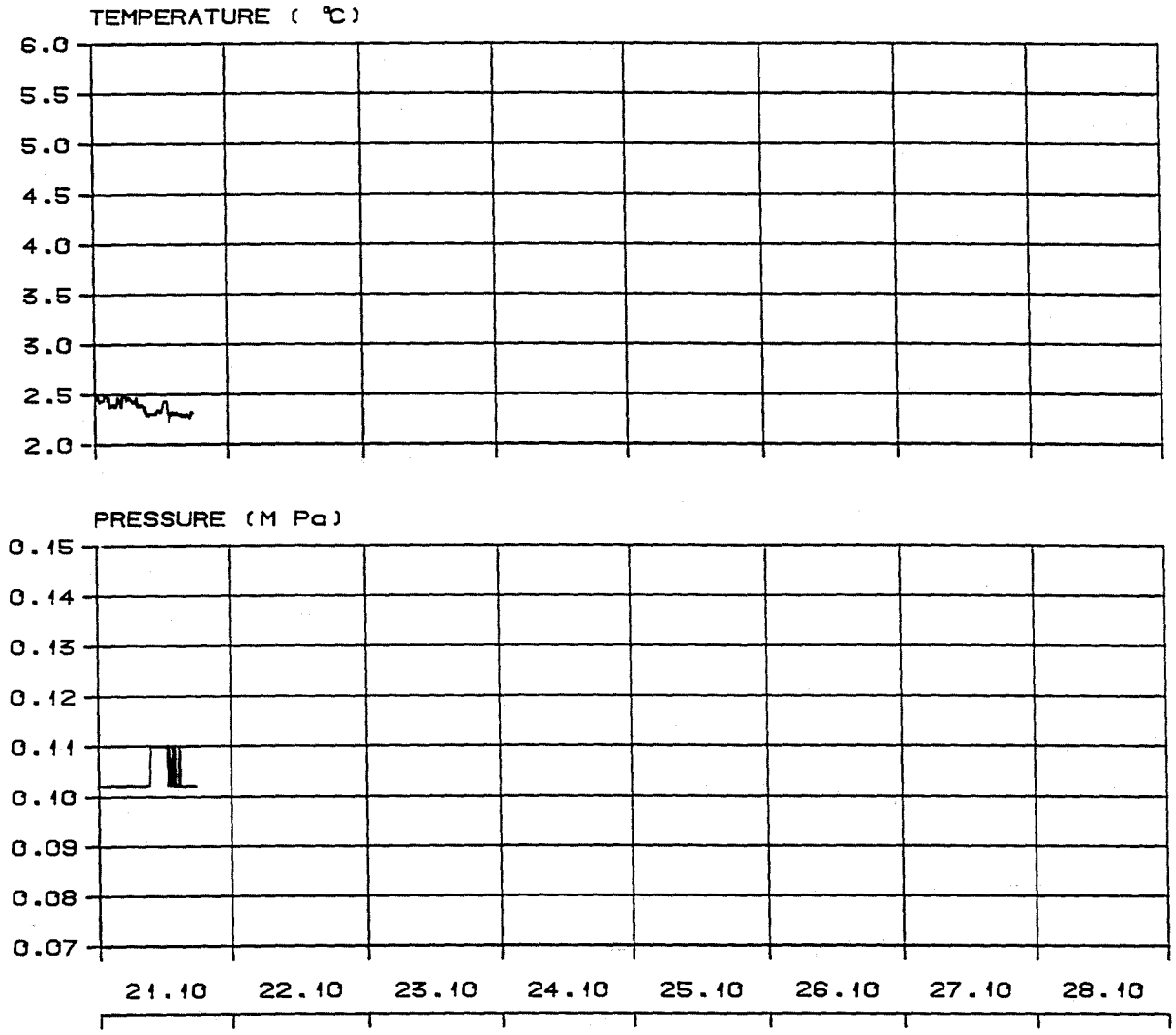
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H 1

Fig. 2-1-8

Continues.....



The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 20.0 m Bottom depth : 186.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H 1

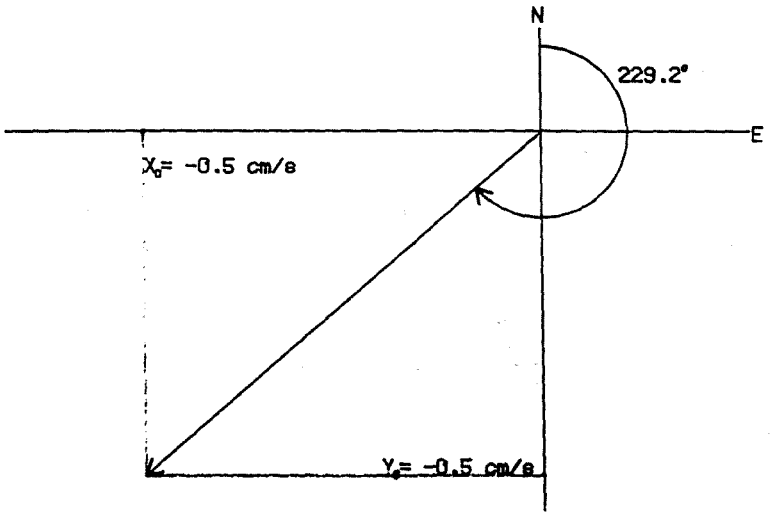
Fig. 2-1-8

Continues.....

HARMONIC ANALYSIS OF CURRENTS

CONSTITUENTS			DECOMPOSED CURRENT				TIDAL CURRENT ELLIPSE				
			E/W		N/S						
Symbol	Period houres	Frequense °/hour	X_j cm/s	g_{xj} °	Y_j cm/s	g_{yj} °	Major axis A_j cm/s	Minor axis B_j cm/s	θ_j °	g_j °	BETA. °
MM	661.31	0.5	0.6	79.9	1.5	318.6	1.5	-0.5	166.2	133.8	59.8
MSF	354.37	1.0	1.2	33.9	1.9	69.9	2.2	0.6	208.8	241.1	46.8
EPS2	13.13	27.4	1.0	190.1	0.8	106.8	1.0	-0.8	75.7	178.7	154.6
MU2	12.87	28.0	1.4	323.2	1.4	221.3	1.5	-1.2	139.4	6.6	92.4
N2	12.66	28.4	1.2	104.5	0.9	3.1	1.3	-0.9	107.3	116.9	83.8
M2	12.42	29.0	9.5	50.1	8.8	307.2	10.4	-8.2	125.4	79.3	152.5
L2	12.19	29.5	2.5	76.8	1.9	336.2	2.9	-2.1	107.7	89.9	110.0
S2	12.00	30.0	4.4	107.9	3.2	7.3	4.5	-3.1	284.7	298.1	178.2
ETA2	11.75	30.6	1.3	263.0	1.5	164.7	1.0	-0.8	159.2	327.7	126.1

MEAN CURRENT



The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 20.0 m Bottom depth : 186.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

H 1

Fig. 2-1-9 Harmonic analysis of currents.

A discription of the model and its definitions :

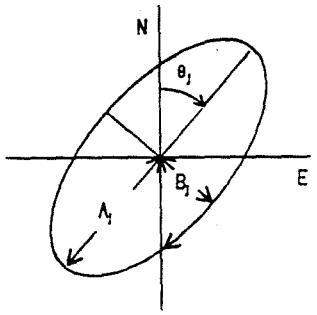
Current-vector decomposed in E/W (real) - and N/S (imaginary) - direction :

$$Z(t)=X_0+\sum_{j=1}^{n}(X_j\cos(\sigma_j t+(V_0+u)_j-g_{xj})+i(Y_0+\sum_{j=1}^{n}Y_j\cos(\sigma_j t+(V_0+u)_j-g_{yj}))$$

g_{xj} , g_{yj} : Greenwich-phase for E/W- and N/S-components of each constituent.

With ellipseparameters :

$$Z(t)=\sum_{j=1}^{n}\exp(i(90^\circ-\theta_j))(A_j\cos(\sigma_j t+(V_0+u)_j-g_j)+iB_j\sin(\sigma_j t+(V_0+u)_j-g_j))$$



g_j : Greenwich phase of the current-vector for each constituent.

Rotationdirection : anticlockwise when $B_j > 0$, clockwise when $B_j < 0$

BETA : The angle between t=0 and major half axis in the ellipse.

Common for both modles :

σ_j : Frequence in degrees/hour.

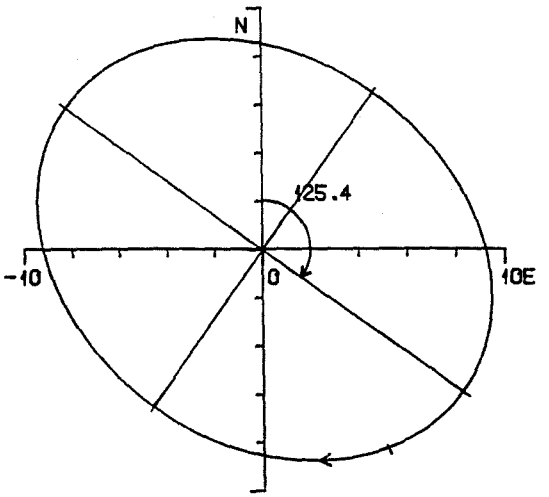
$(V_0+u)_j$: Astronomic argument relative to Greenwich-meridian.

During the calculation of Z(t) will V_0+u be put into the formulas at the time t=0.

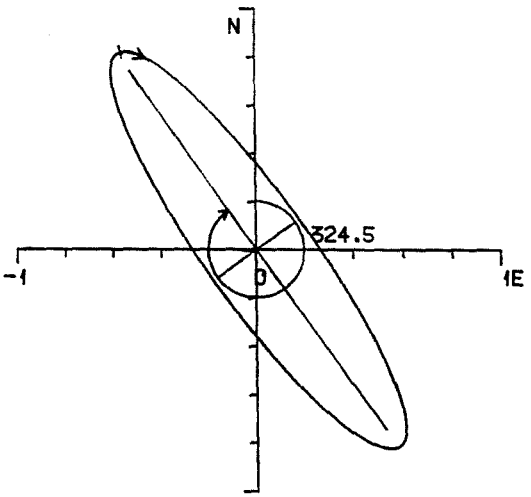
The time t is in hours; the same timezone as the analysed data.

t=0 in the midle of the measurement series : 1989 23.09 H. 1000 , marked with a line on the ellipse.

M2-ellipse



K1-ellipse



The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 20.0 m Bottom depth : 186.0 m

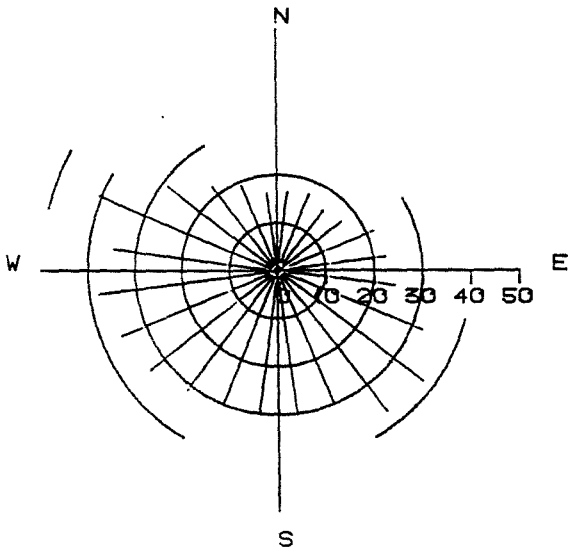
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 21.10 H. 1740

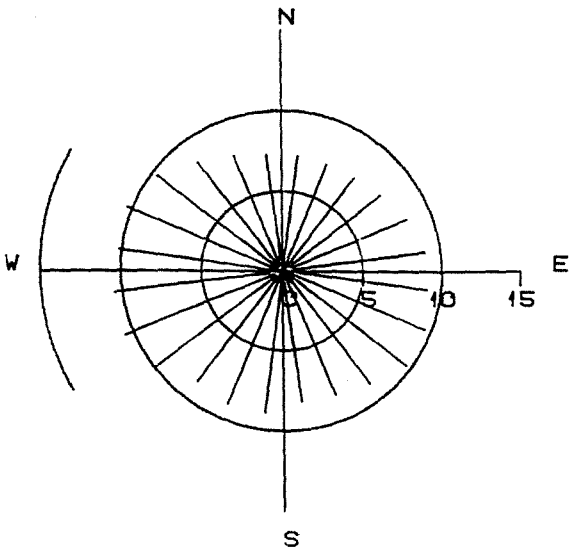
H 1

Fig. 2-1-10 M2 and K1 ellipse.

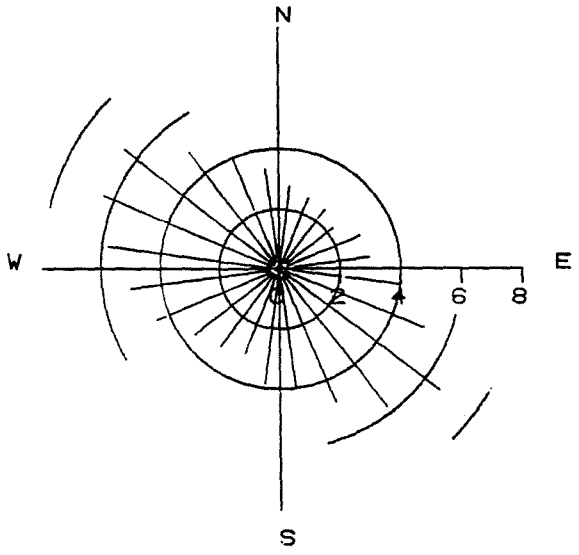
CURRENT VELOCITY DISTRIBUTION



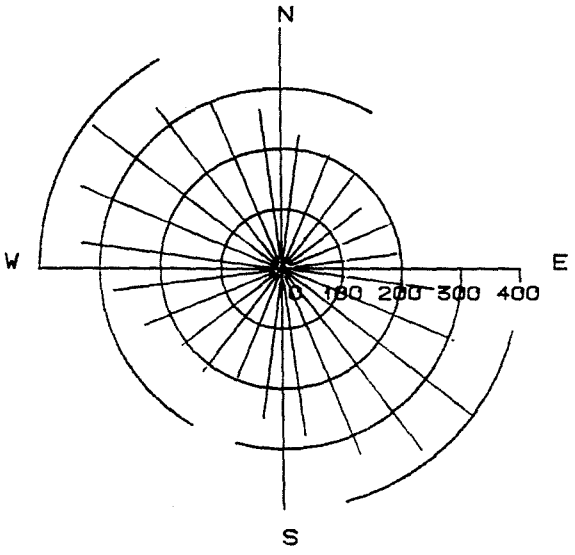
Maksimum velocity (cm/s)



Mean velocity (cm/s)



Relative flux in %



Number measured

Number of obeservations : 6494

The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 45.0 m Bottom depth : 186.0 m

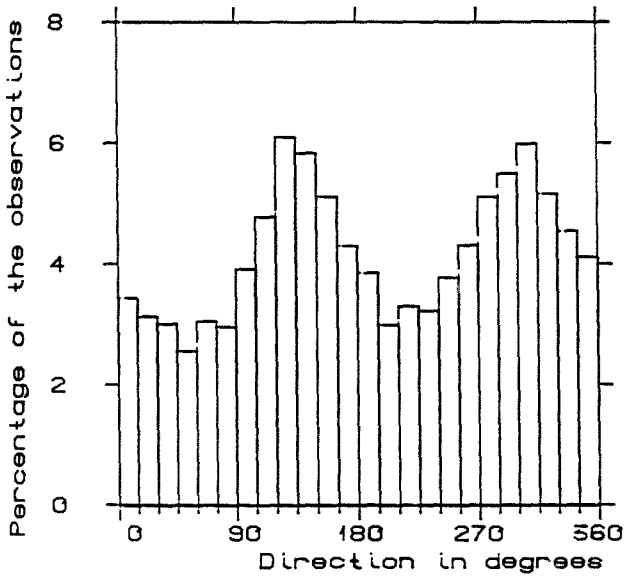
Time interval : 10.00 minutes.

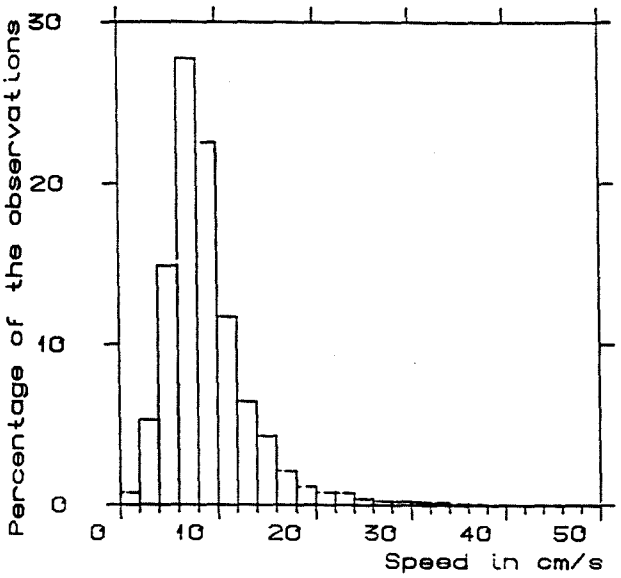
Obeservation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

H 1

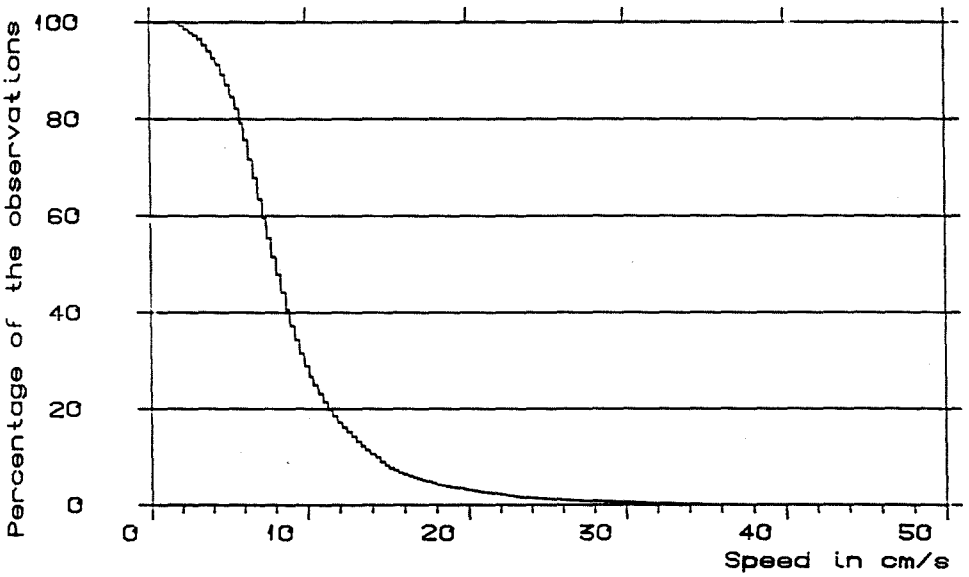
Fig. 2-2-1 Current velocity distribution.

HISTOGRAM





CURRENT SPEED DISTRIBUTION



Number of observations : 6494

The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 45.0 m Bottom depth : 186.0 m

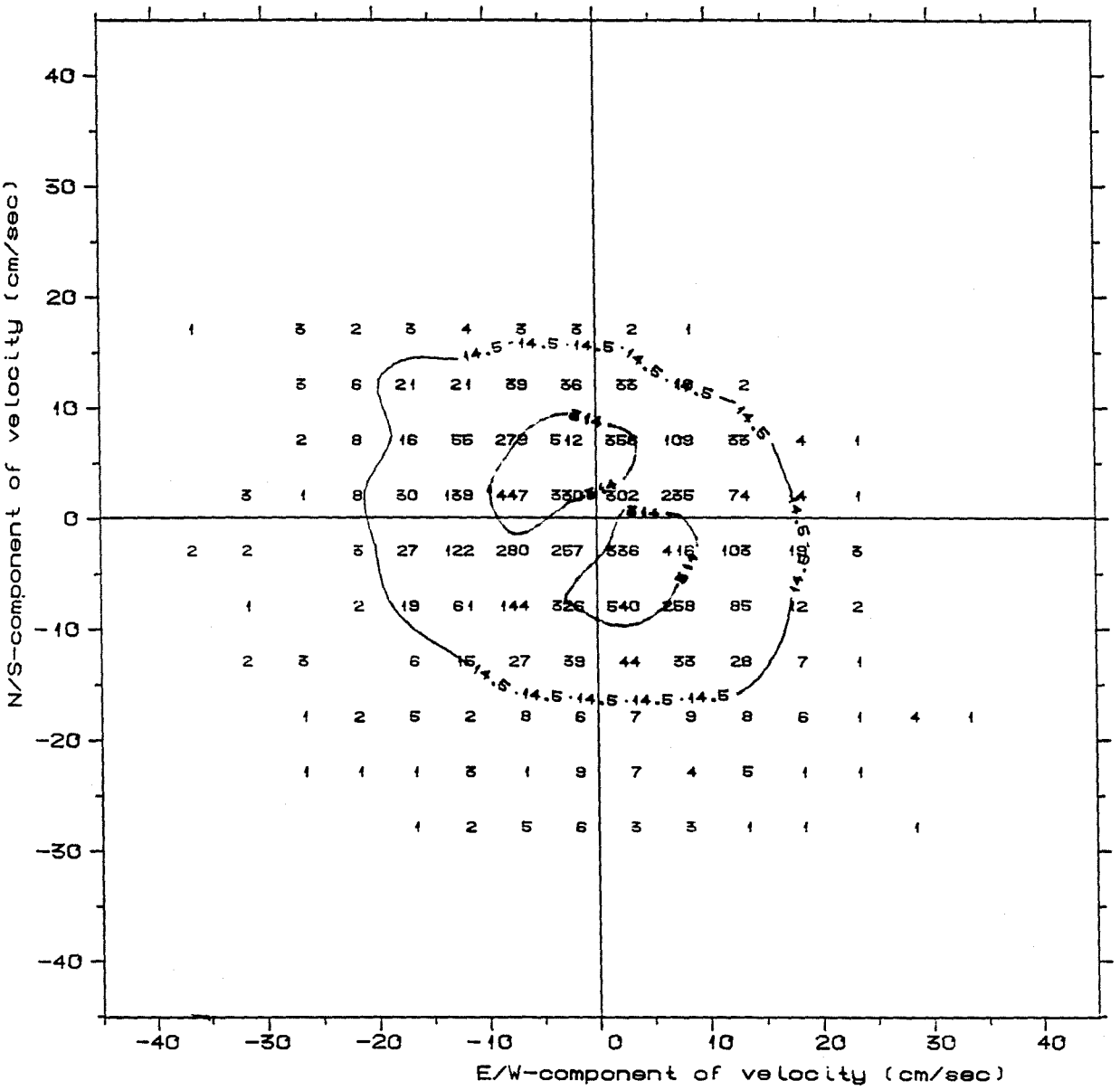
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

H I

Fig. 2-2-2 Histogram of speed and direction.
Current speed distribution.

VELOCITY DISTRIBUTION DIAGRAM



Number of observations : 6494

Isoline for 50% and 96%

Number of observations : 6494

The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 45.0 m Bottom depth : 186.0 m

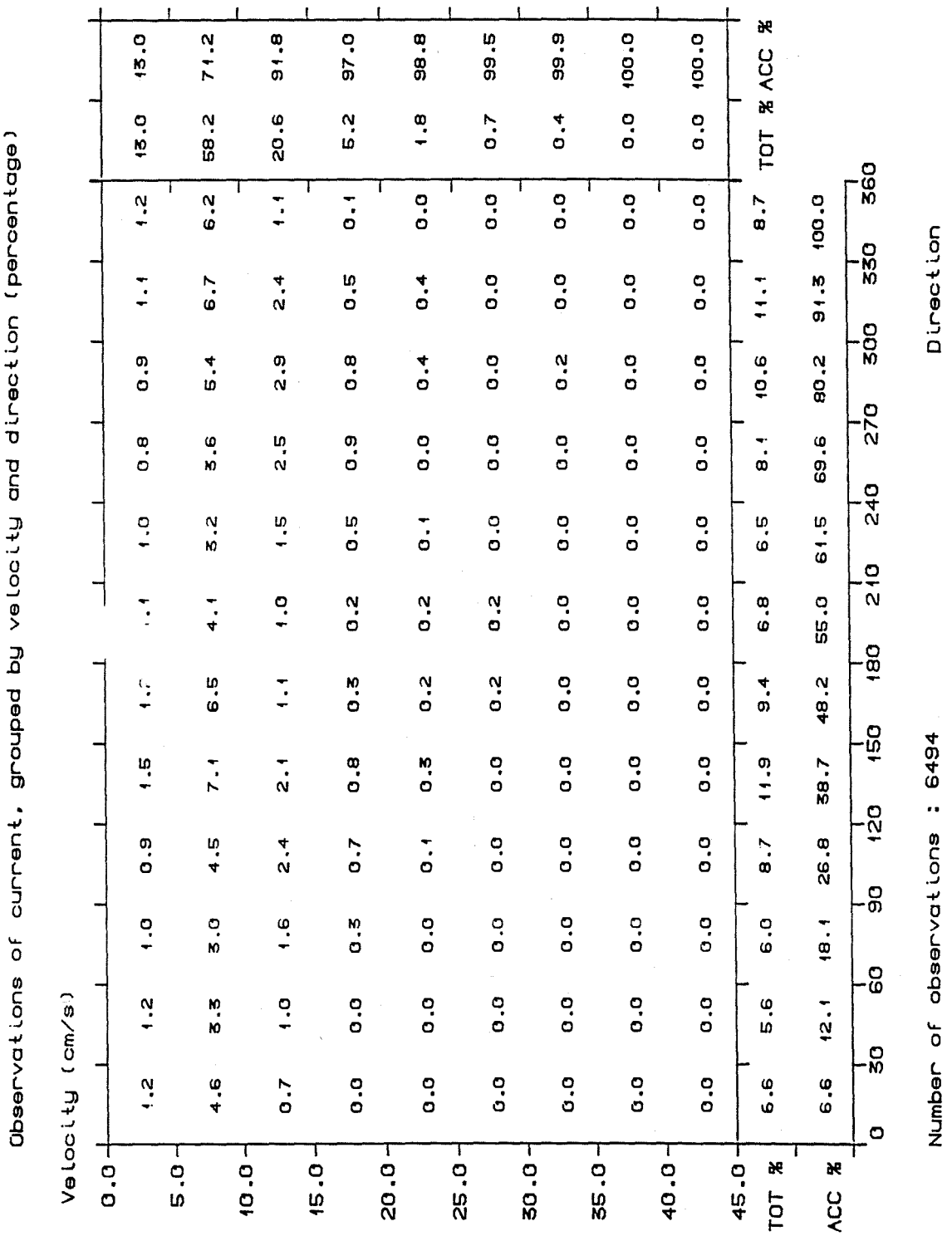
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

H I

Fig. 2-2-3 Velocity distribution diagram.

DIRECTION DISTRIBUTION OF CURRENT VELOCITY



Number of observations : 6494

The Barents Sea

Position : N 74° 29.90' E 39° 57.3[illegible]'

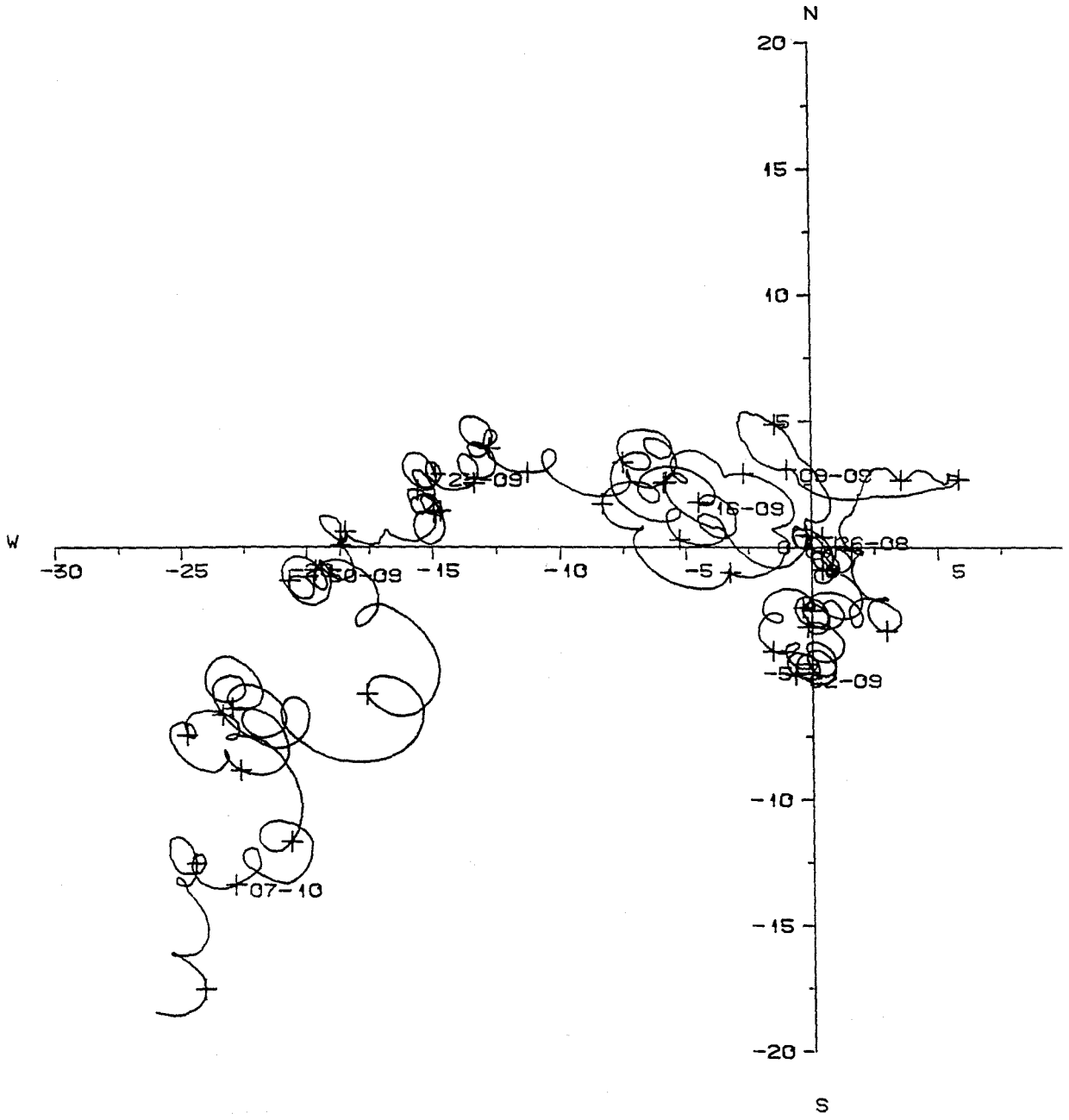
Instrument depth : 45.0 m Bottom depth : 186.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

Fig. 2-2-4 Velocity distribution table.

PROGRESSIVE VECTOR DIAGRAM



Units in km

Number of observations : 6494

The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

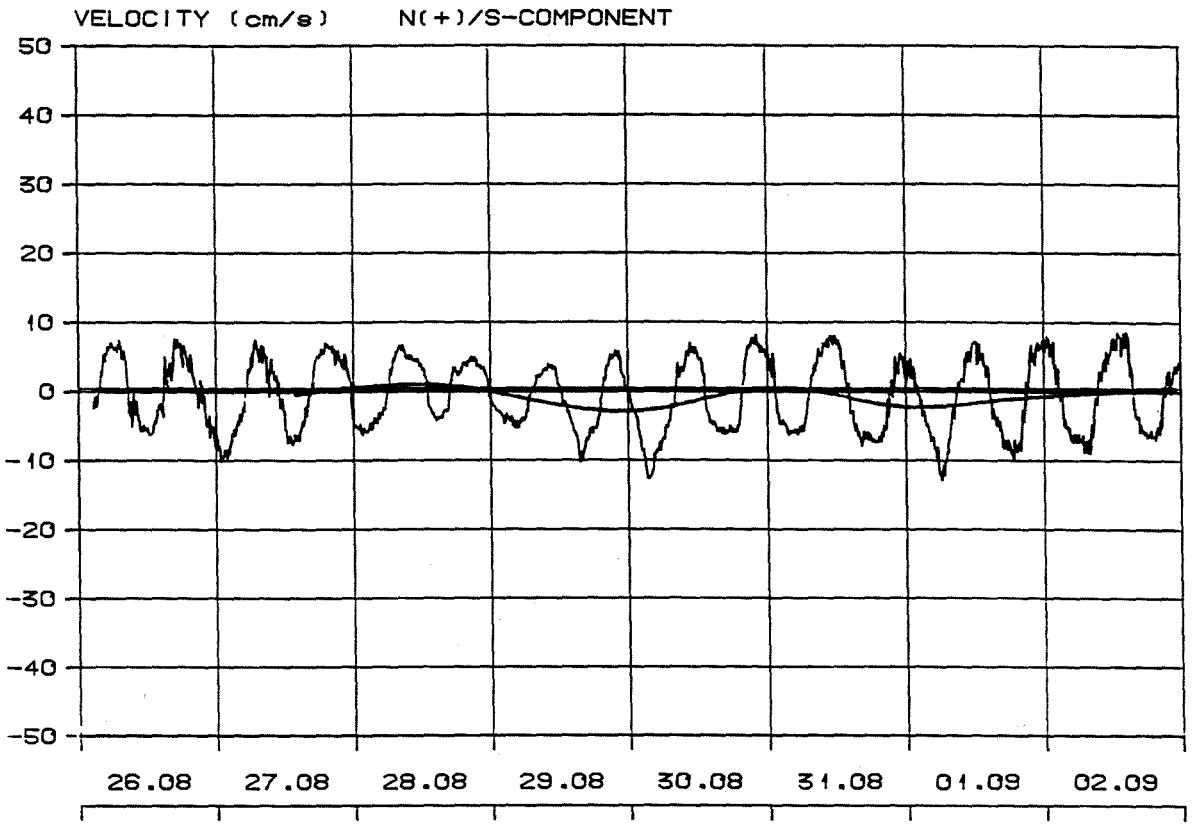
Instrument depth : 45.0 m Bottom depth : 186.0 m

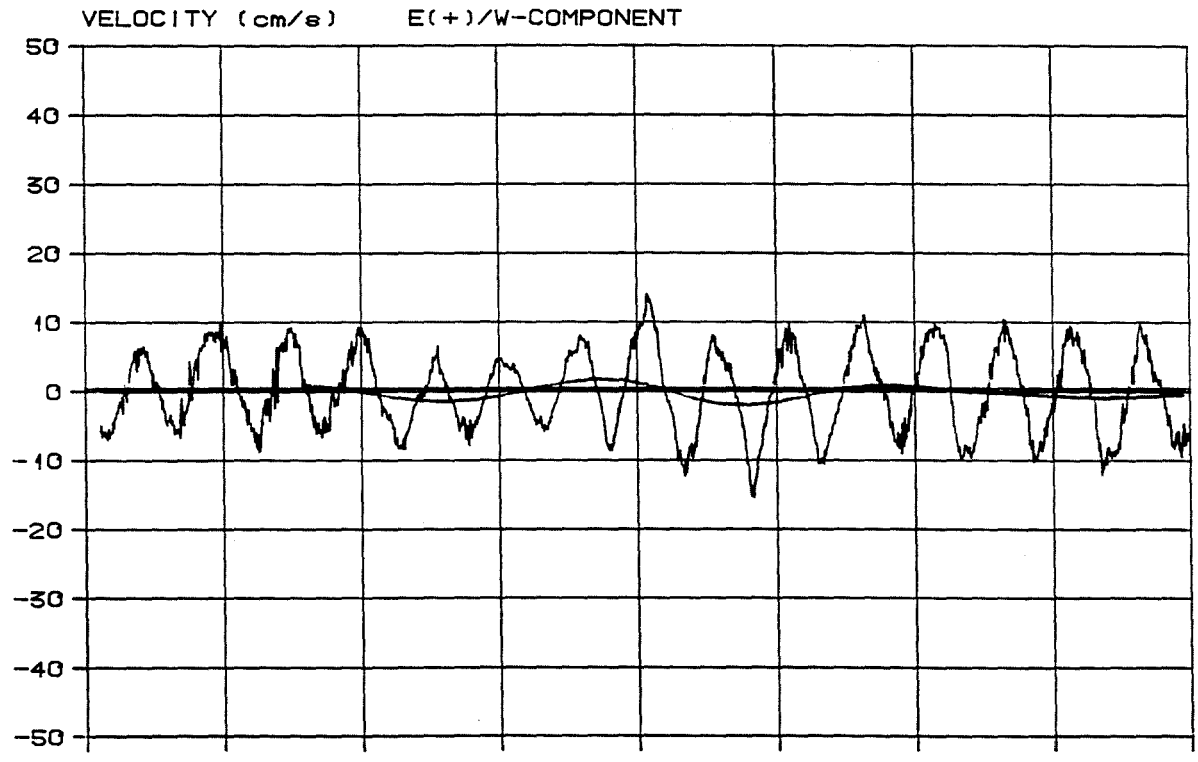
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

H 1

Fig. 2-2-5 Progressive vector diagram.





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

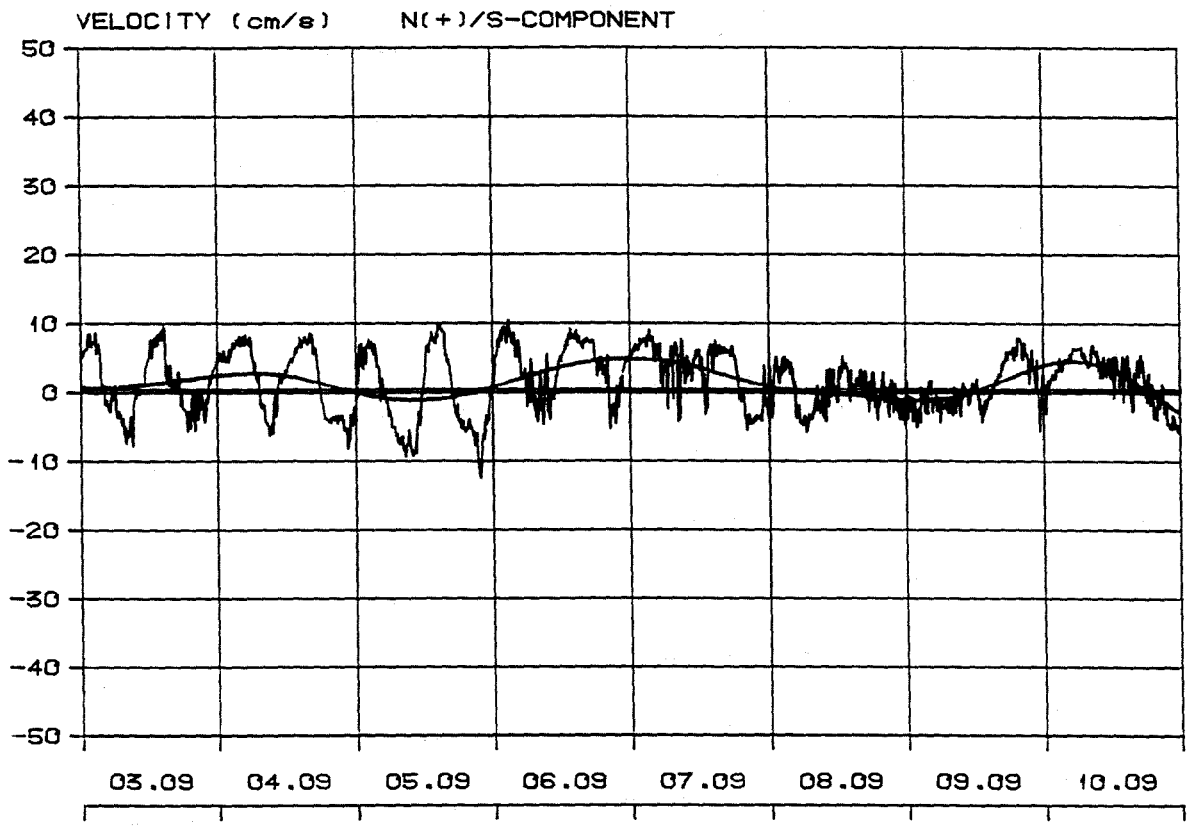
Instrument depth : 45.0 m Bottom depth : 186.0 m

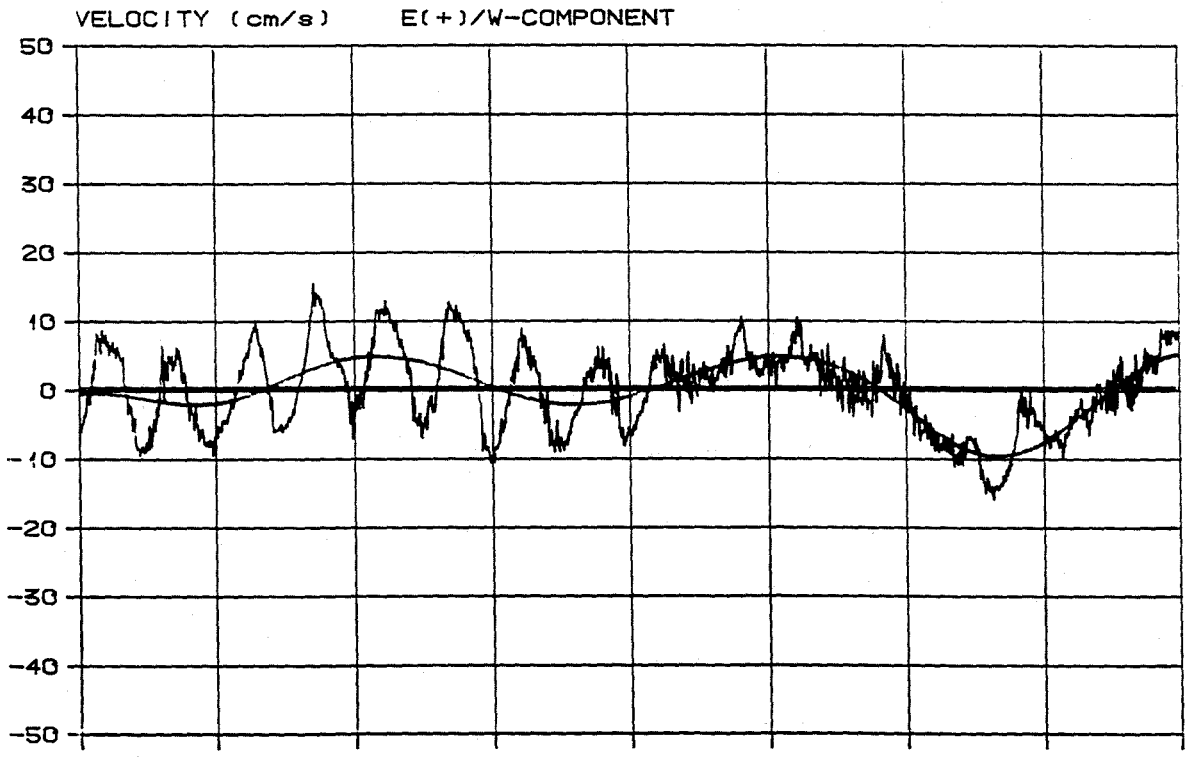
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

H I

Fig. 2-2-6 N/S and E/W components of current.





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 45.0 m Bottom depth : 186.0 m

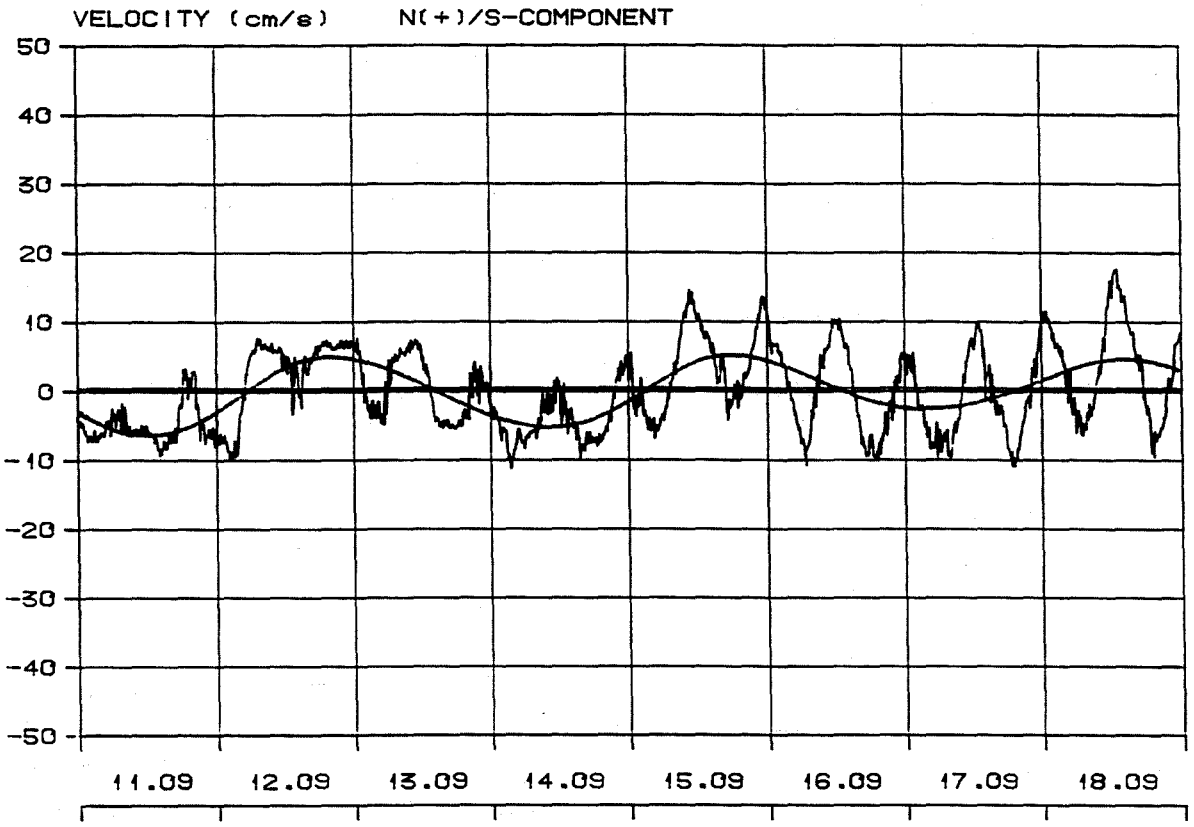
Time interval : 10.00 minutes.

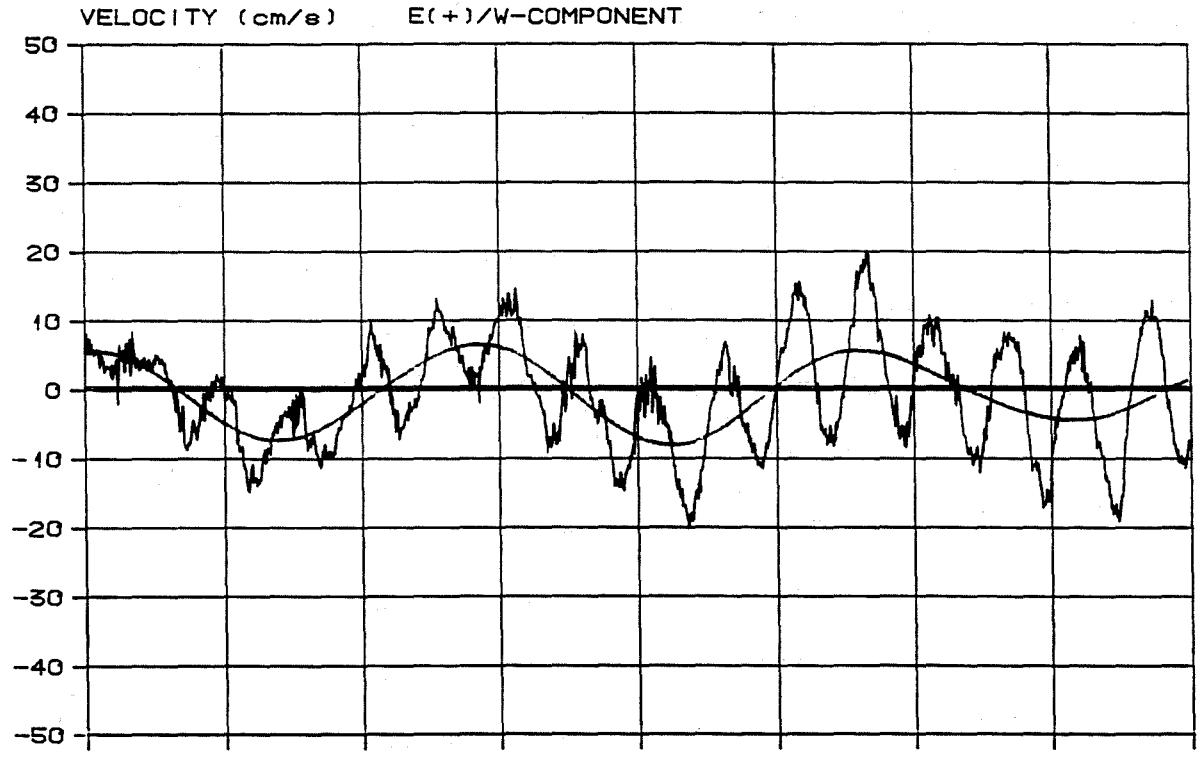
Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

H I

Fig. 2-2-6

Continues.....





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 45.0 m Bottom depth : 186.0 m

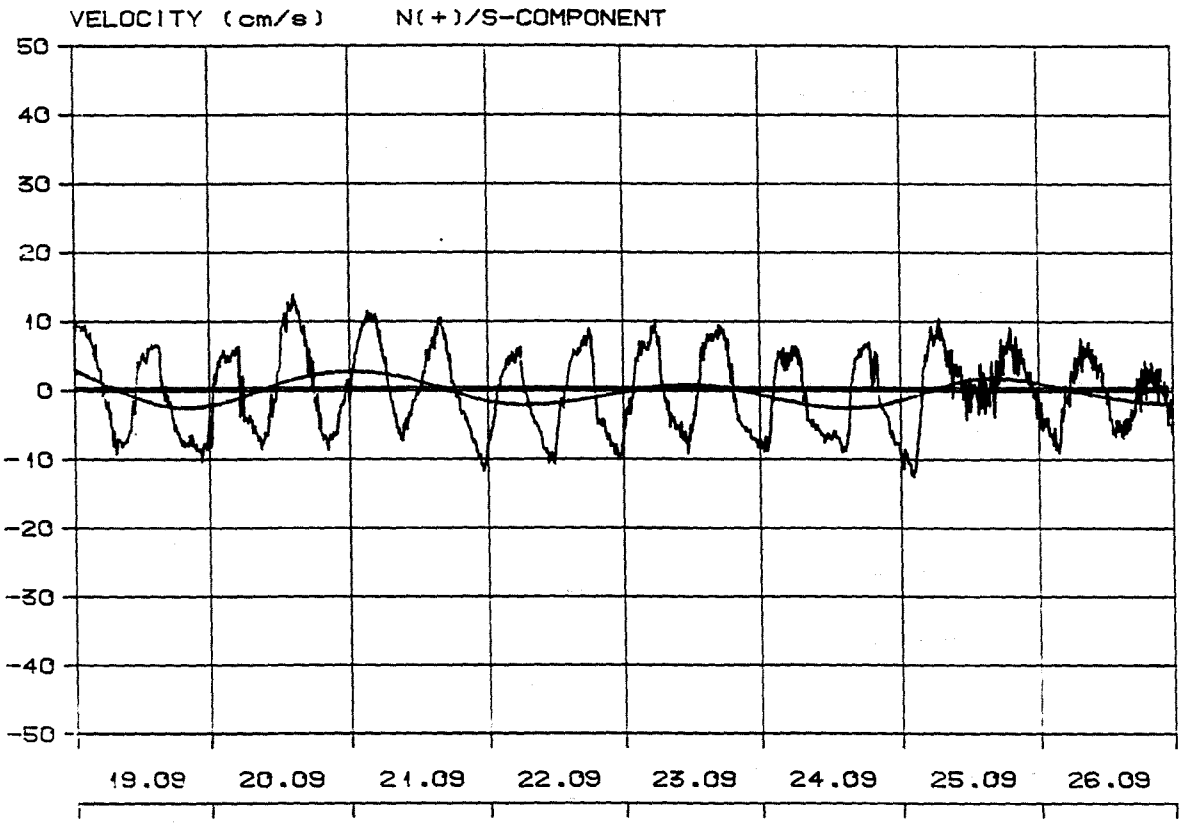
Time interval : 10.00 minutes.

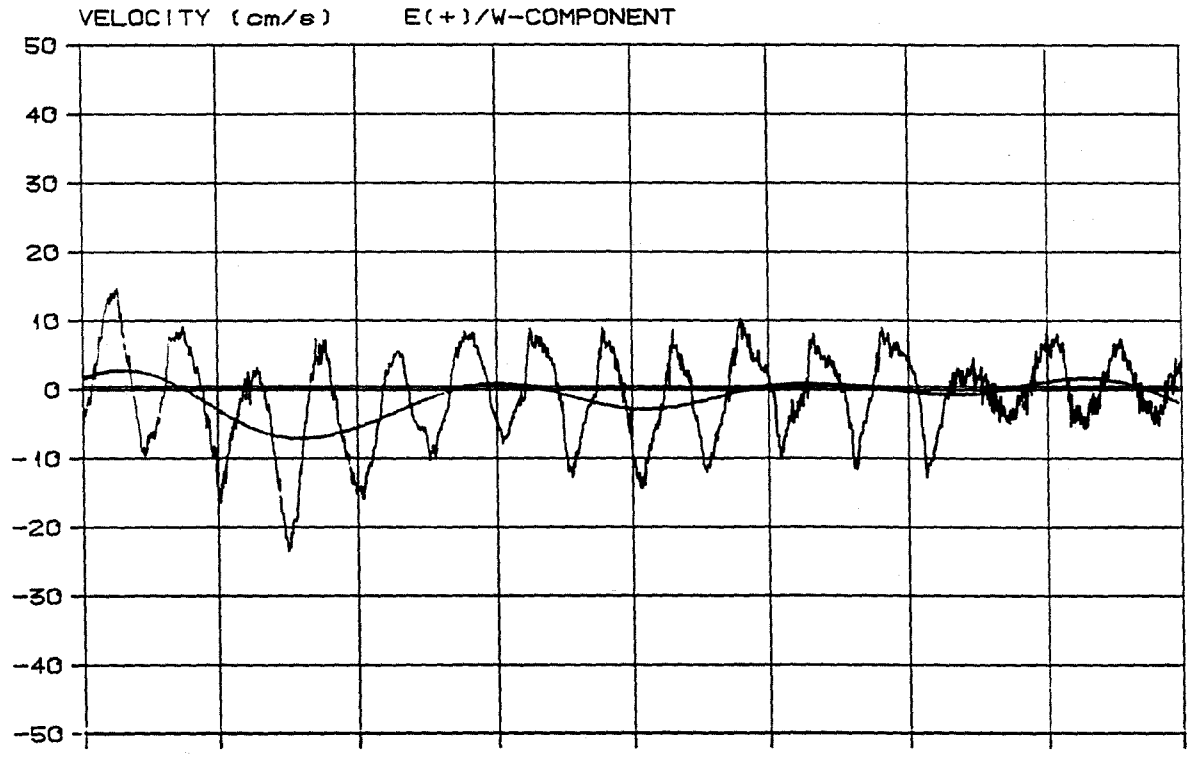
Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

H 1

Fig. 2-2-6

Continues.....





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 45.0 m Bottom depth : 186.0 m

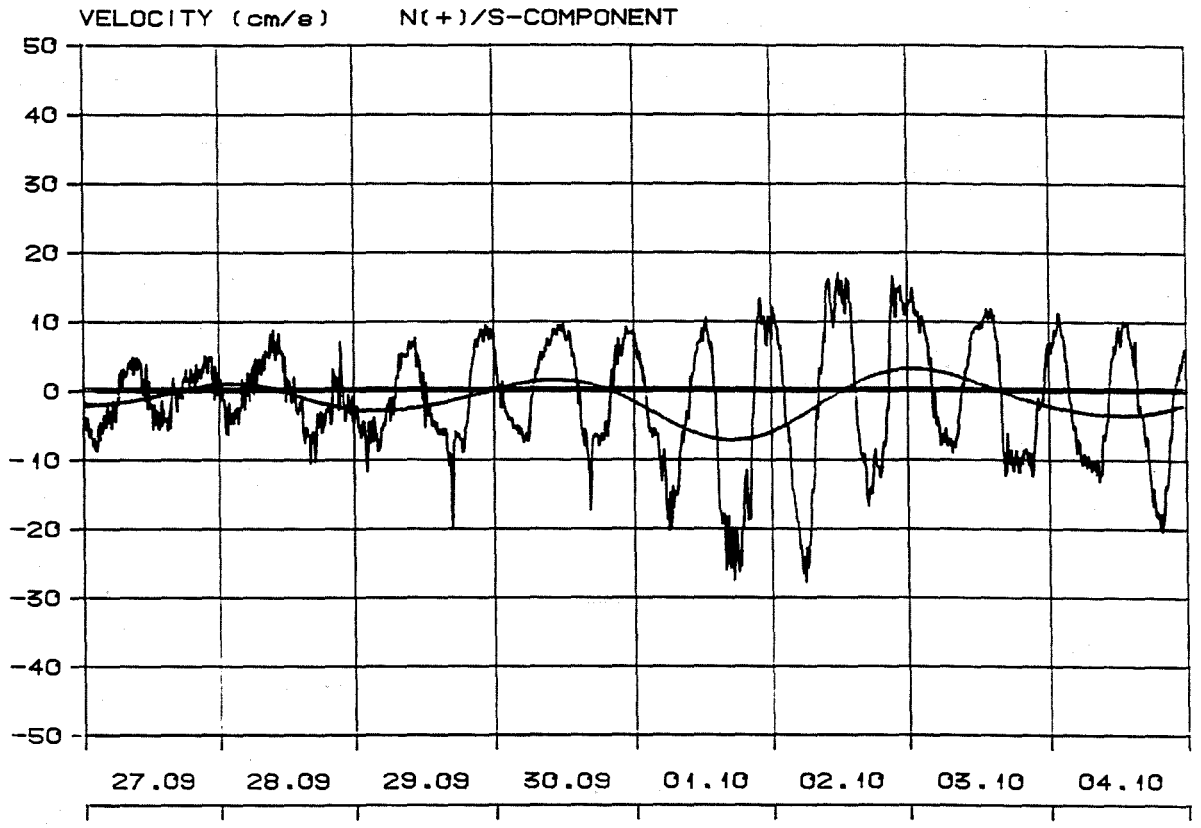
Time interval : 10.00 minutes.

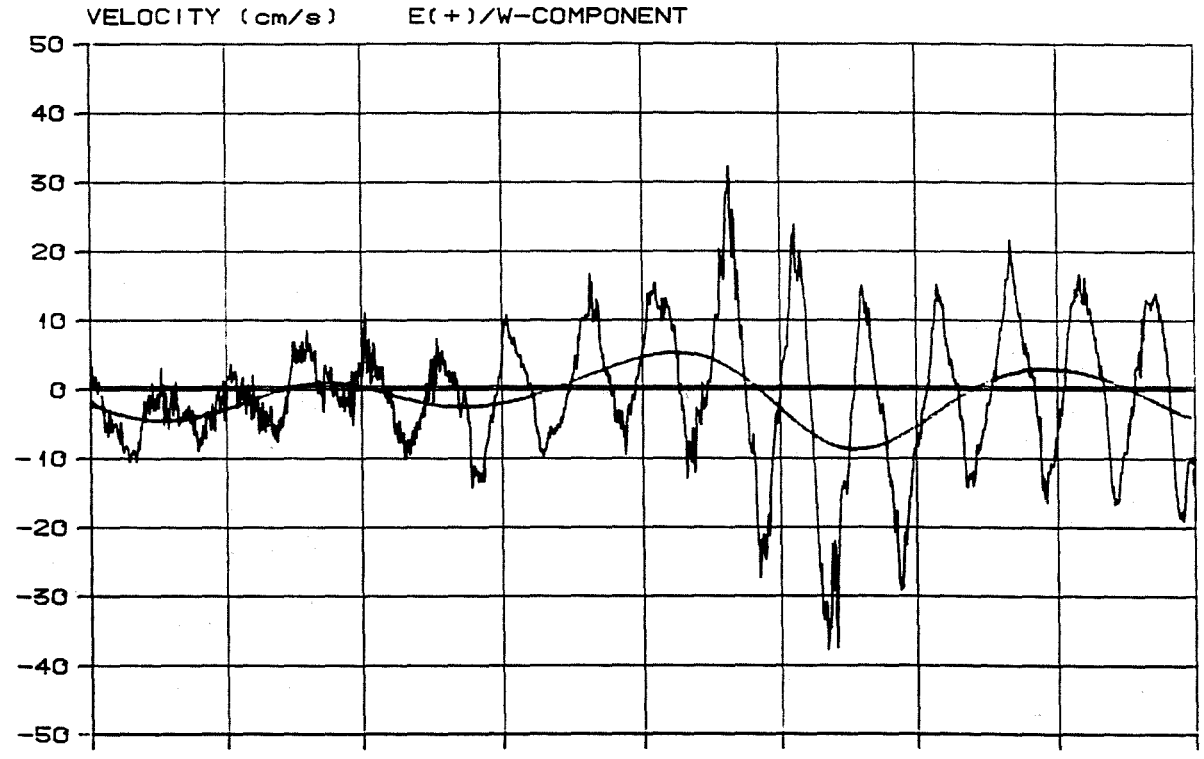
Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

H 1

Fig. 2-2-6

Continues.....





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 45.0 m Bottom depth : 186.0 m

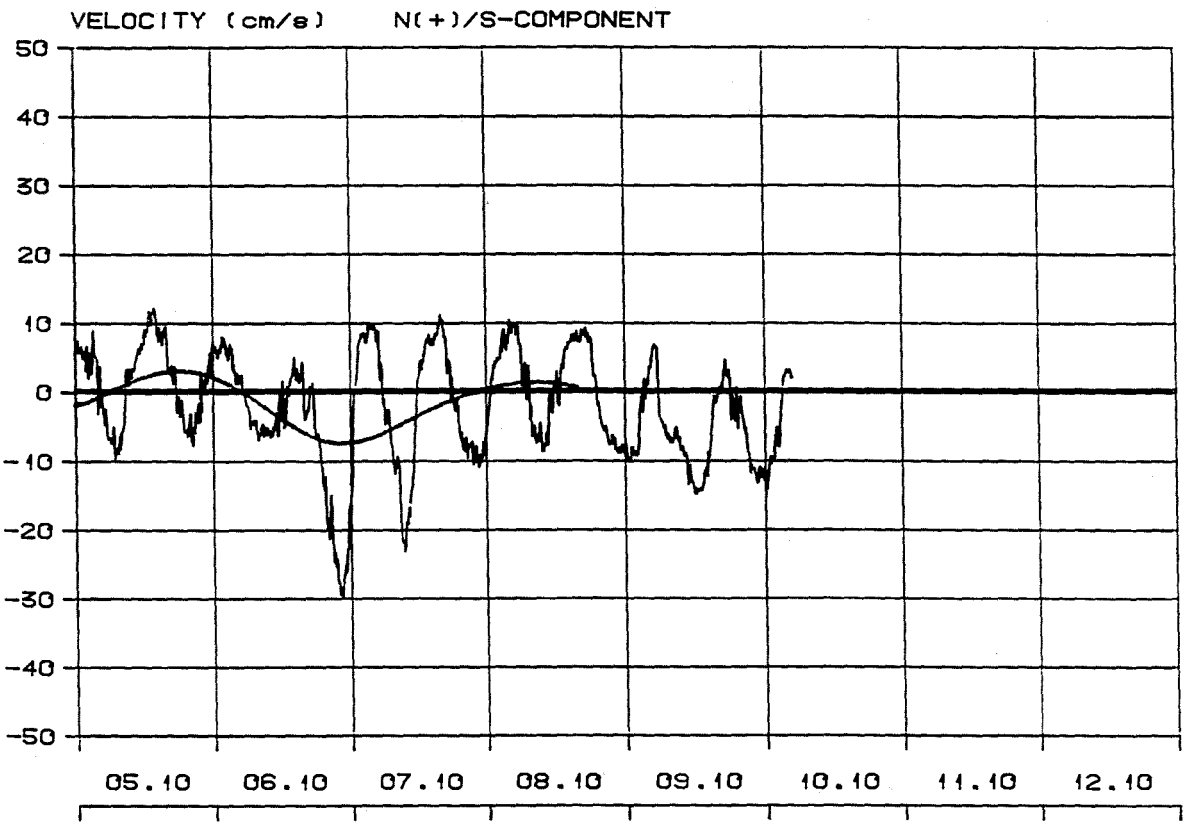
Time interval : 10.00 minutes.

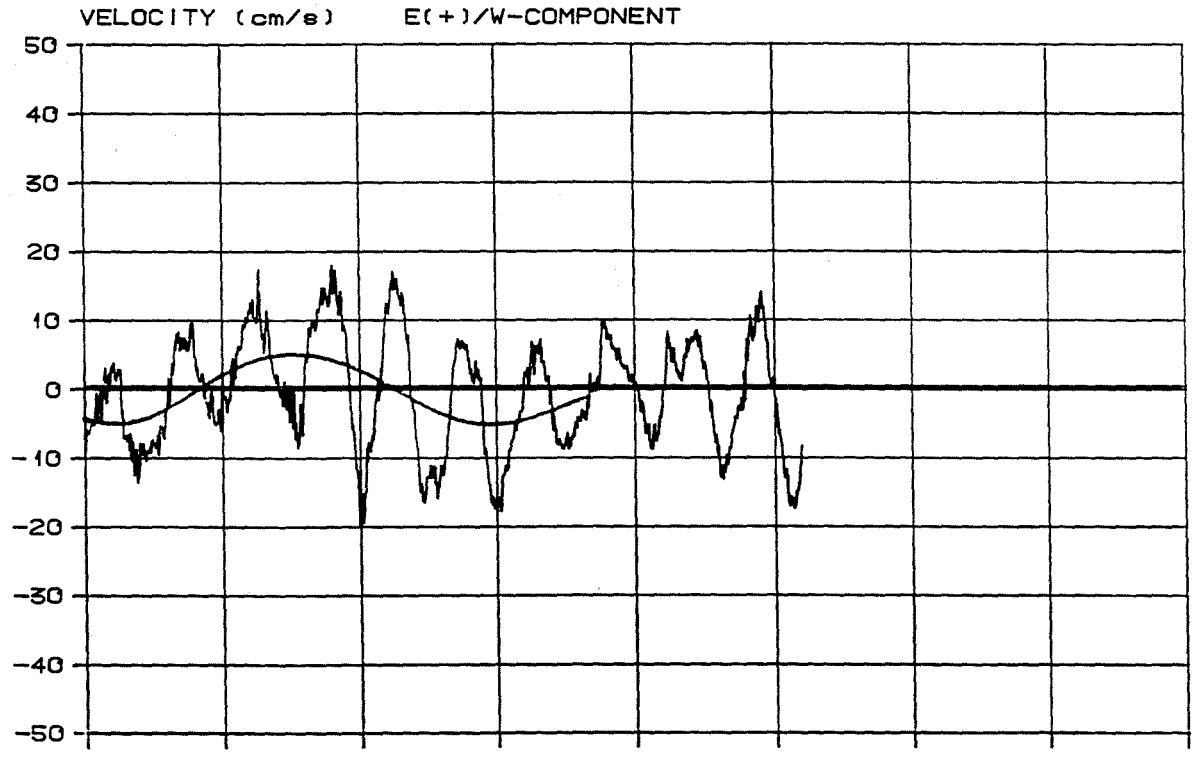
Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

H 1

Fig. 2-2-6

Continues.....





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 45.0 m Bottom depth : 186.0 m

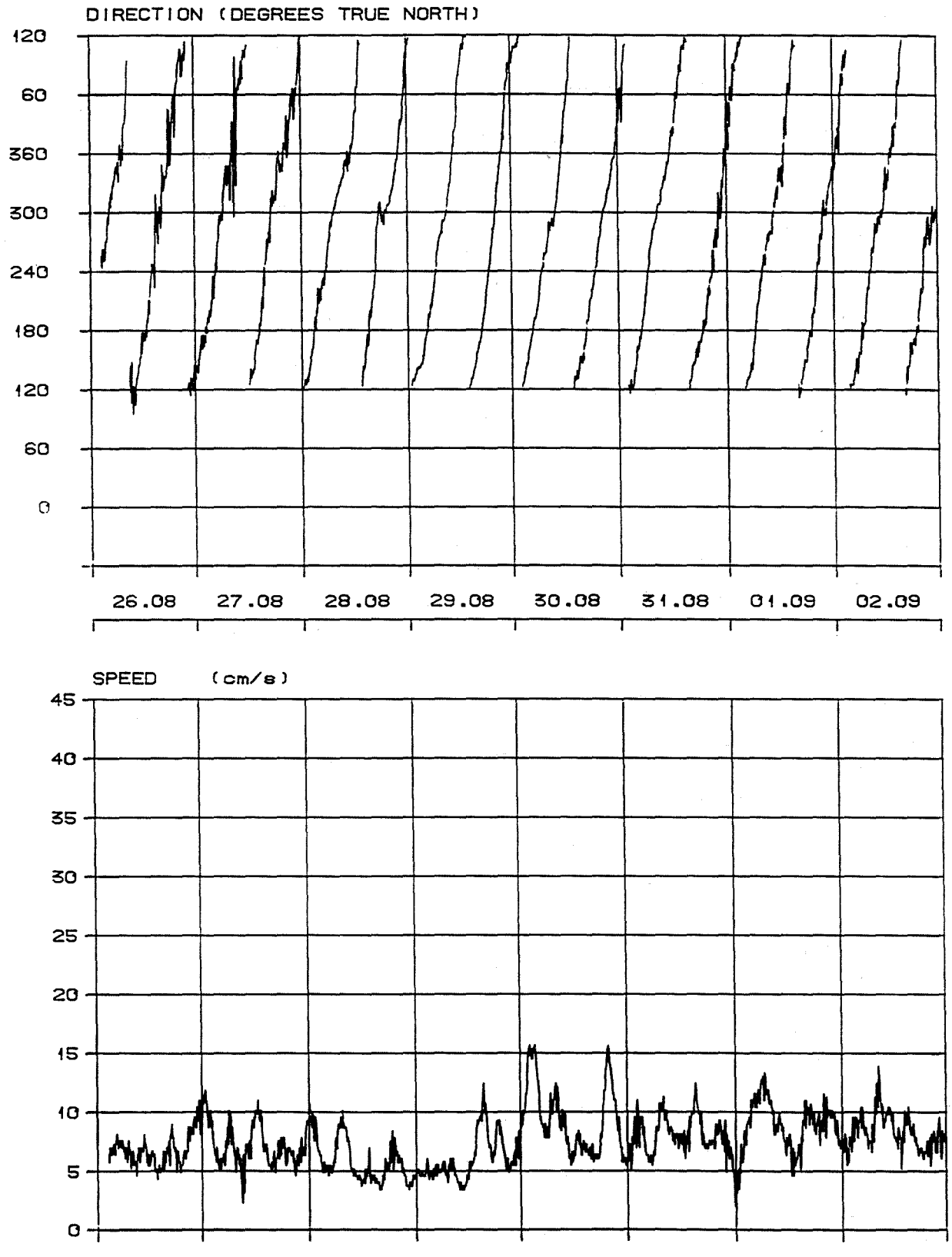
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

H 1

Fig. 2-2-6

Continues.....



The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

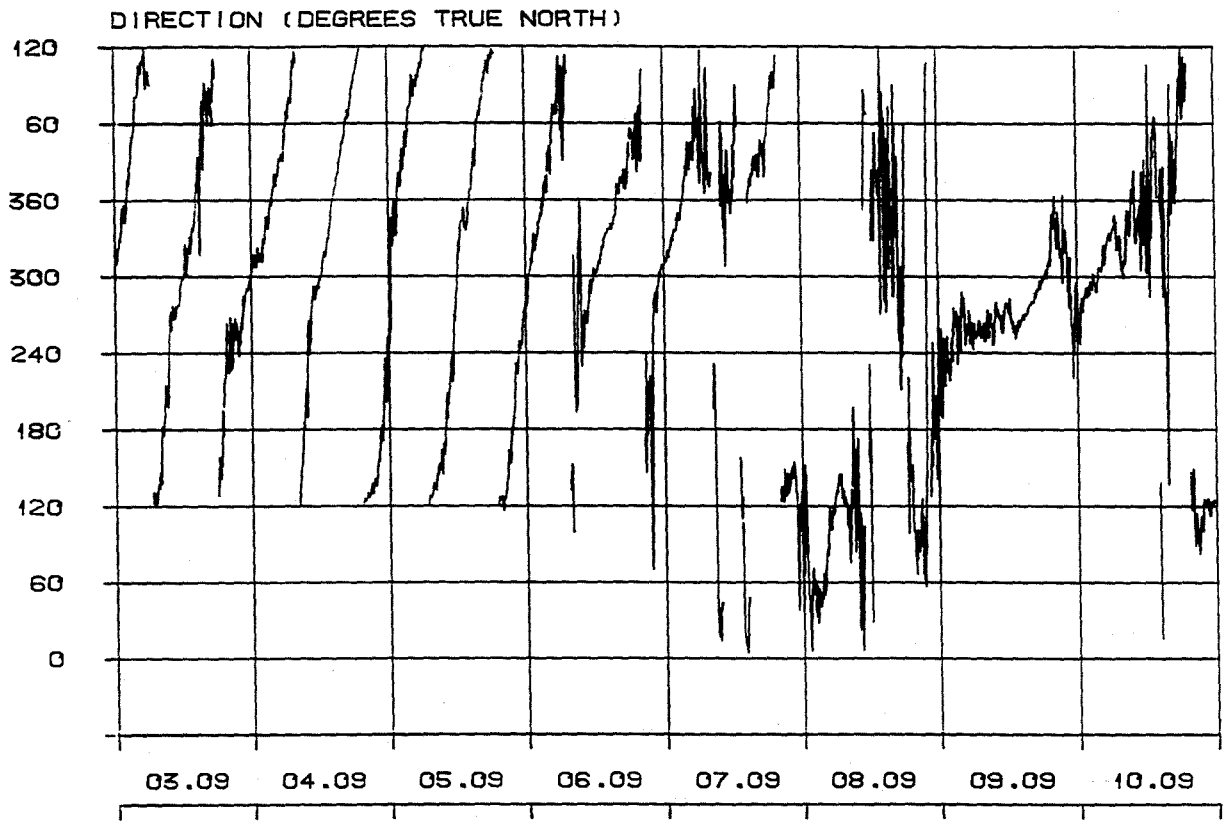
Instrument depth : 45.0 m Bottom depth : 186.0 m

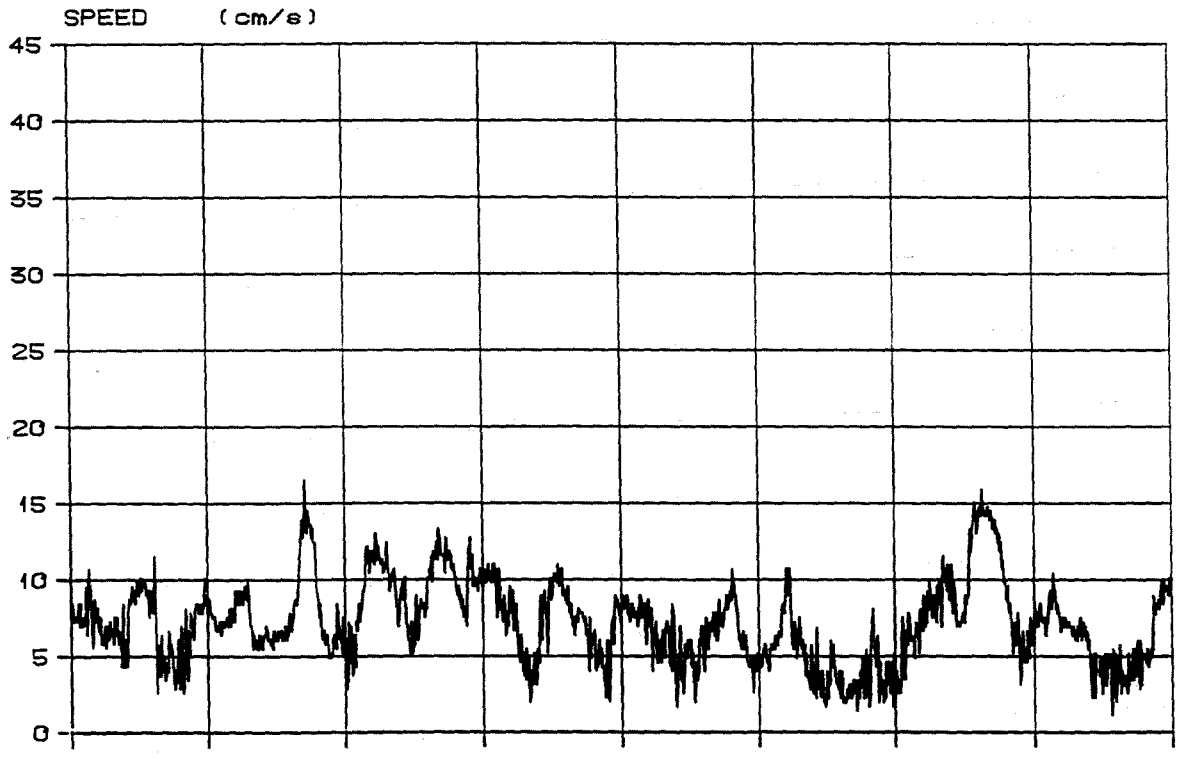
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

H I

Fig. 2-2-7 Speed and direction of current.





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

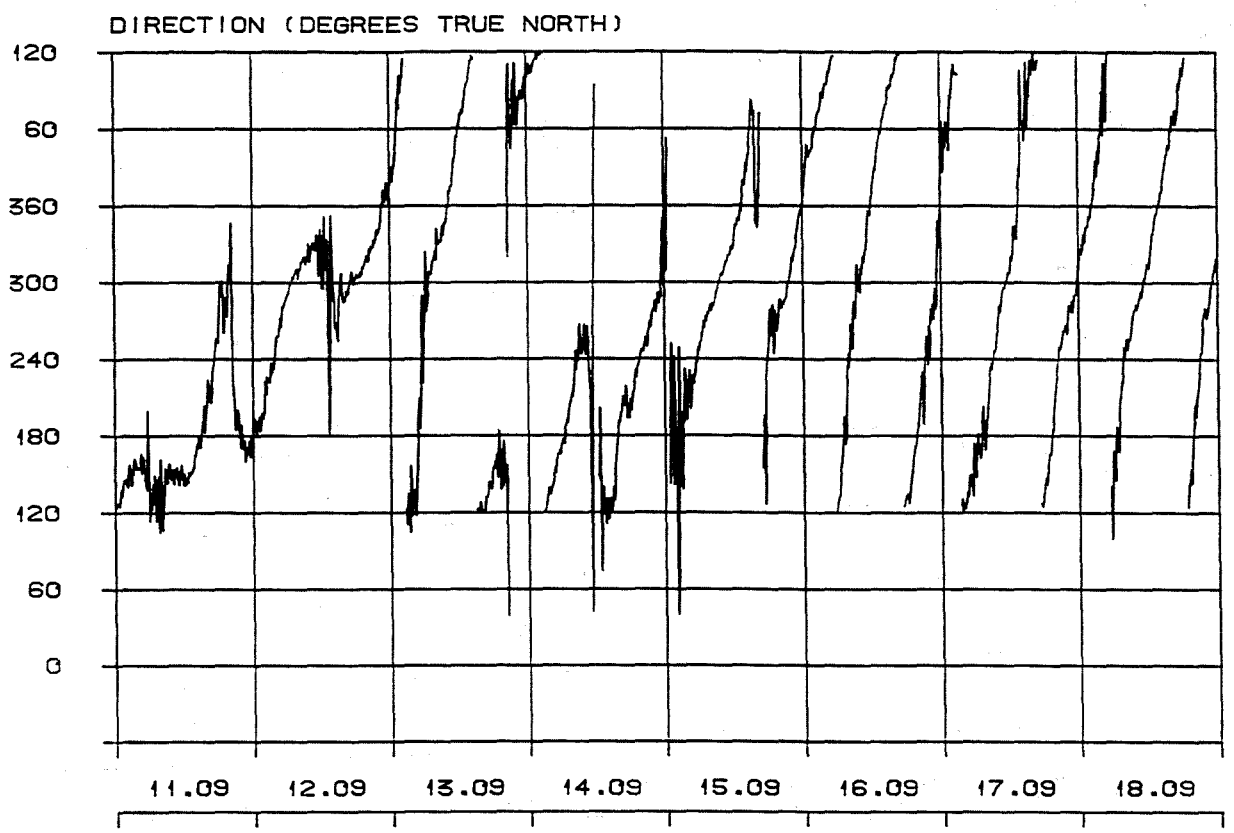
Instrument depth : 45.0 m Bottom depth : 186.0 m

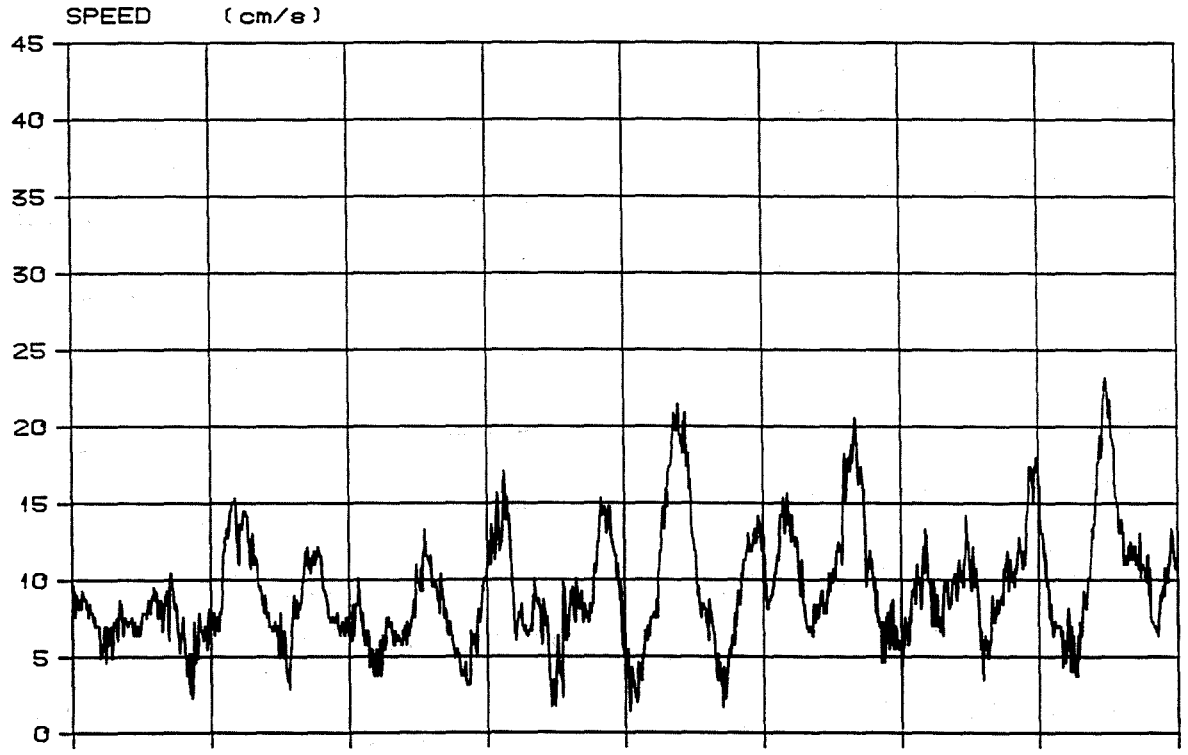
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

Fig. 2-2-7

Continues.....





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 45.0 m Bottom depth : 186.0 m

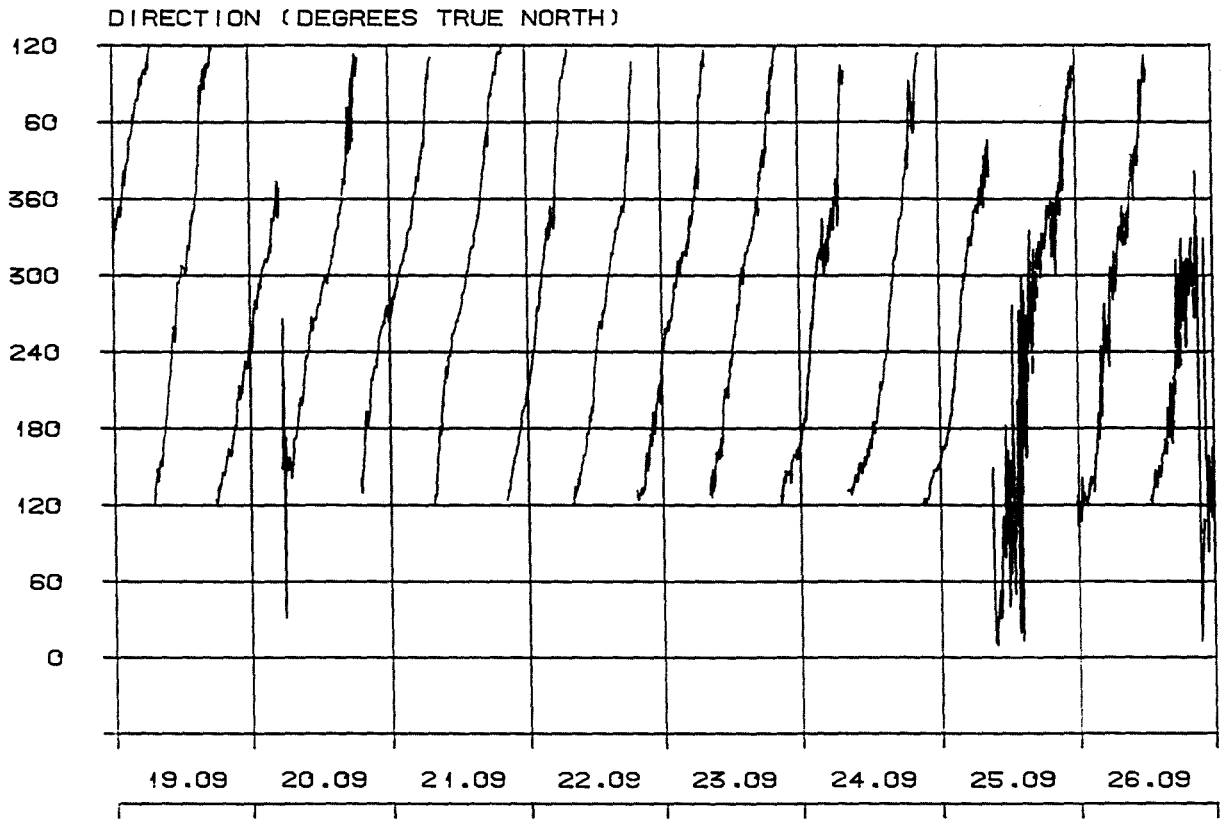
Time interval : 10.00 minutes.

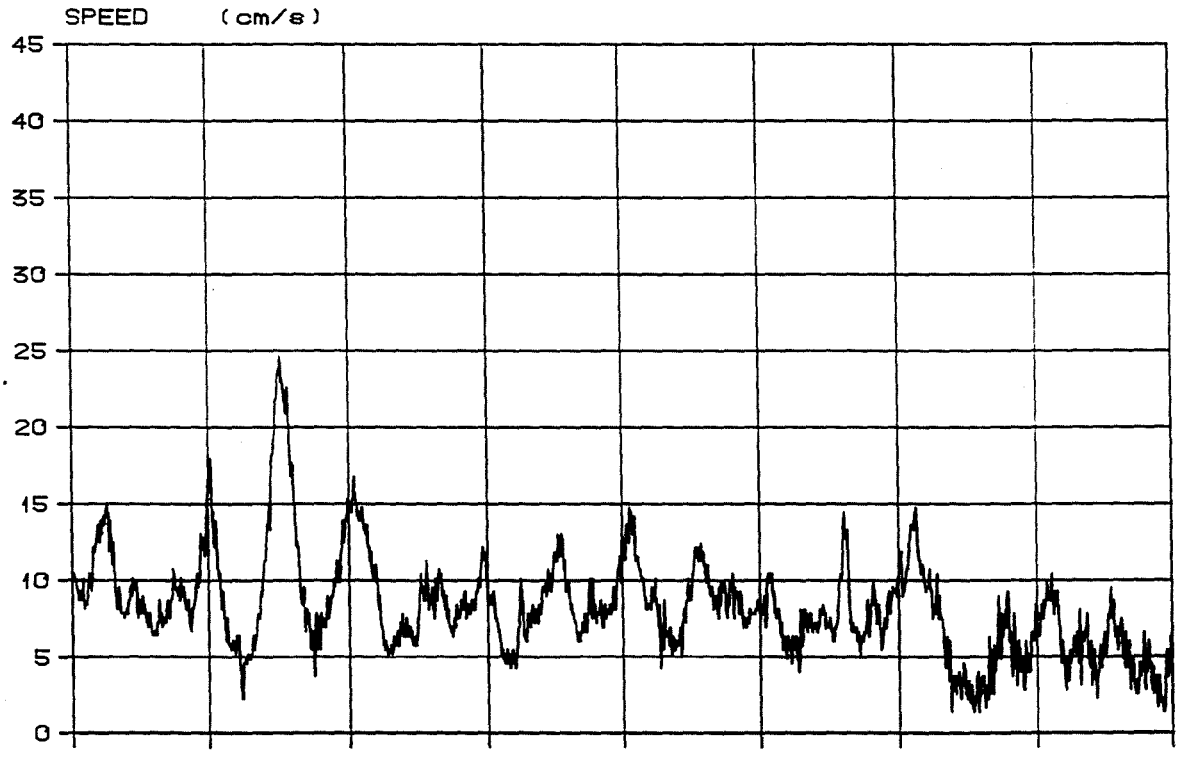
Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

H 1

Fig. 2-2-7

Continues.....





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 45.0 m Bottom depth : 186.0 m

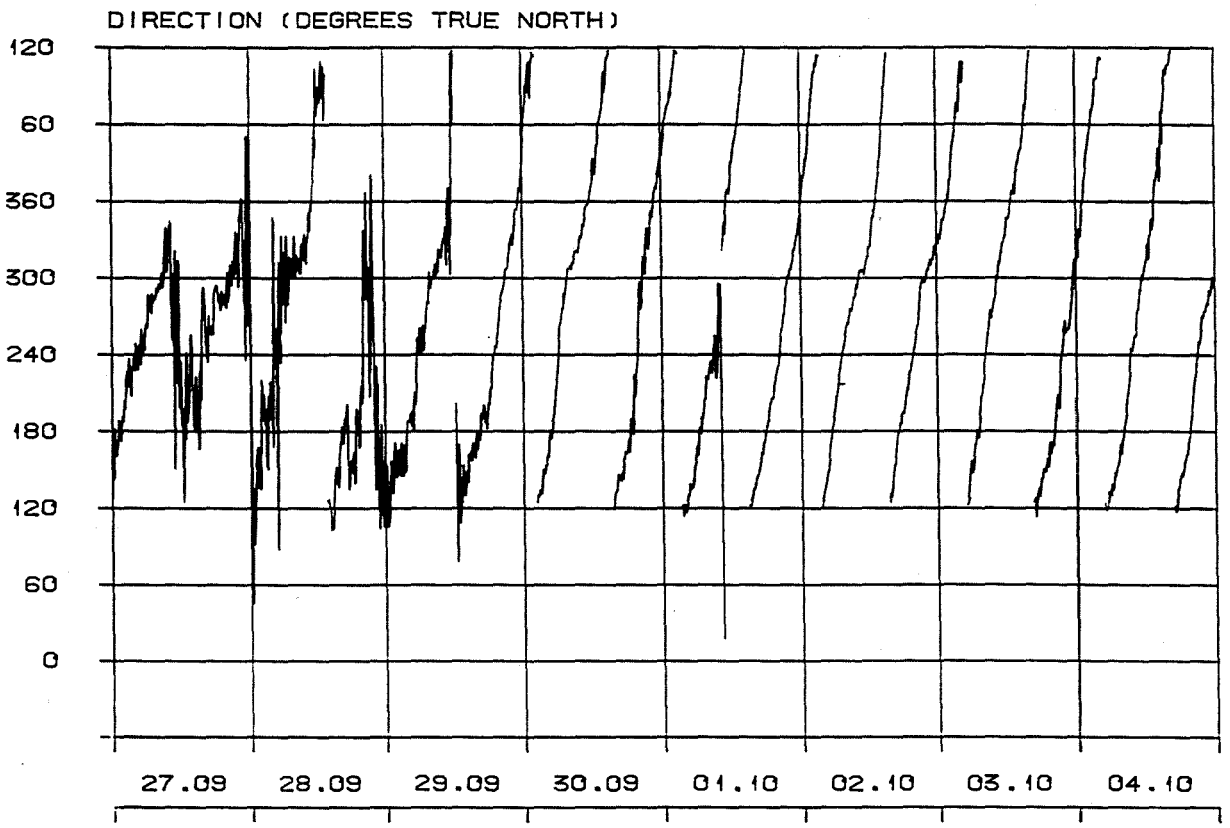
Time interval : 10.00 minutes.

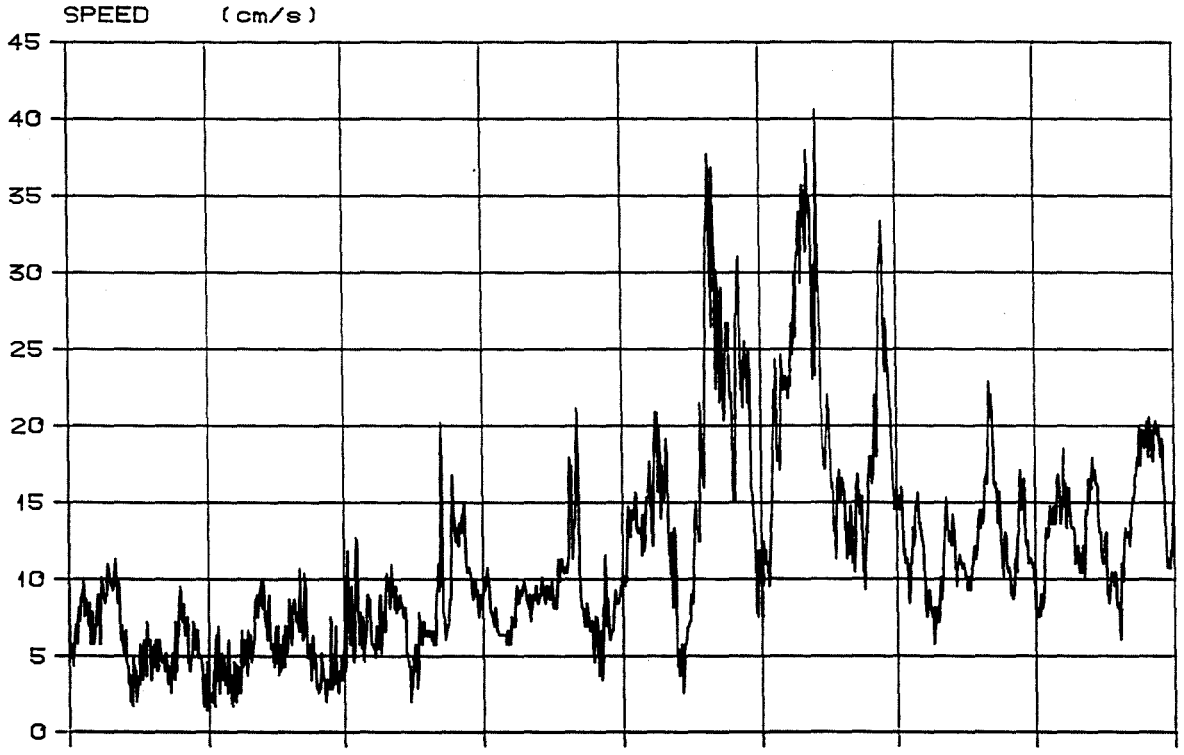
Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

H 1

Fig. 2-2-7

Continues.....





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 45.0 m Bottom depth : 186.0 m

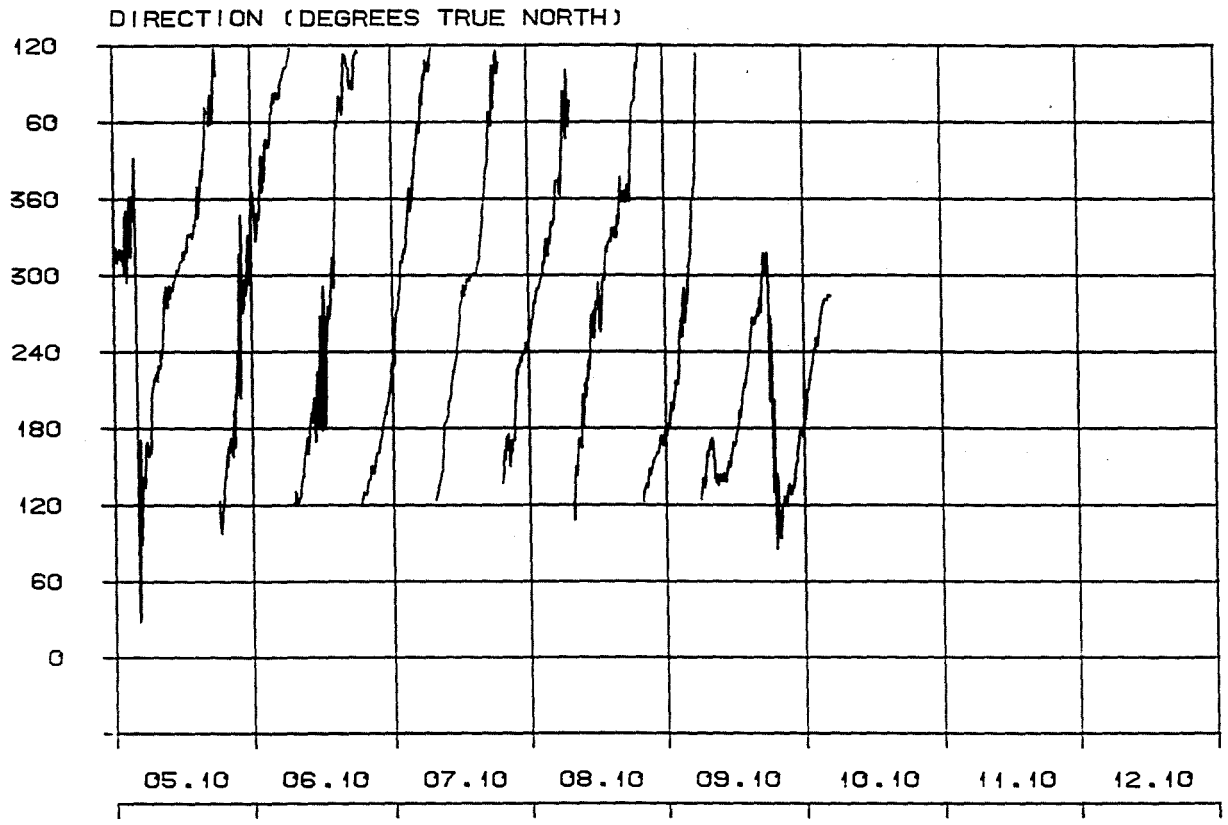
Time interval : 10.00 minutes.

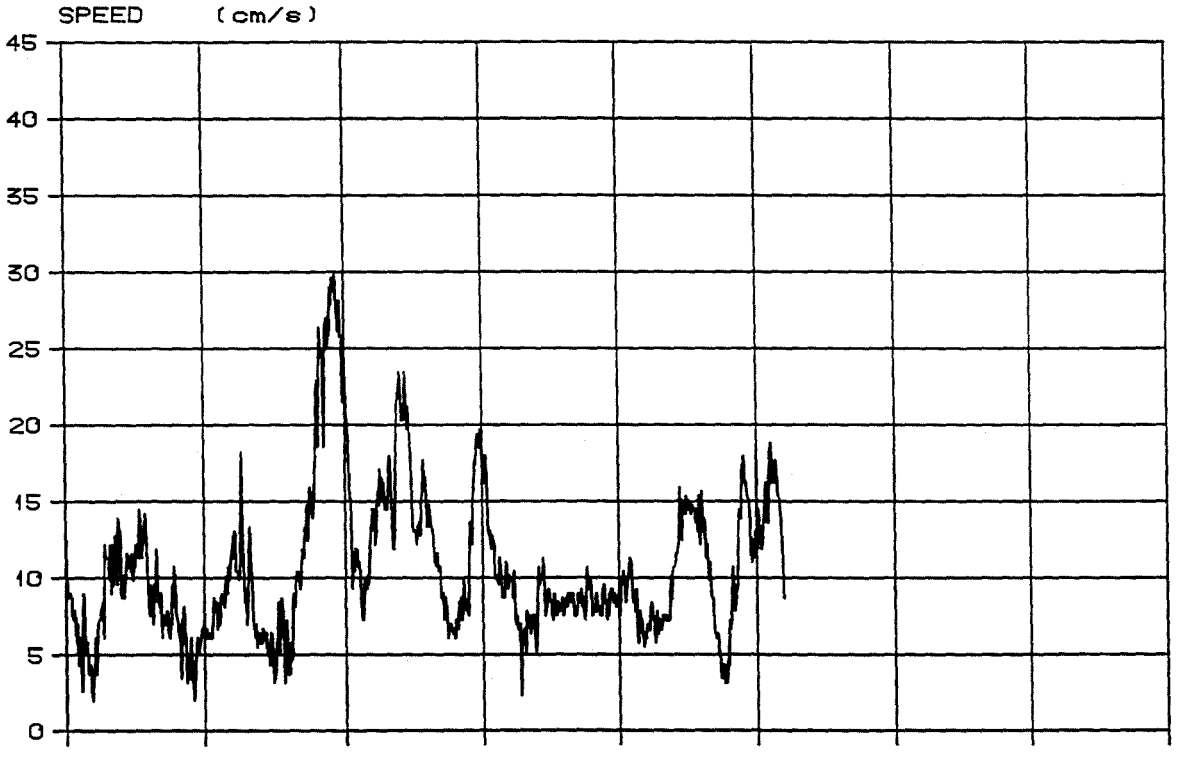
Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

H I

Fig. 2-2-7

Continues.....





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 45.0 m Bottom depth : 186.0 m

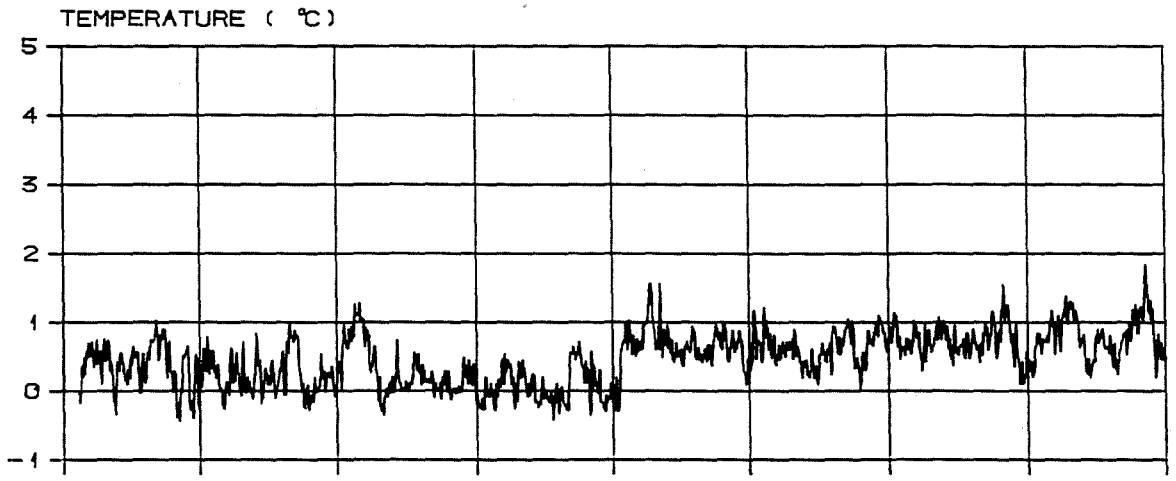
Time interval : 10.00 minutes.

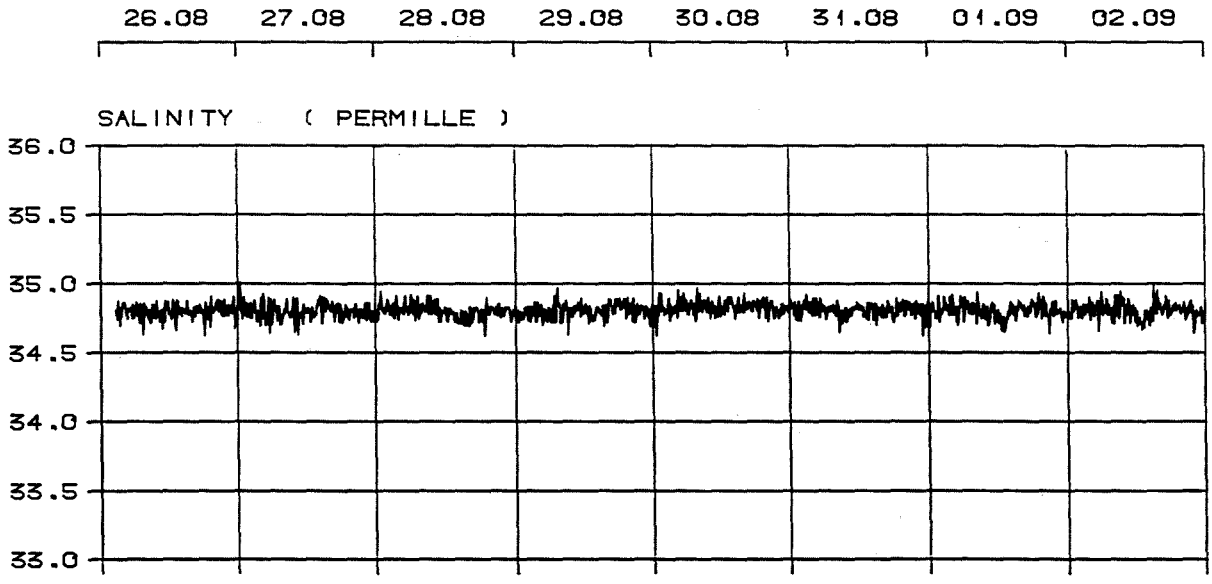
Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

H 1

Fig. 2-2-7

Continues.....





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

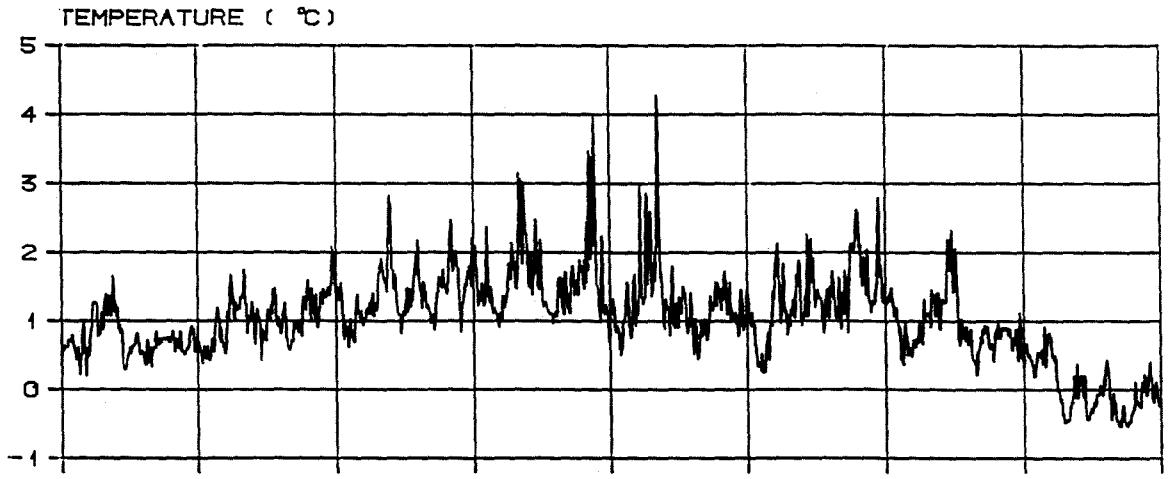
Instrument depth : 45.0 m Bottom depth : 186.0 m

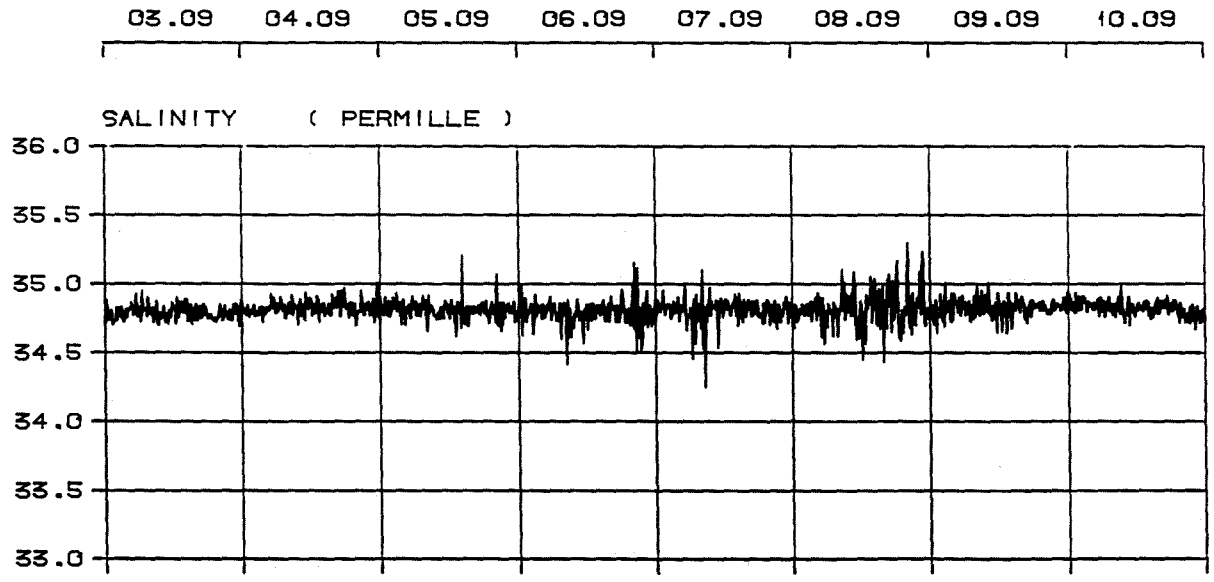
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

H I

Fig. 2-2-8 Temperature and salinity.





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

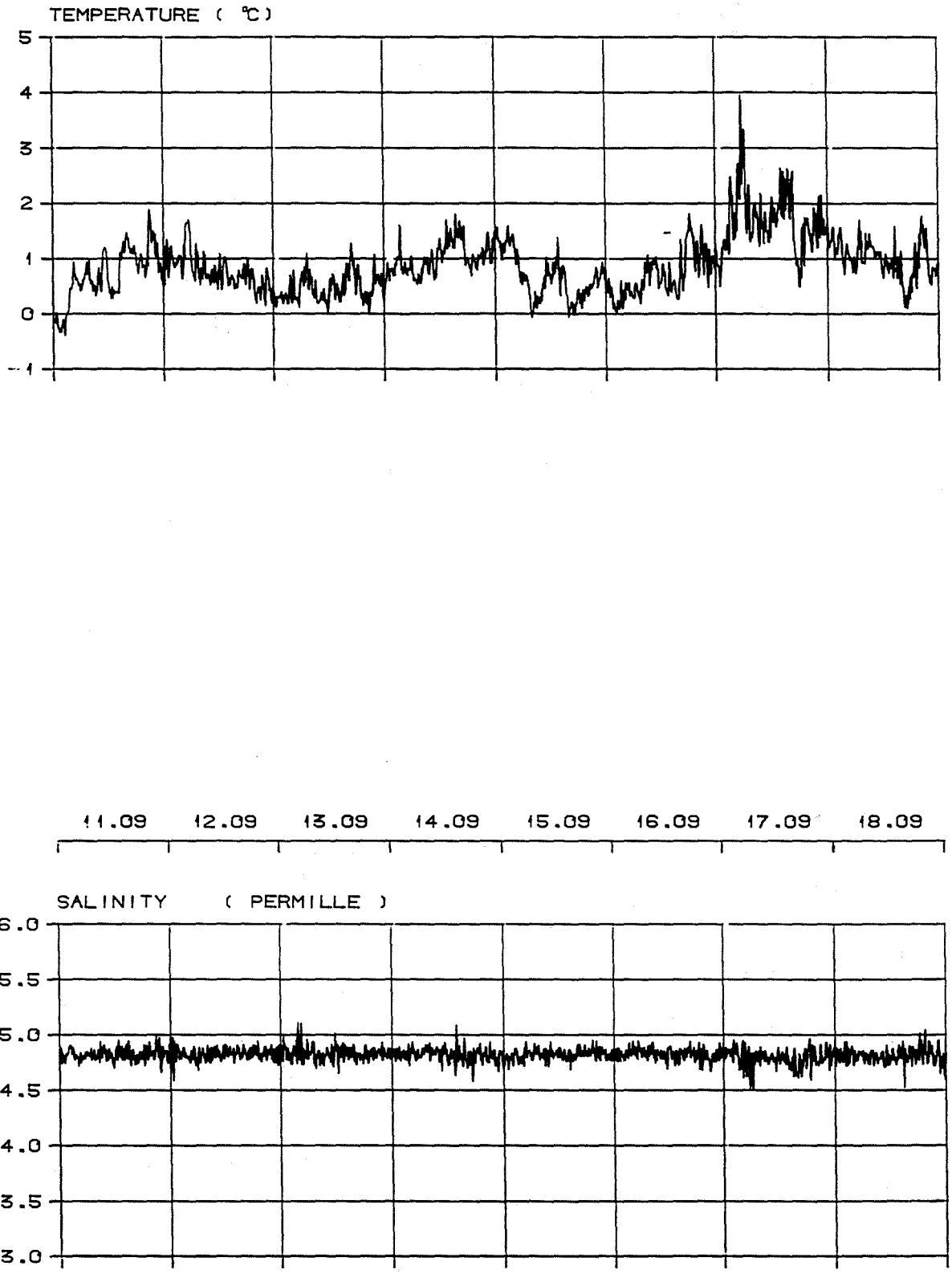
Instrument depth : 45.0 m Bottom depth : 186.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

Fig. 2-2-8

Continues.....



The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 45.0 m Bottom depth : 186.0 m

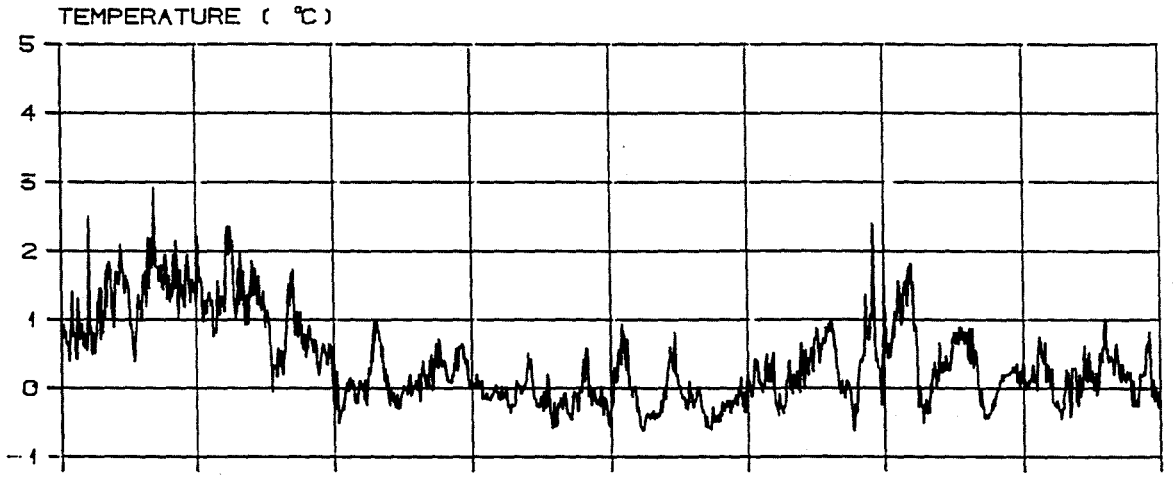
Time interval : 10.00 minutes.

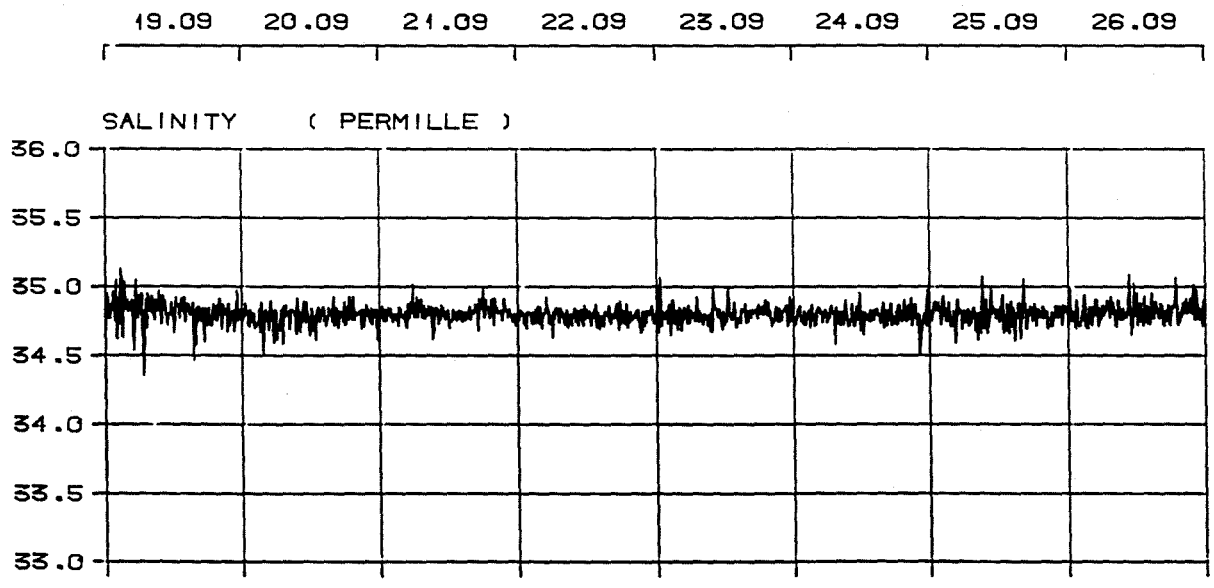
Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

H 1

Fig. 2-2-8

Continues.....





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

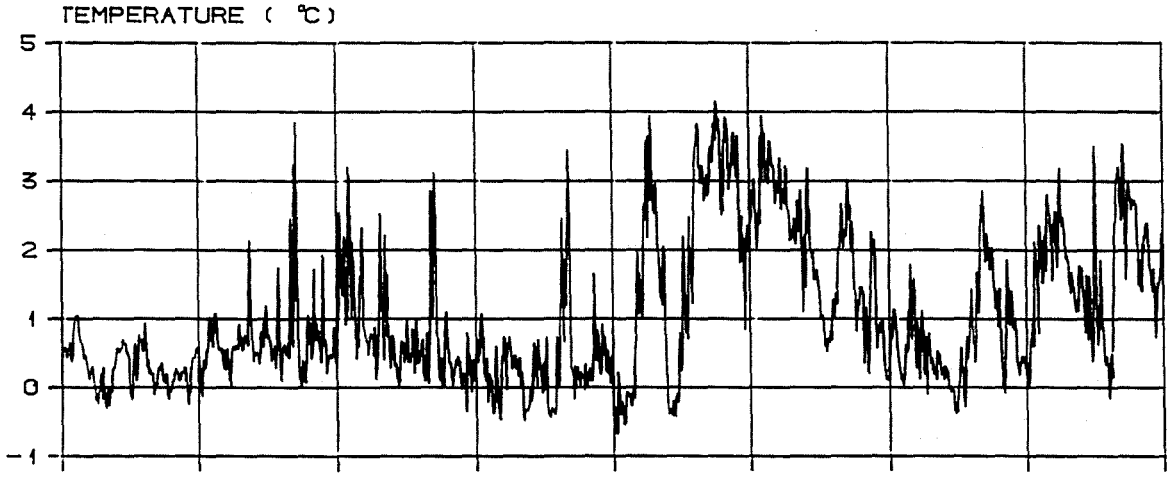
Instrument depth : 45.0 m Bottom depth : 186.0 m

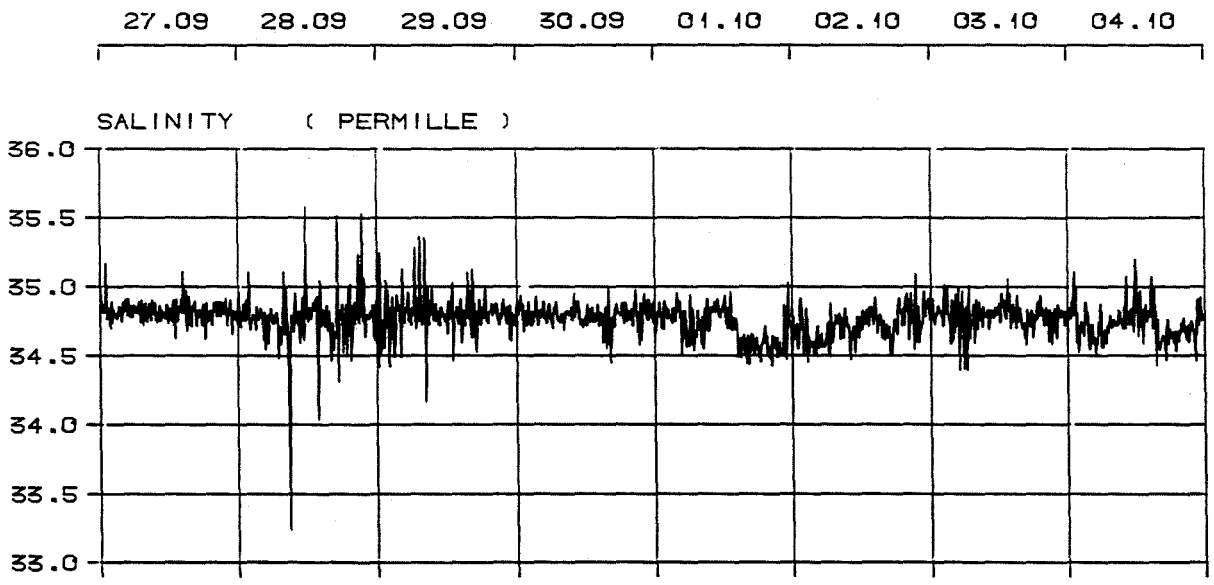
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

Fig. 2-2-8

Continues.....





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 45.0 m Bottom depth : 186.0 m

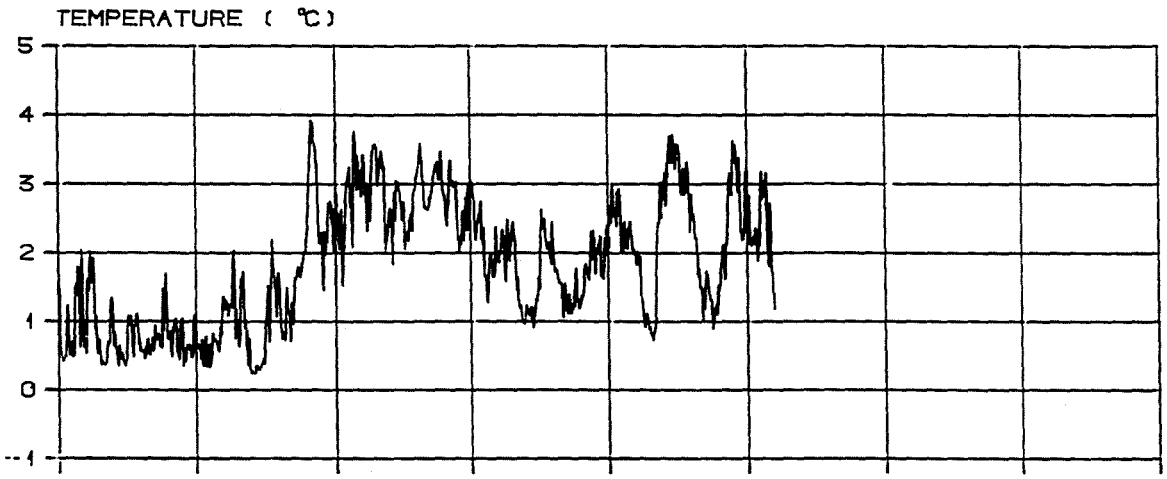
Time interval : 10.00 minutes.

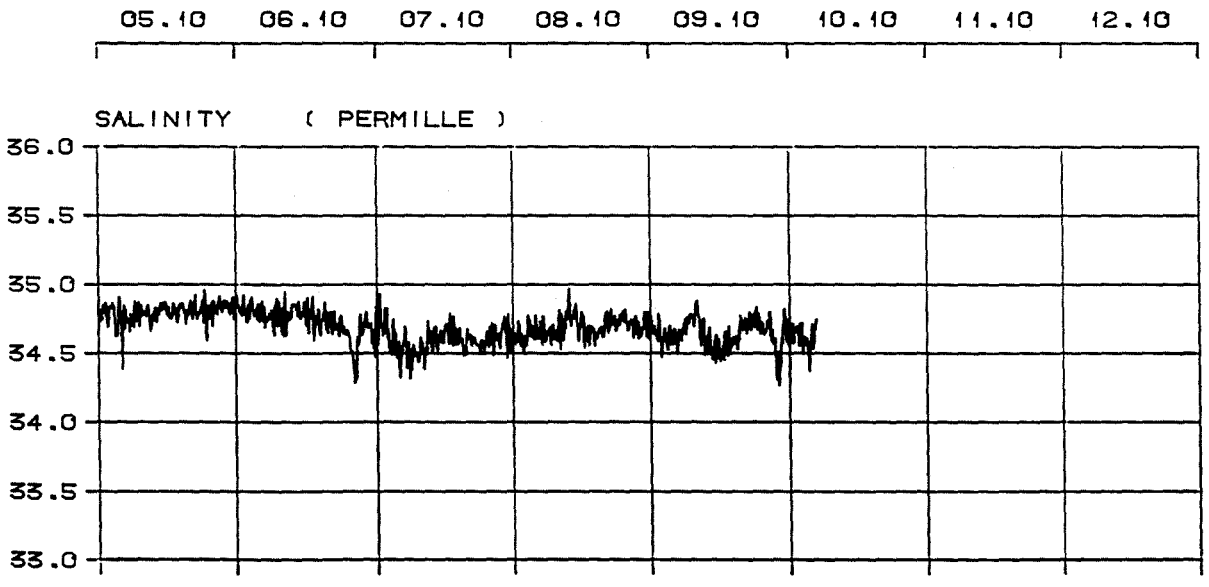
Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

H I

Fig. 2-2-8

Continues.....





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 45.0 m Bottom depth : 186.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

H 1

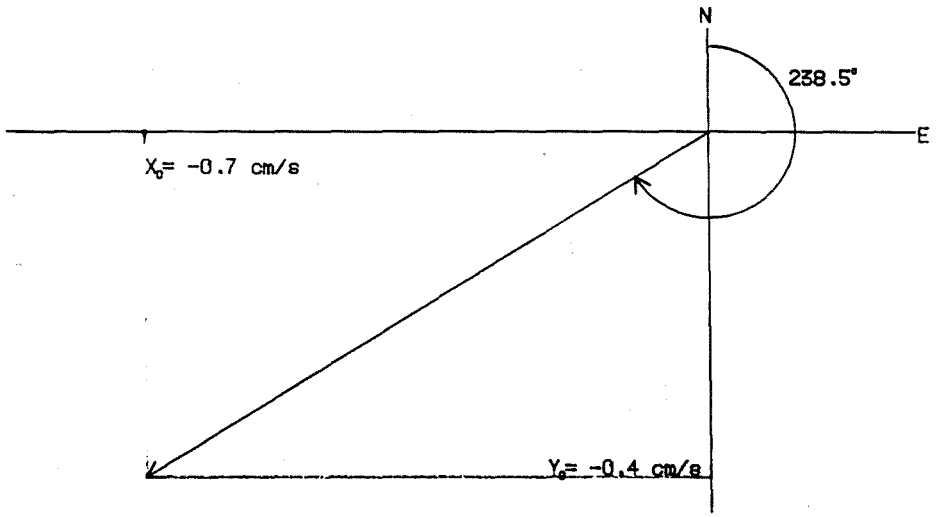
Fig. 2-2-8

Continues.....

HARMONIC ANALYSIS OF CURRENTS

CONSTITUENTS			DECOMPOSED CURRENT				TIDAL CURRENT ELLIPSE				
			E/W		N/S						
Symbol	Period hours	Frequense °/hour	X_j cm/s	g_{xj} °	Y_j cm/s	g_{yj} °	Major axis A_j cm/s	Minor axis B_j cm/s	θ_j °	g_j °	BETA. °
K1	23.93	15.0	0.8	224.9	1.0	88.6	1.1	-0.4	143.2	252.4	116.3
N2	12.66	28.4	1.1	86.8	0.6	325.3	1.2	-0.5	110.5	95.6	55.6
M2	12.42	29.0	7.5	63.6	6.7	319.9	8.2	-6.3	121.6	88.7	50.6
L2	12.19	29.5	1.0	334.0	1.1	244.1	1.3	-1.1	0.3	244.4	48.8
S2	12.00	30.0	3.1	128.3	2.1	36.2	3.1	-2.1	92.5	130.0	40.0

MEAN CURRENT



The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 45.0 m Bottom depth : 186.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

H 1

Fig. 2-2-9 Harmonic analysis of currents.

A discription of the model and its definitions :

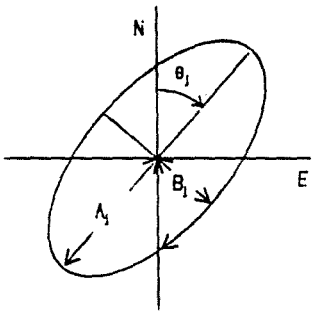
Current-vector decomposed in E/W (real) - and N/S (imaginary) - direction :

$$Z(t)=X_0+\sum_{j=1}^{n}(X_j\cos(\sigma_j t+(V_0+u)_j-g_{xj})+i(Y_0+\sum_{j=1}^{n}Y_j\cos(\sigma_j t+(V_0+u)_j-g_{yj}))$$

g_{xj} , g_{yj} : Greenwich-phase for E/W- and N/S-components of each constituent.

With ellipseparameters :

$$Z(t)=\sum_{j=1}^{n}\exp(i(90^\circ-\theta_j))(A_j\cos(\sigma_j t+(V_0+u)_j-g_j)+iB_j\sin(\sigma_j t+(V_0+u)_j-g_j))$$



g_j : Greenwich phase of the current-vector for each constituent.

Rotationdirection : anticlockwise when $B_j > 0$, clockwise when $B_j < 0$

BETA : The angle between t=0 and major half axis in the ellipse.

Common for both modles :

σ_j : Frequence in degrees/hour.

$(V_0+u)_j$: Astronomic argument relative to Greenwich-meridian.

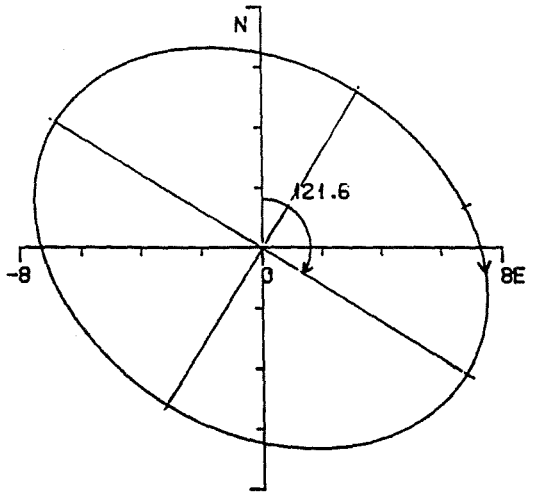
During the calculation of Z(t) will V_0+u be put into the formulas at the time t=0.

The time t is in houres; the same timezone as the analysed data.

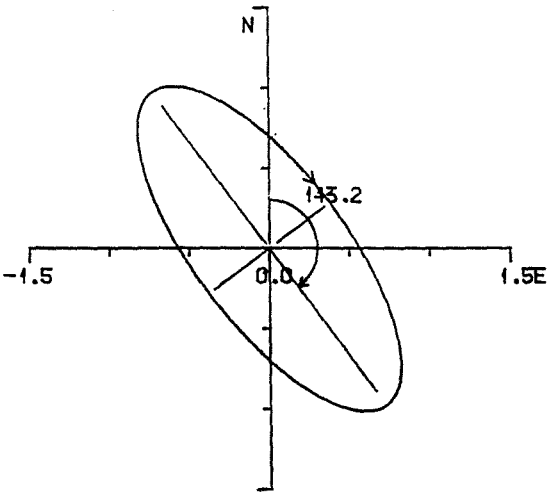
t=0 in the midle of the measurement series : 1989 17.09 H. 1500 ,

marked with a line on the ellipse.

M2-ellipse



K1-ellipse



The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 45.0 m Bottom depth : 186.0 m

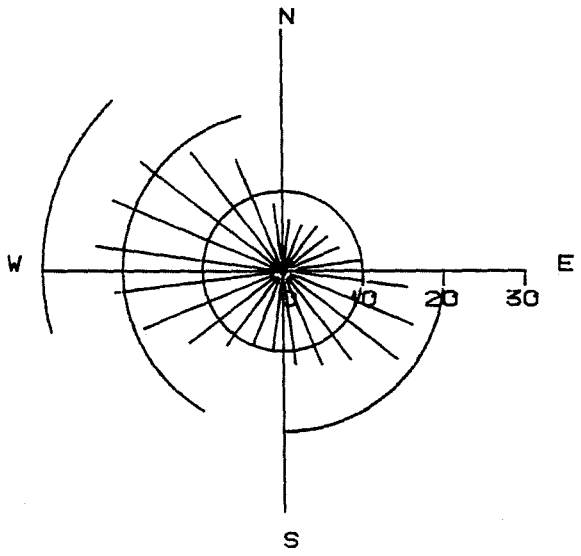
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 10.10 H. 0430

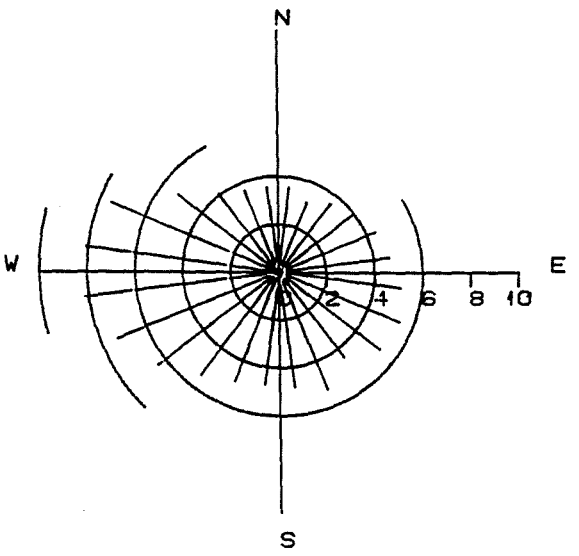
H 1

Fig. 2-2-10 M2 and K1 ellipse.

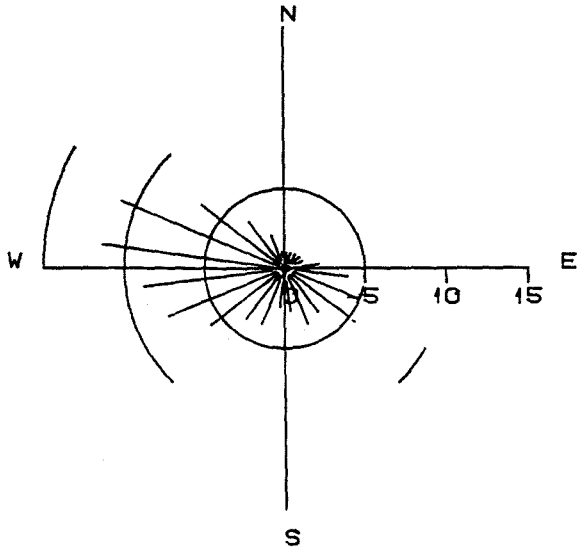
CURRENT VELOCITY DISTRIBUTION



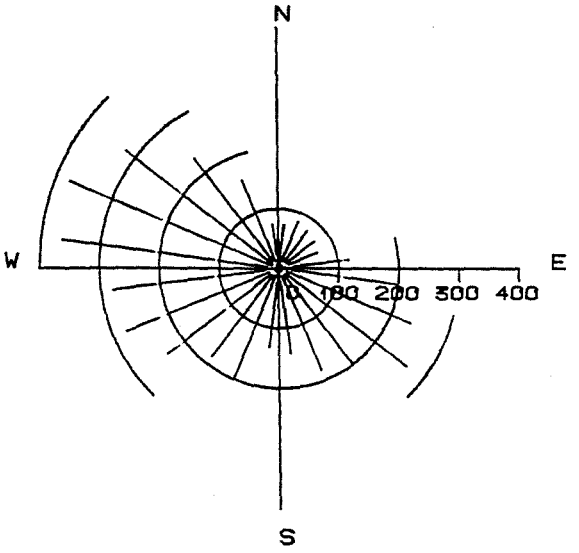
Maksimum velocity (cm/s)



Mean velocity (cm/s)



Relative flux in %



Number measured

Number of obeervatione : 4545

The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 150.0 m Bottom depth : 186.0 m

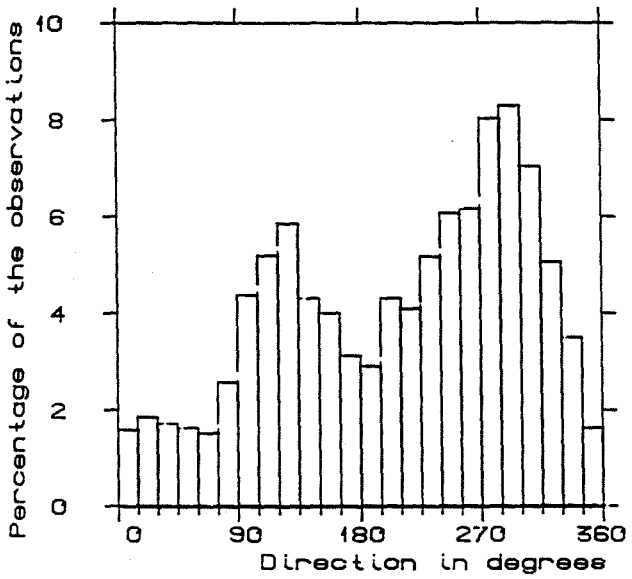
Time interval : 10.00 minutes.

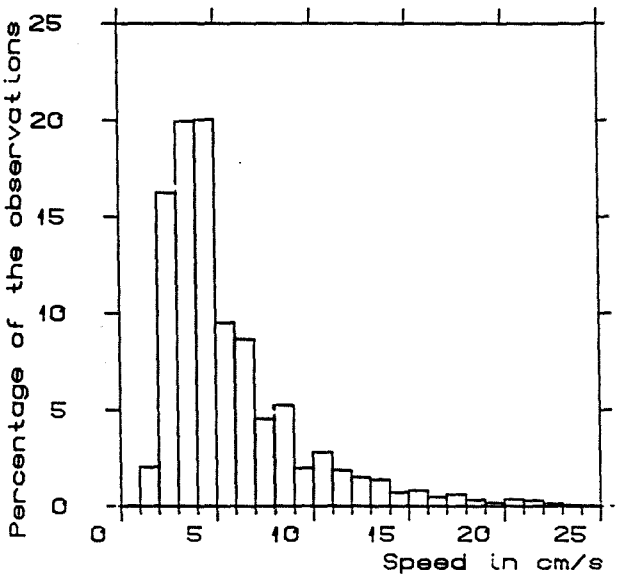
Obeervation period: 1989 26.08 H. 0230 - 1989 26.09 H. 1550

H 1

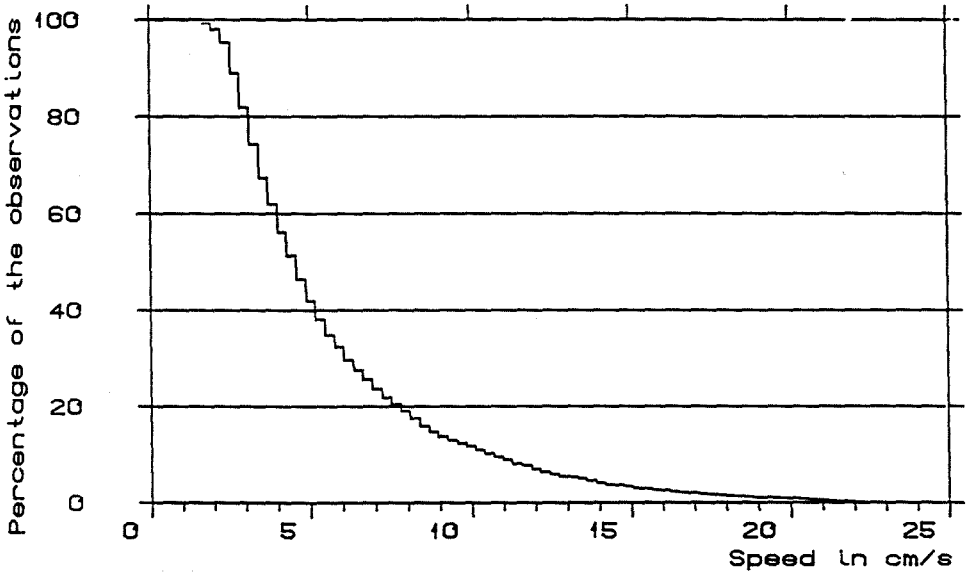
Fig. 2-3-1 Current velocity distribution.

HISTOGRAM





CURRENT SPEED DISTRIBUTION



Number of observations : 4545

The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 150.0 m Bottom depth : 186.0 m

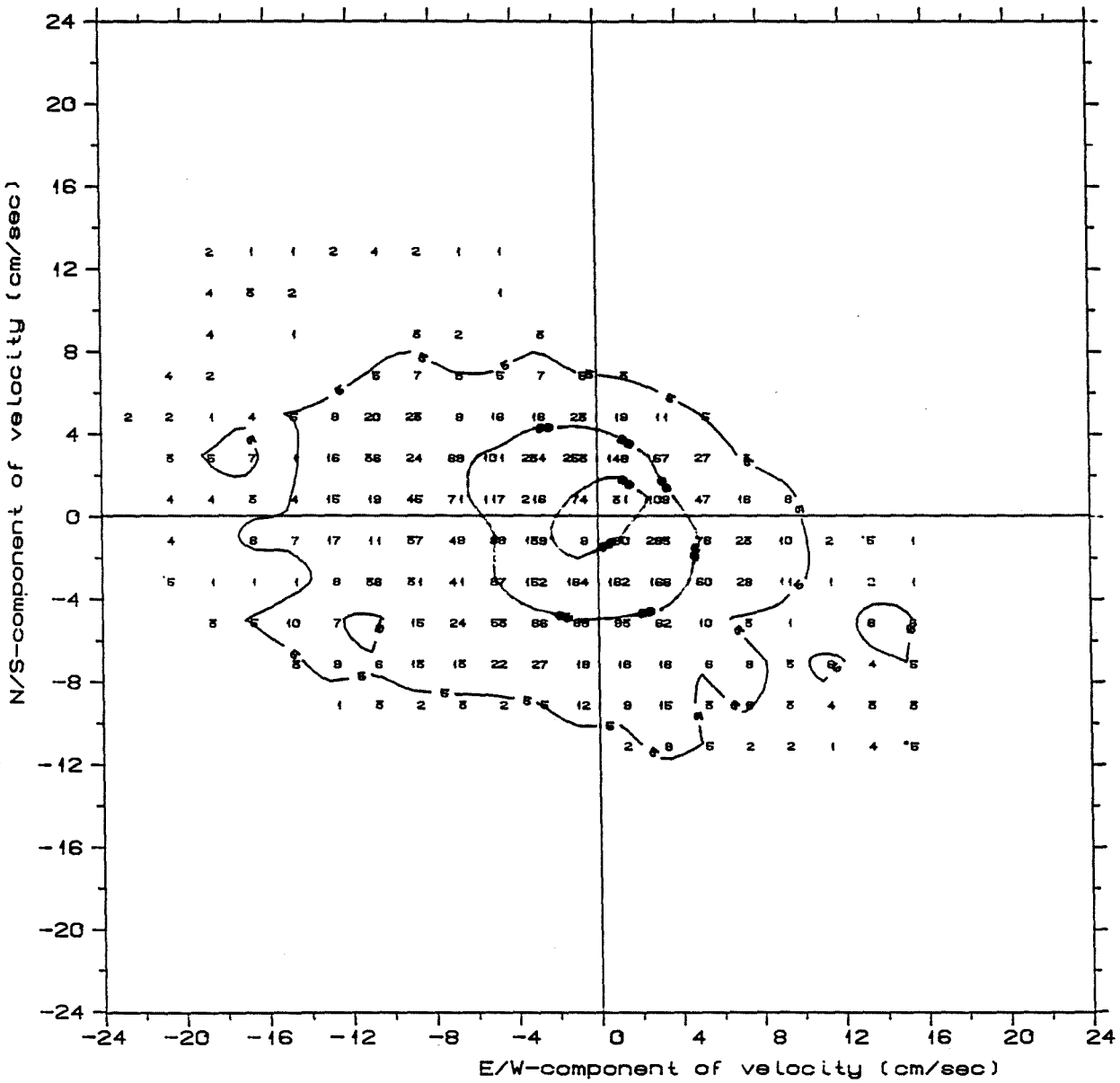
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 26.09 H. 1550

H 1

Fig. 2-3-2 Histogram of speed and direction. Current speed distribution.

VELOCITY DISTRIBUTION DIAGRAM



Number of observations : 4545

Isoline for 50% and 96%

Number of observations : 4545

The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 150.0 m Bottom depth : 186.0 m

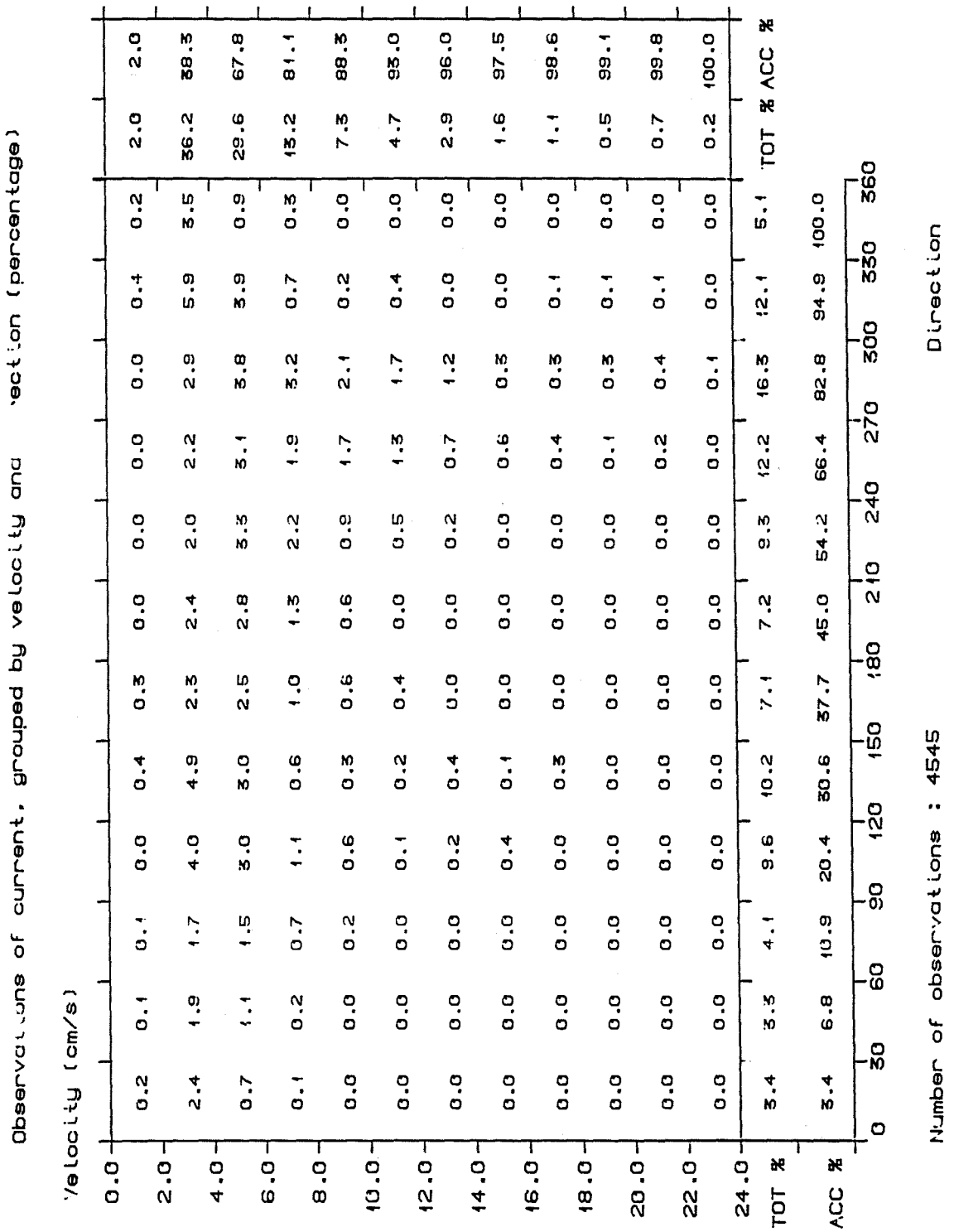
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 26.09 H. 1550

H 1

Fig. 2-3-3 Velocity distribution diagram.

DIRECTION DISTRIBUTION OF CURRENT VELOCITY



Number of observations : 4545

The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

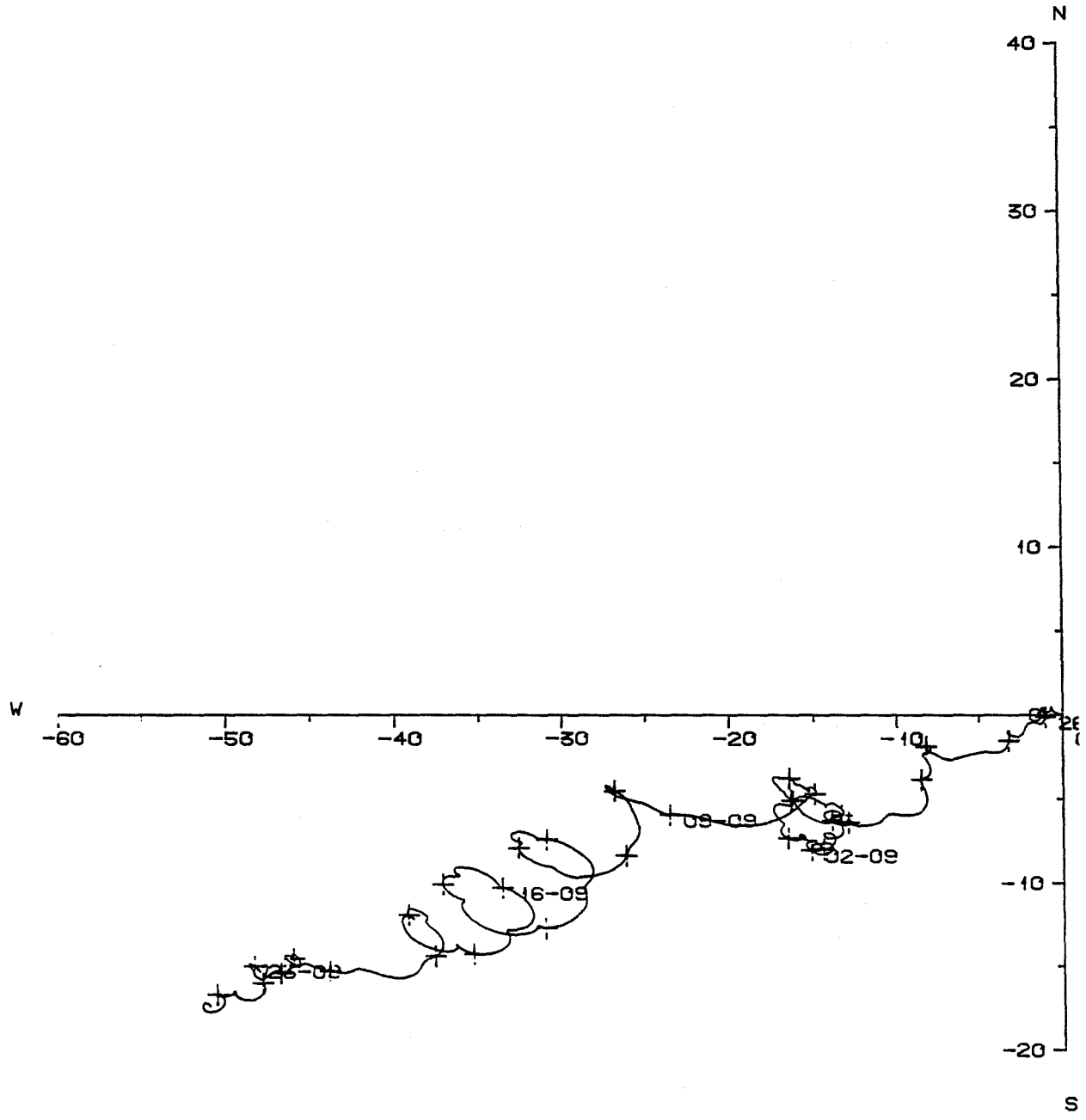
Instrument depth : 150.0 m Bottom depth : 186.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 26.09 H. 1550

Fig. 2-3-4 Velocity distribution table.

PROGRESSIVE VECTOR DIAGRAM



Units in km

Number of observations : 4545

The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

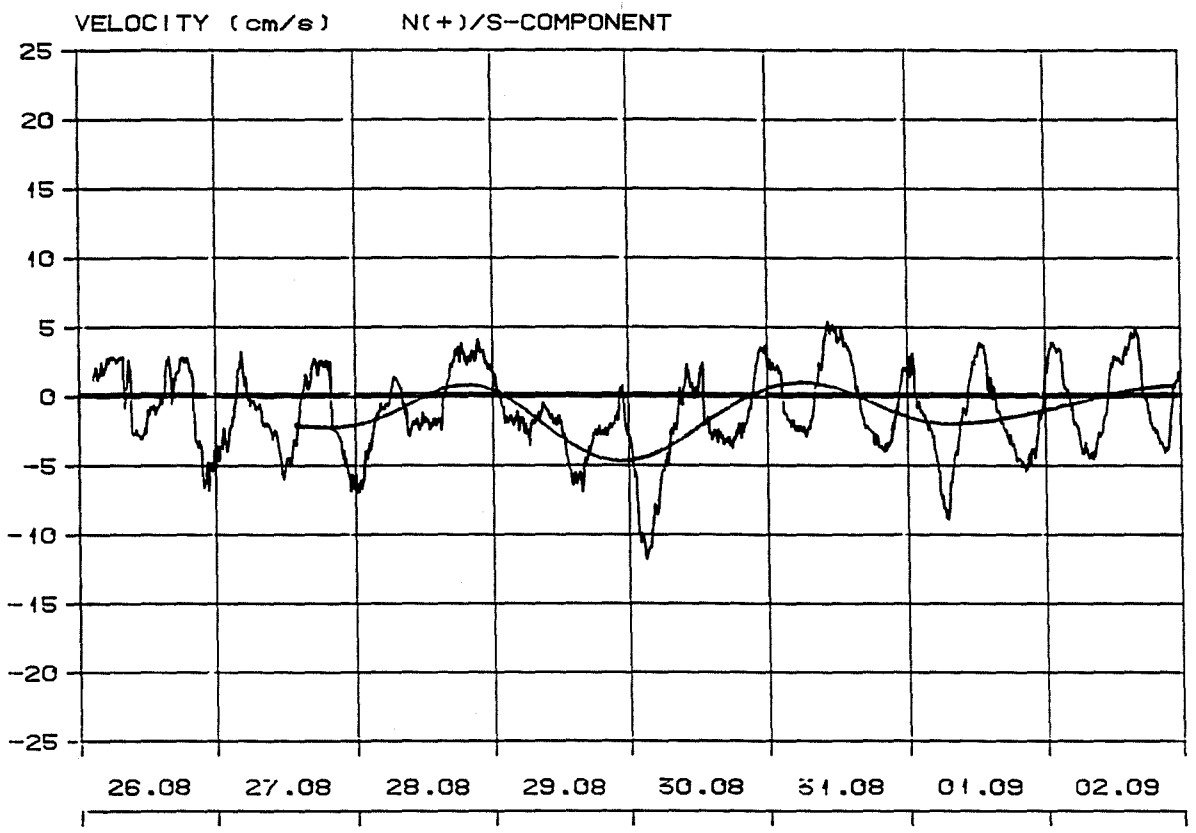
Instrument depth : 150.0 m Bottom depth : 186.0 m

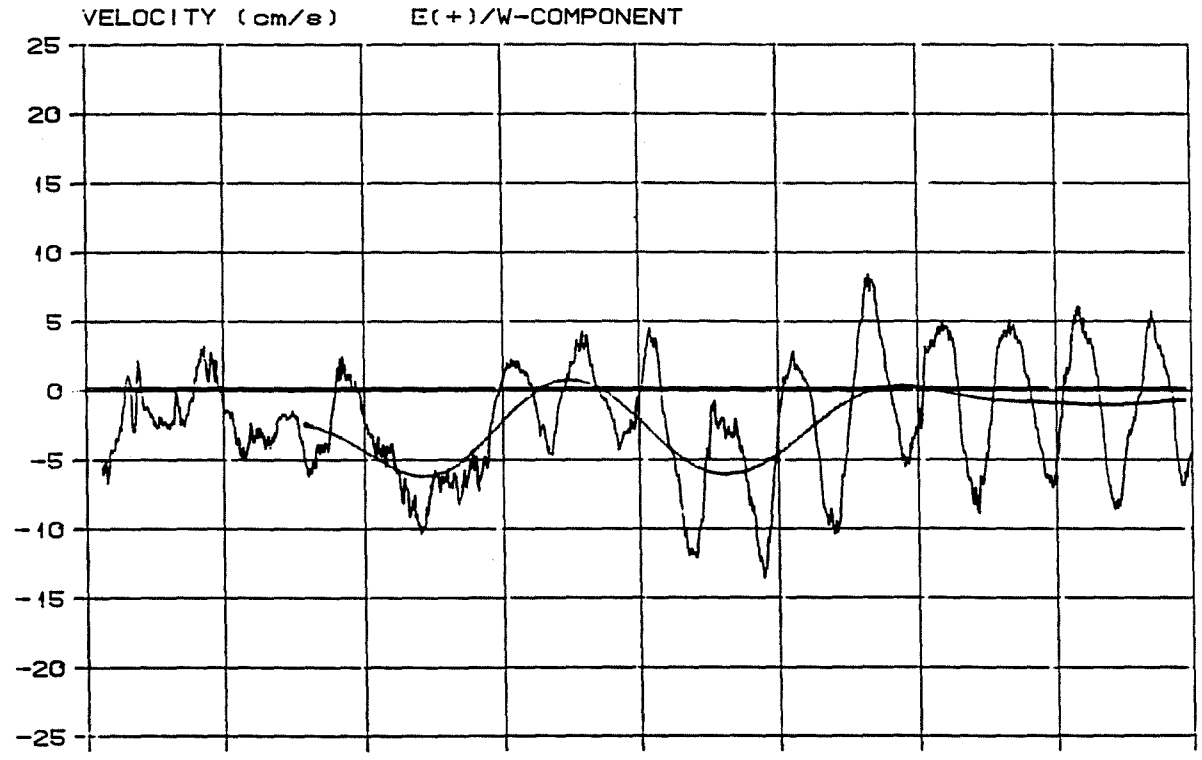
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 26.09 H. 1550

H 1

Fig. 2-3-5 Progressive vector diagram.





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

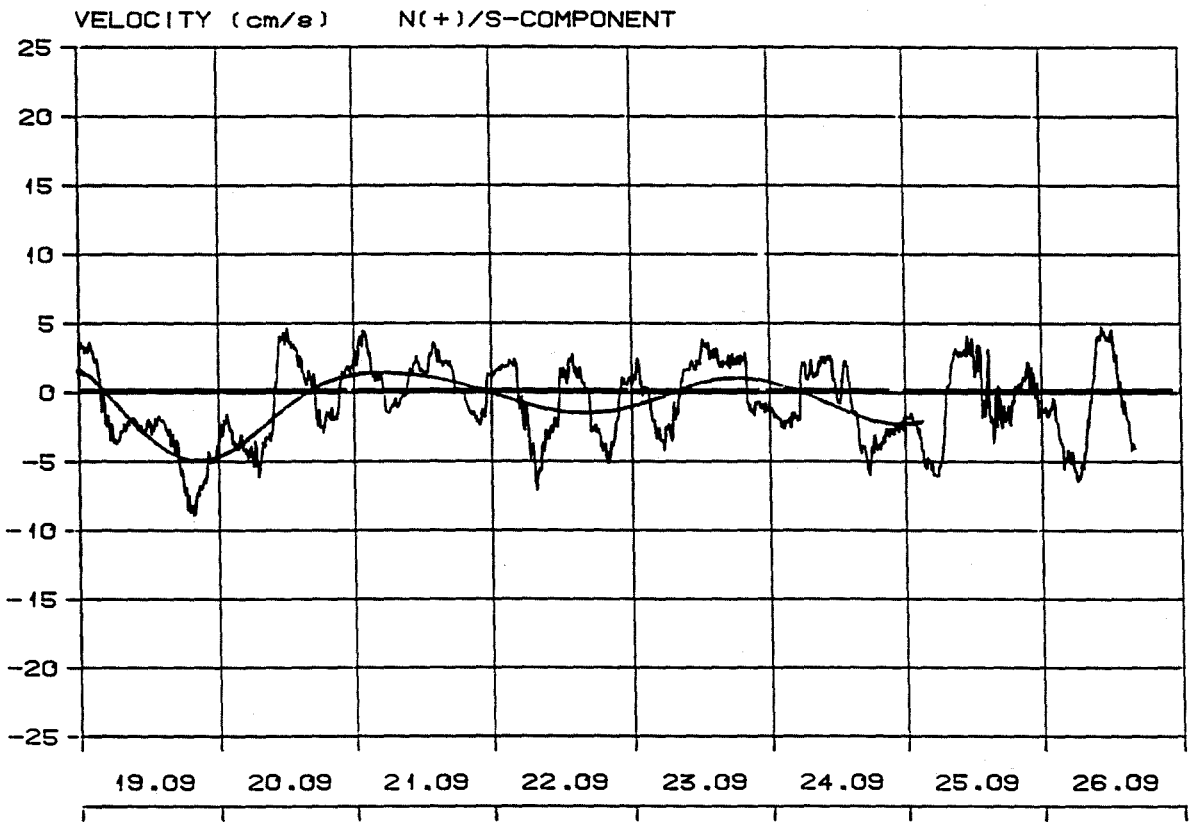
Instrument depth : 150.0 m Bottom depth : 186.0 m

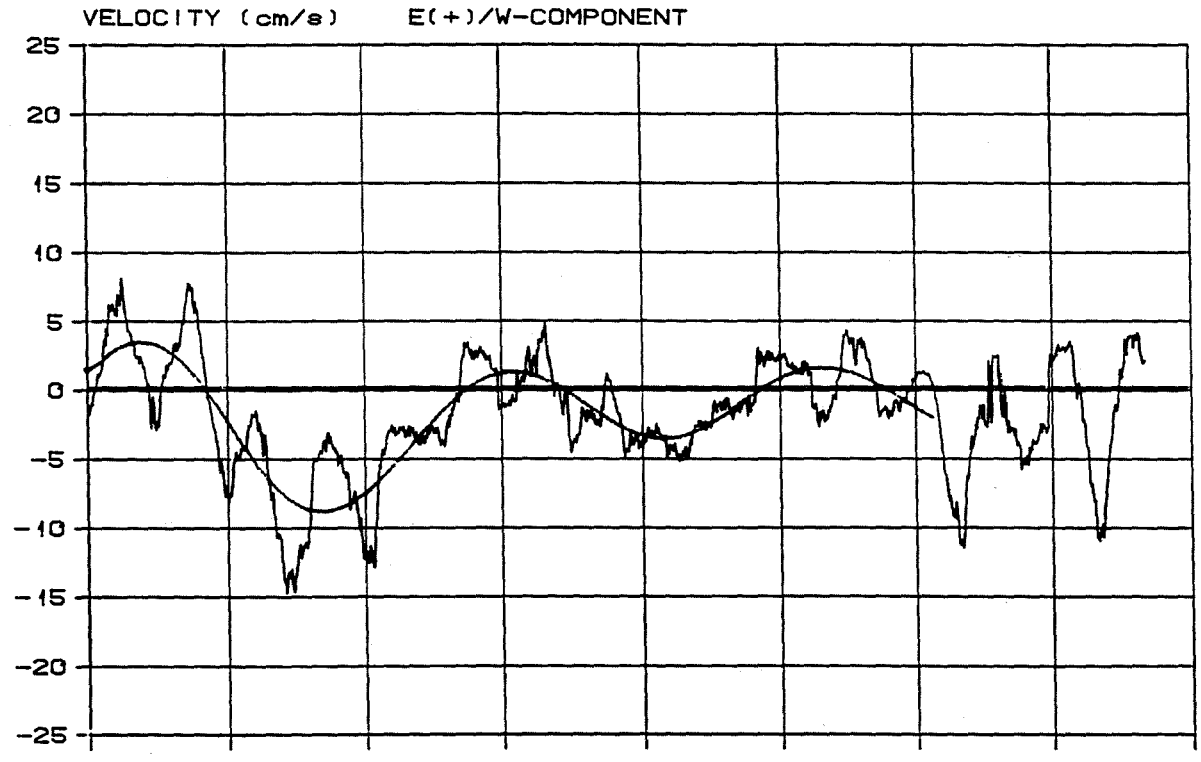
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 26.09 H. 1550

H I

Fig. 2-3-6 N/S and E/W components of current.





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 150.0 m Bottom depth : 186.0 m

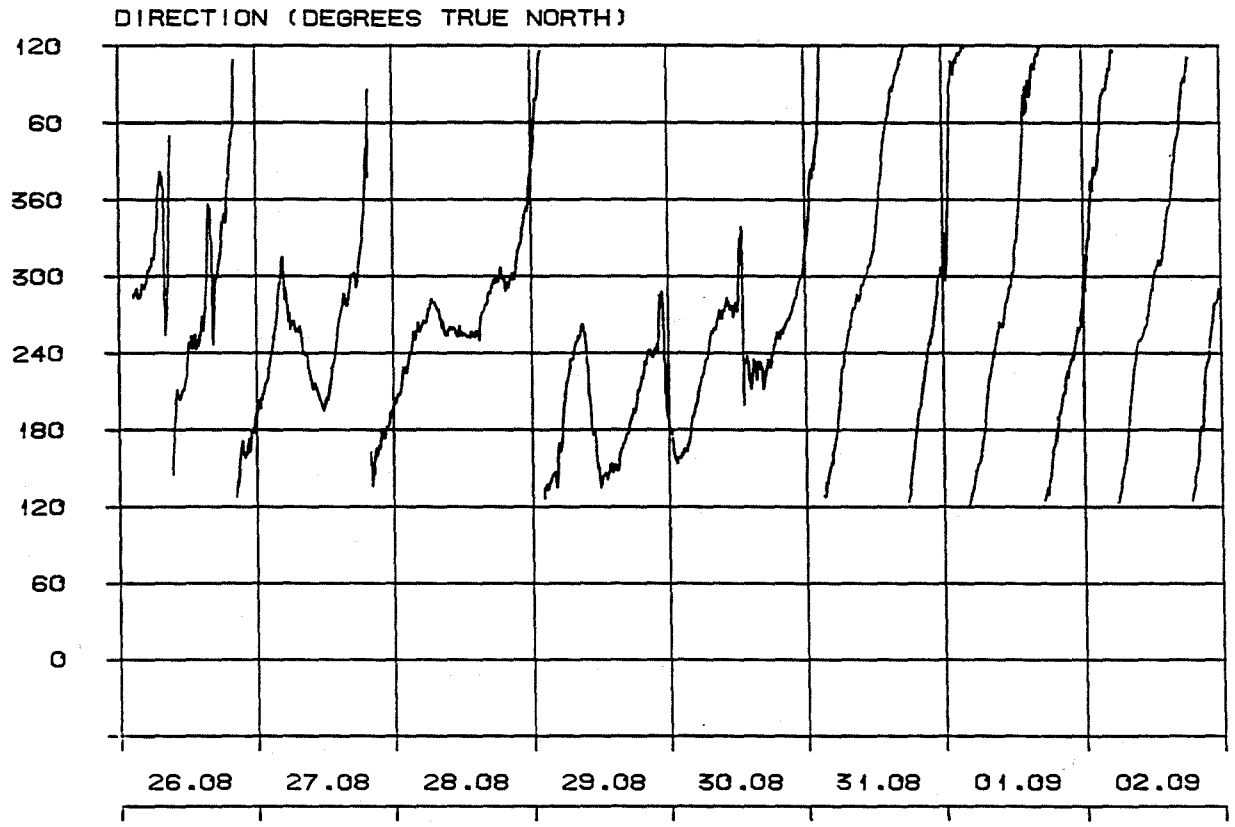
Time interval : 10.00 minutes.

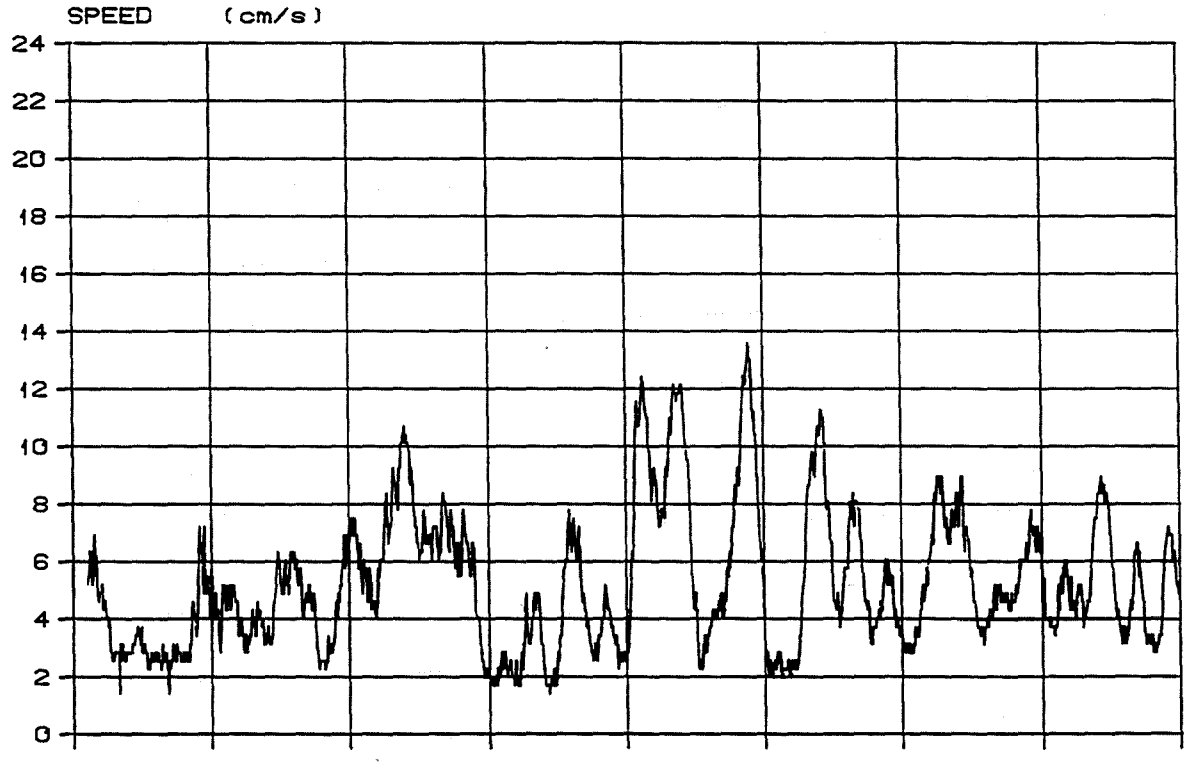
Observation period: 1989 26.08 H. 0230 - 1989 26.09 H. 1550

H 1

Fig. 2-3-6

Continues.....





The Barents Sea

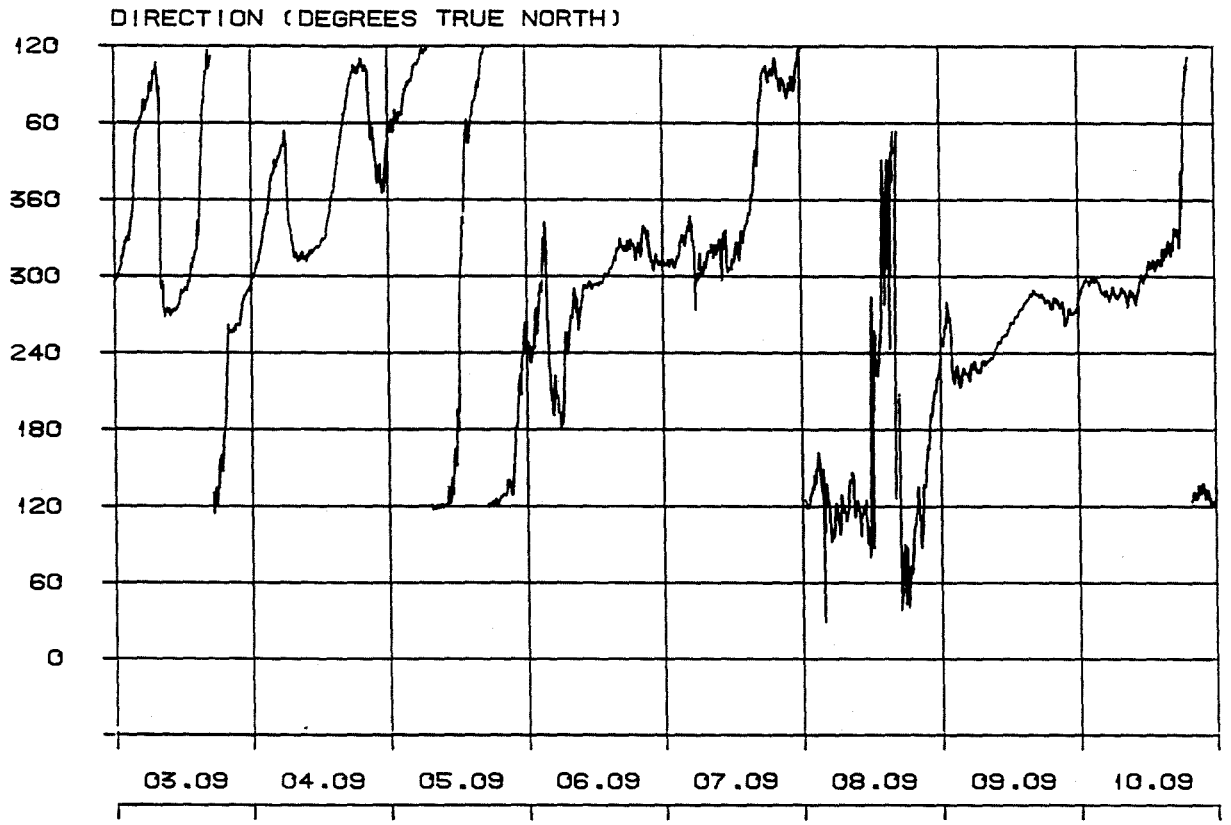
Position : N 74° 29.90' E 39° 57.90'

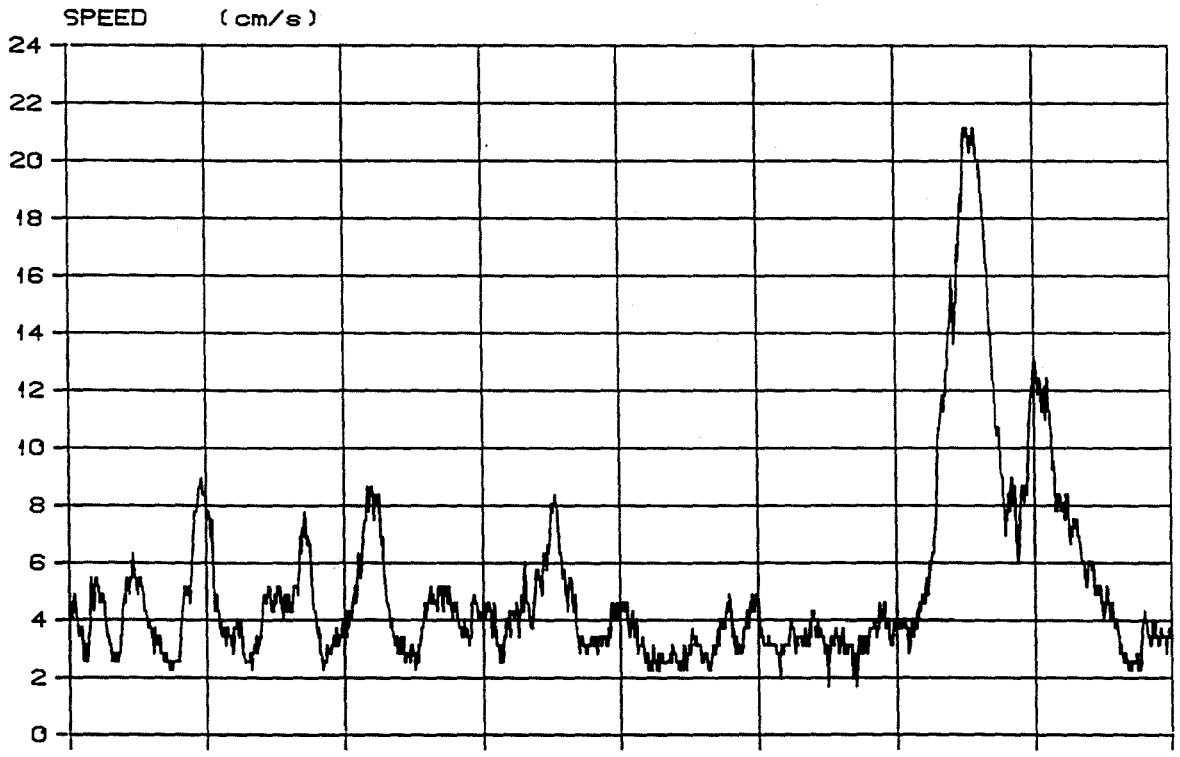
Instrument depth : 150.0 m Bottom depth : 186.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 26.09 H. 1550

Fig. 2-3-7 Speed and direction of current.





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 150.0 m Bottom depth : 186.0 m

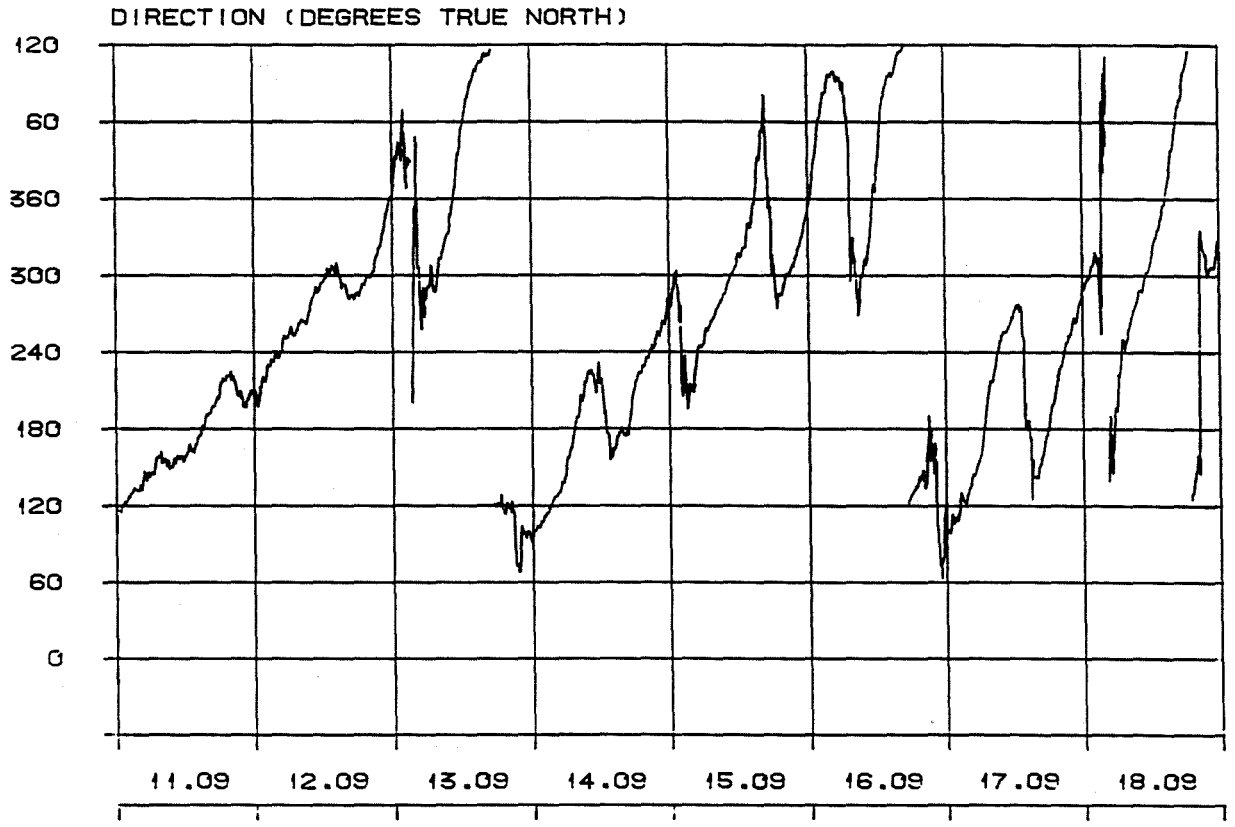
Time interval : 10.00 minutes.

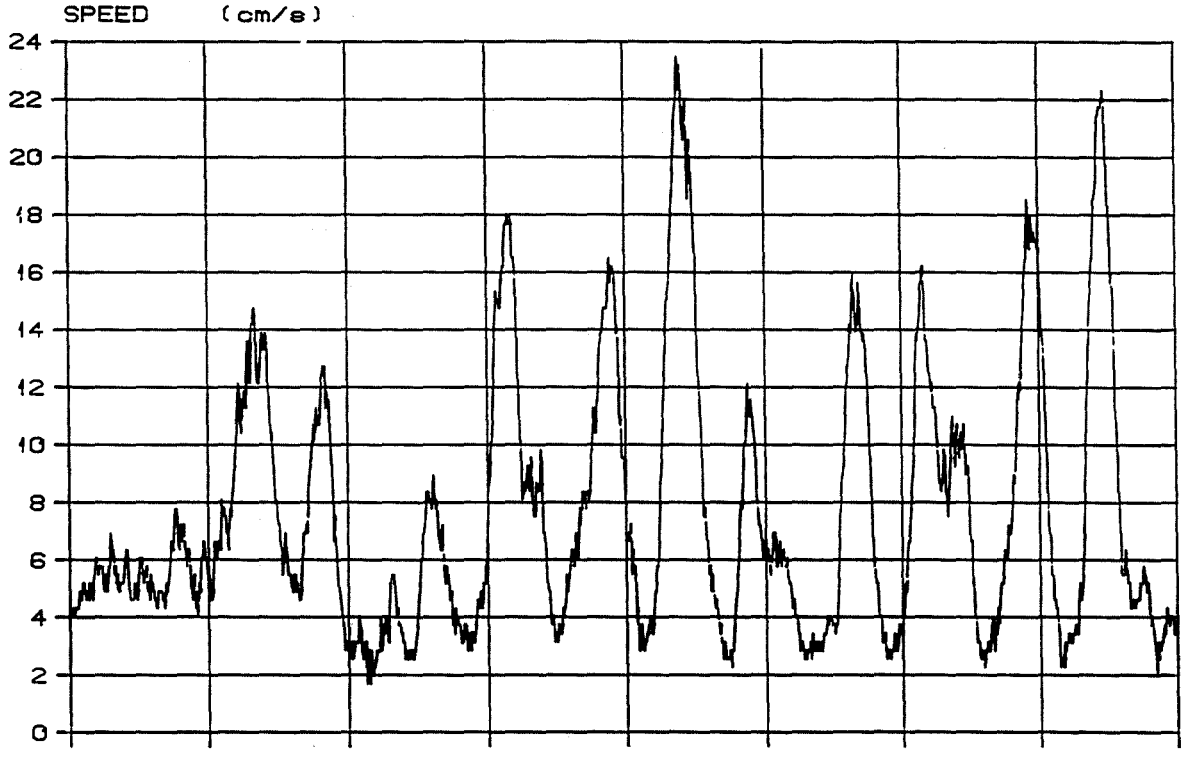
Observation period: 1989 26.08 H. 0230 - 1989 26.09 H. 1550

H 1

Fig. 2-3-7

Continues.....





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

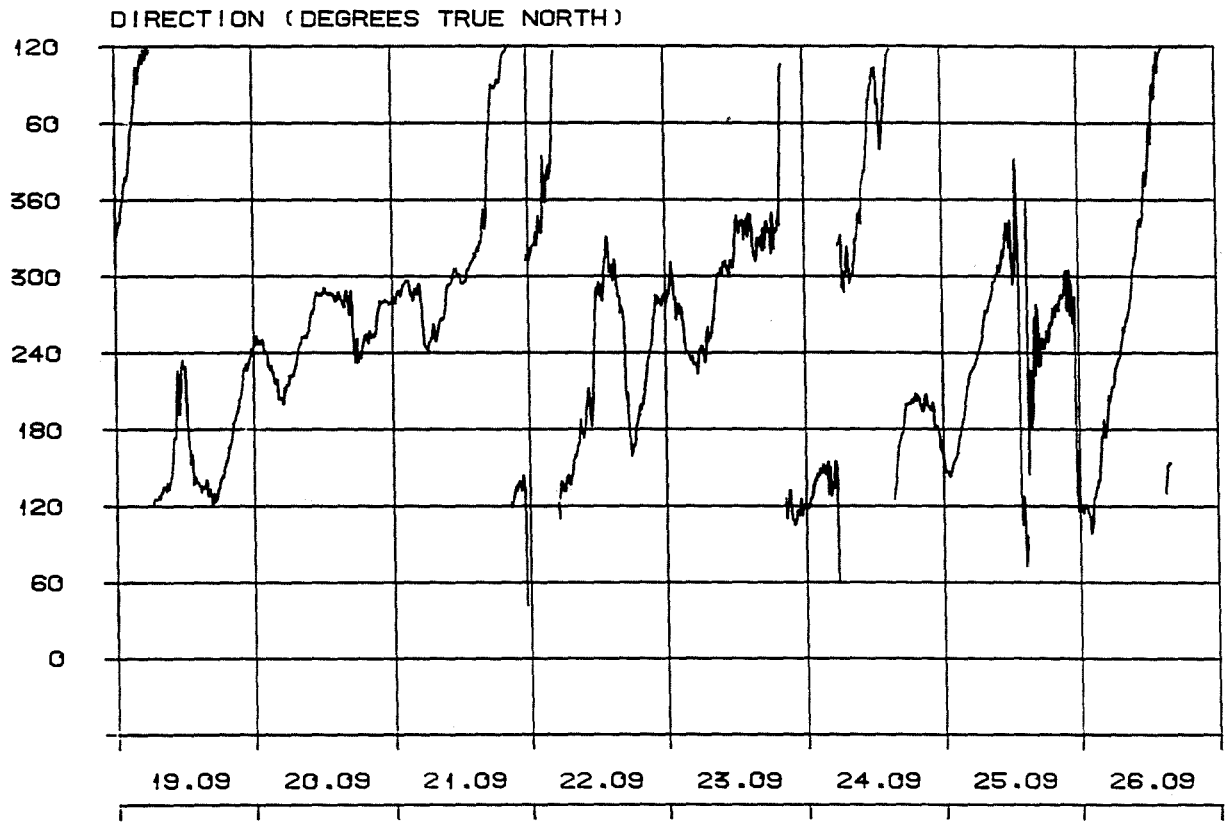
Instrument depth : 150.0 m Bottom depth : 186.0 m

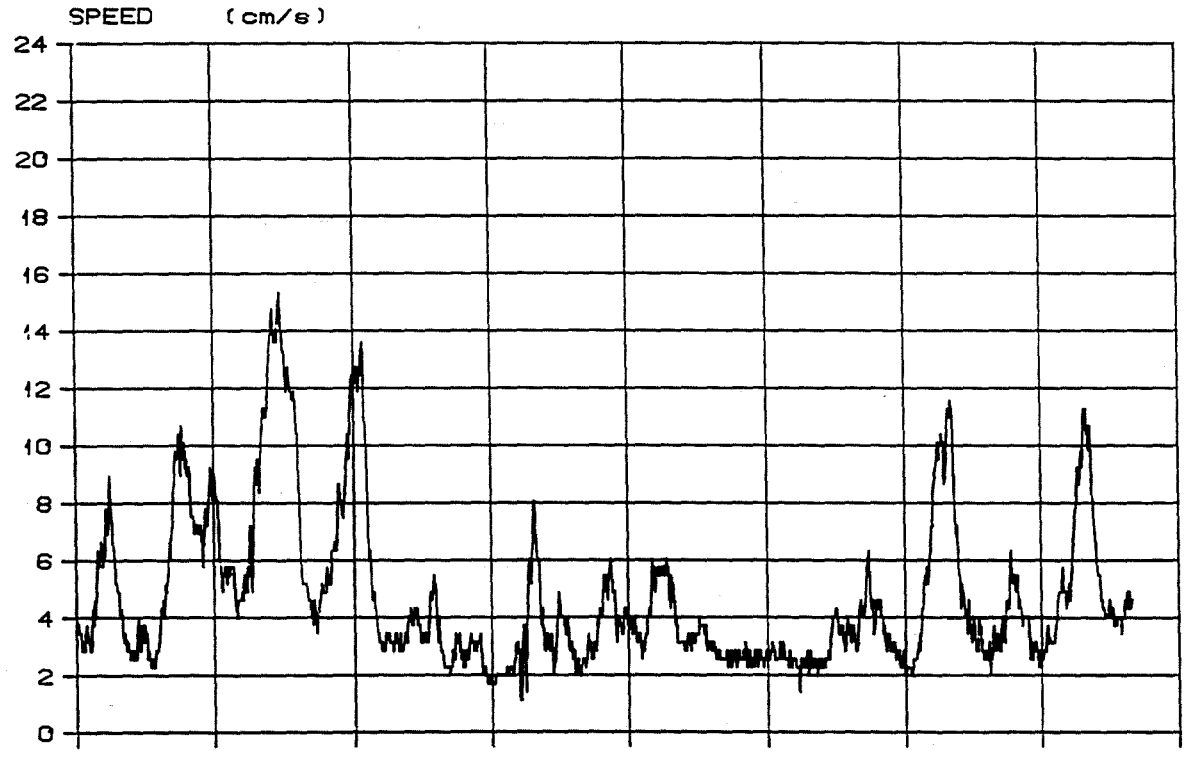
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 26.09 H. 1550

Fig. 2-3-7

Continues.....





The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 150.0 m Bottom depth : 186.0 m

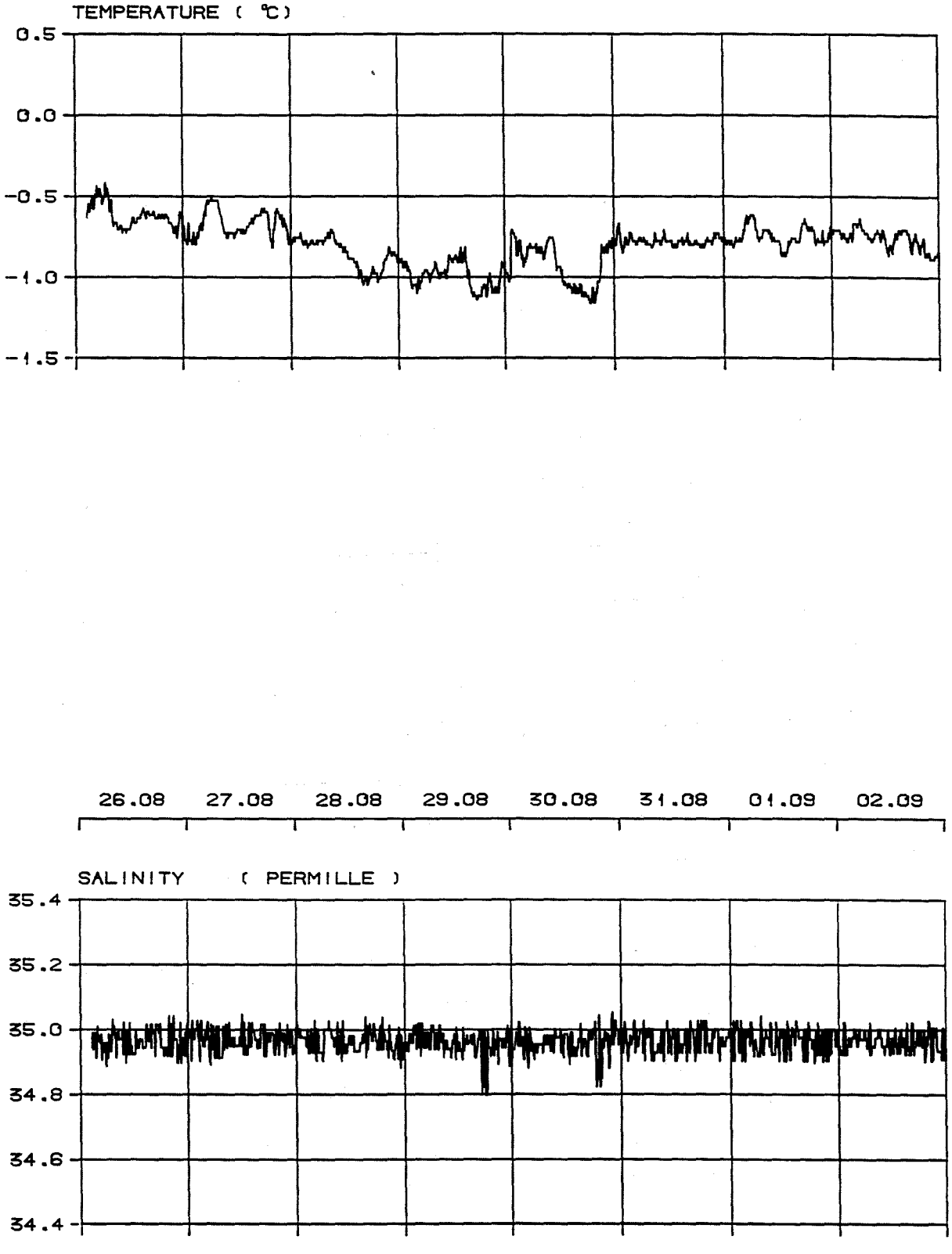
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 26.09 H. 1550

H 1

Fig. 2-3-7

Continues.....



The Barents Sea

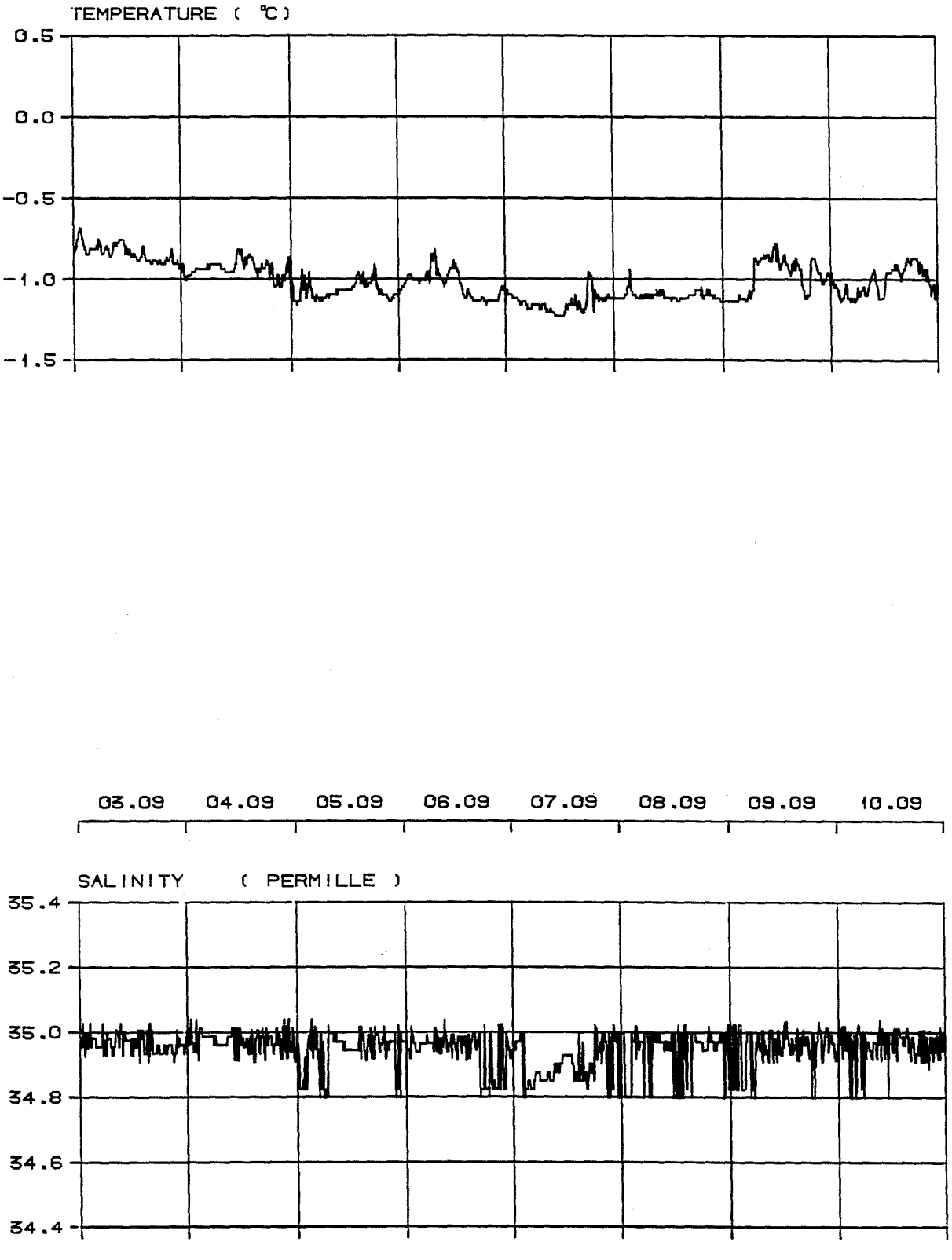
Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 150.0 m Bottom depth : 186.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 26.09 H. 1550

Fig. 2-3-8 Temperature and salinity.



The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 150.0 m Bottom depth : 186.0 m

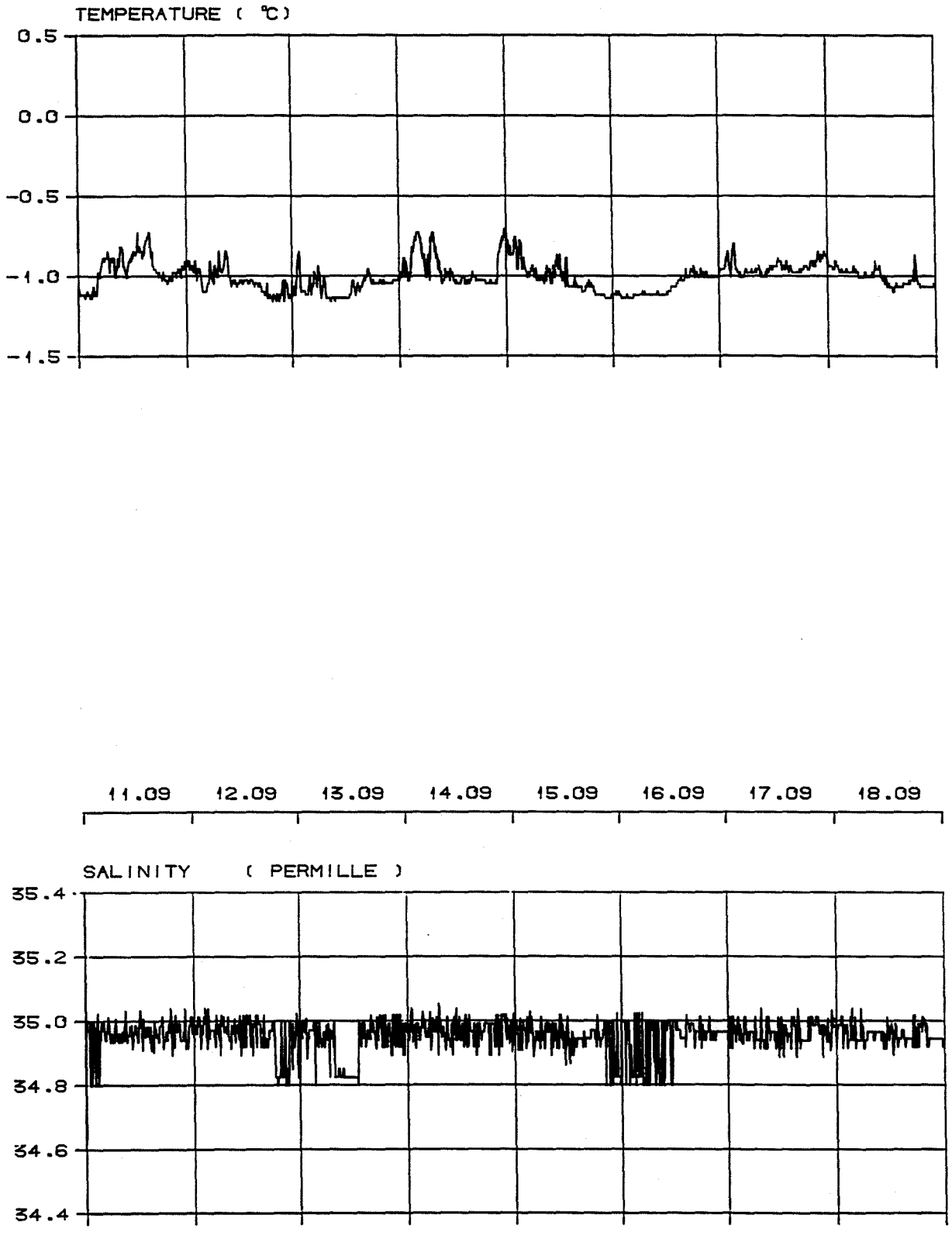
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 26.09 H. 1550

H 1

Fig. 2-3-8

Continues.....



The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

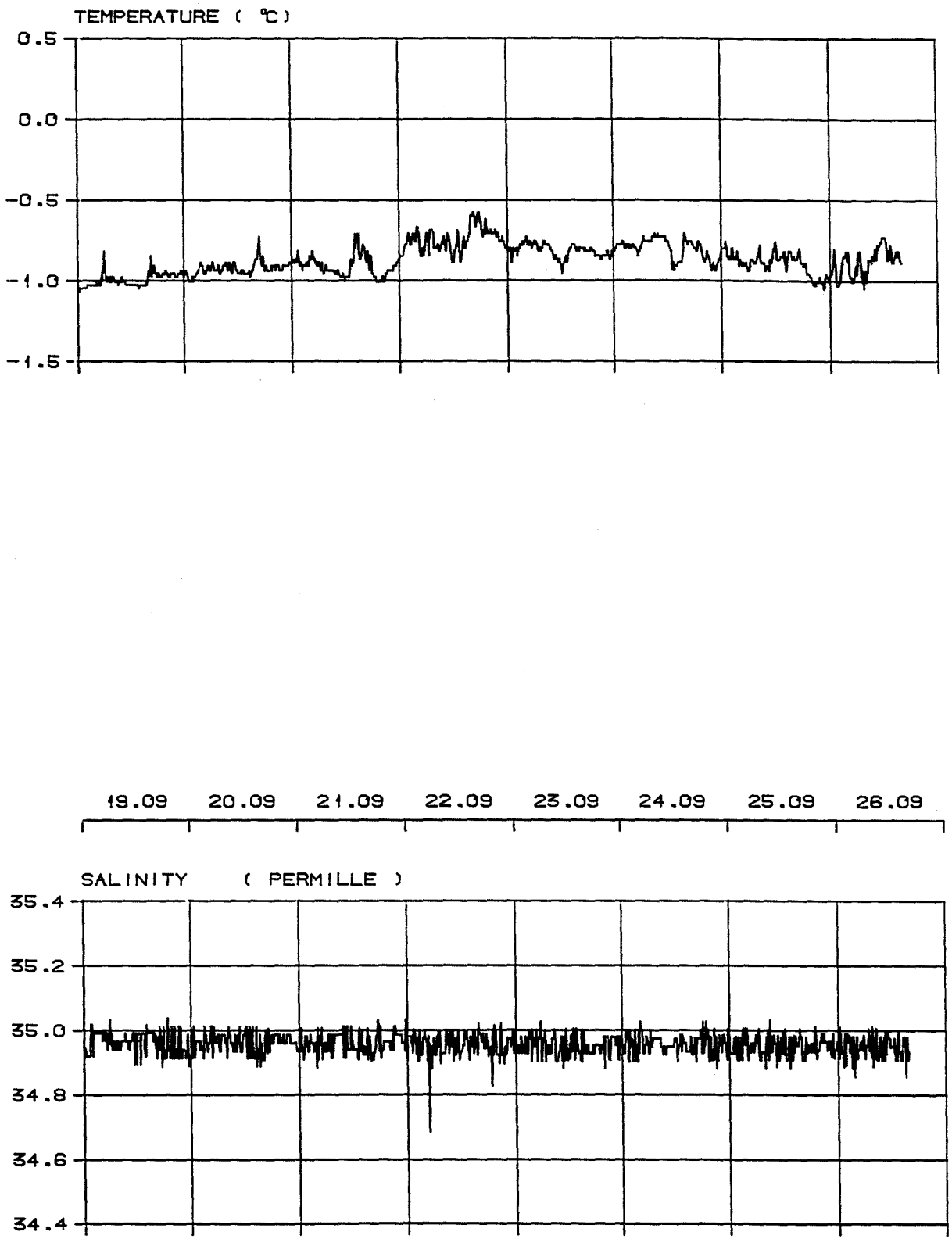
Instrument depth : 150.0 m Bottom depth : 186.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 26.09 H. 1550

Fig. 2-3-8

Continues.....



The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 150.0 m Bottom depth : 186.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 26.09 H. 1550

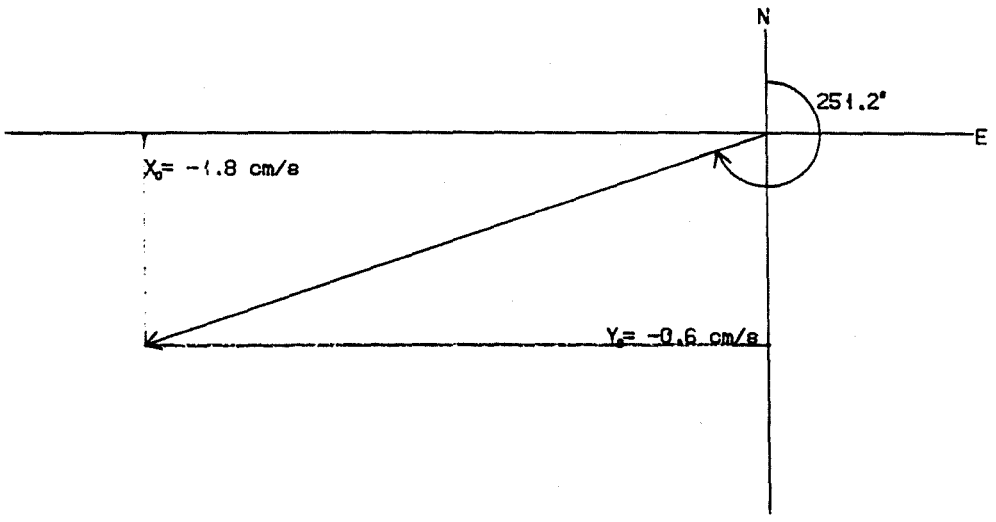
Fig. 2-3-8

Continues.....

HARMONIC ANALYSIS OF CURRENTS

CONSTITUENTS			DECOMPOSED CURRENT				TIDAL CURRENT ELLIPSE				
			E/W		N/S		Major axis	Minor axis			
Symbol	Period houres	Frequense °/hour	X_j cm/s	g_{xj} °	Y_j cm/s	g_{yj} °	A_1 cm/s	B_1 cm/s	θ_j °	g_j °	BETA. °
MSF	354.37	1.0	0.8	79.7	0.8	124.8	1.0	0.4	222.6	283.9	35.4
K1	23.93	15.0	1.1	237.4	0.8	121.7	1.1	-0.6	114.1	251.1	31.7
M2	12.42	29.0	3.3	86.5	1.5	321.4	3.5	-1.2	107.5	92.9	70.3
S2	12.00	30.0	2.6	125.9	1.6	19.5	2.7	-1.5	103.8	133.6	43.7

MEAN CURRENT



The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 150.0 m Bottom depth : 186.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 26.09 H. 1550

H 1

Fig. 2-3-9 Harmonic analysis of currents.

A discription of the model and its definitions :

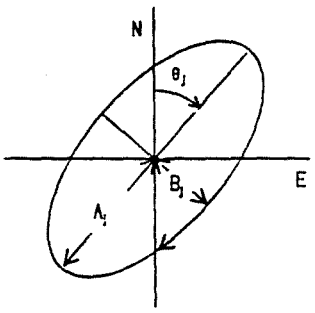
Current-vector decomposed in E/W (real) - and N/S (imaginary) - direction :

$$Z(t)=X_0+\sum_{j}^{n}(X_j\cos(\sigma_j t+(V_0+u)_j-g_{xj})+i(Y_0+\sum_{j}^{n}Y_j\cos(\sigma_j t+(V_0+u)_j-g_{yj}))$$

g_{xj} , g_{yj} : Greenwich-phase for E/W- and N/S-components of each constituent.

With ellipseparameters :

$$Z(t)=\sum_{j}^{n}\exp(i(90^\circ-\theta_j))(A_j\cos(\sigma_j t+(V_0+u)_j-g_j)+iB_j\sin(\sigma_j t+(V_0+u)_j-g_j))$$



g_j : Greenwich phase of the current-vector for each constituent.

Rotationdirection : anticlockwise when $B_j > 0$, clockwise when $B_j < 0$

BETA : The angle between t=0 and major half axis in the ellipse.

Common for both modles :

σ_j : Frequence in degrees/hour.

$(V_0+u)_j$: Astronomic argument relative to Greenwich-meridian.

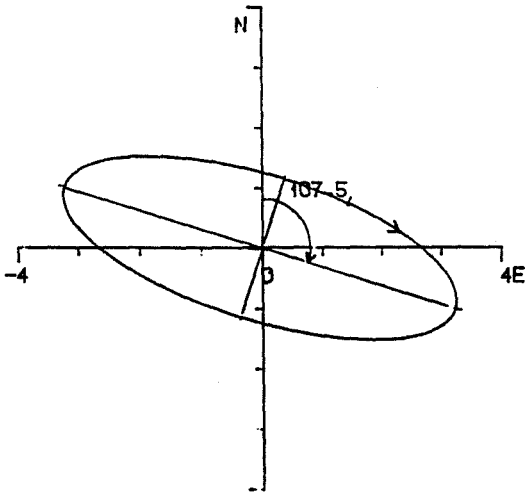
During the calculation of Z(t) will V_0+u be put into the formulas at the time t=0.

The time t is in houres; the same timezone as the analysed data.

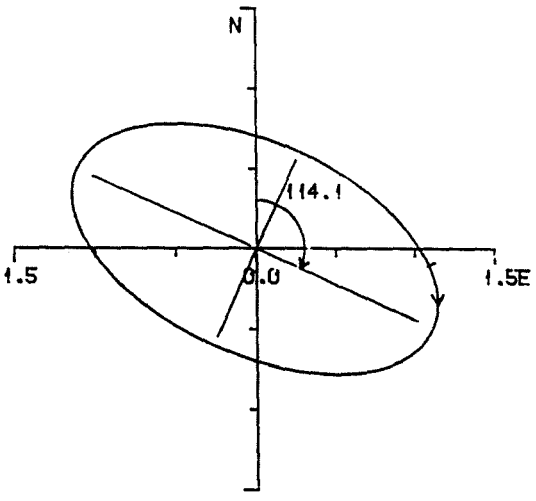
t=0 in the midle of the measurement series : 1989 10.09 H. 2100 ,

marked with a line on the ellipse.

M2-ellipse



K1-ellipse



The Barents Sea

Position : N 74° 29.90' E 39° 57.90'

Instrument depth : 150.0 m Bottom depth : 186.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 0230 - 1989 26.09 H. 1550

H 1

Fig. 2-3-10 M2 and K1 ellipse.

Appendix D

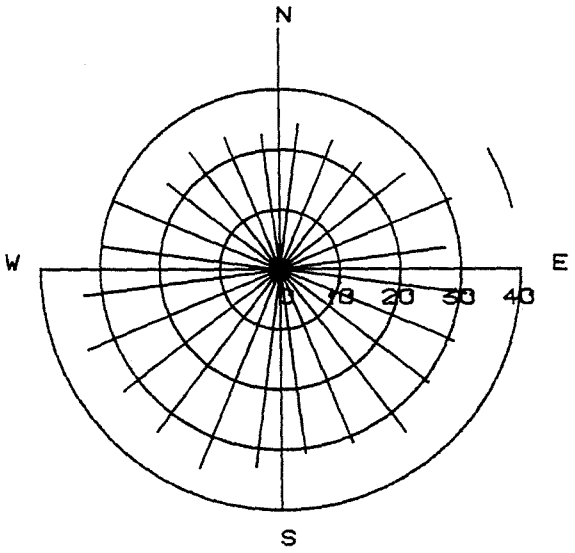
AANDERAA RCM CURRENT DATA

Mooring : 3

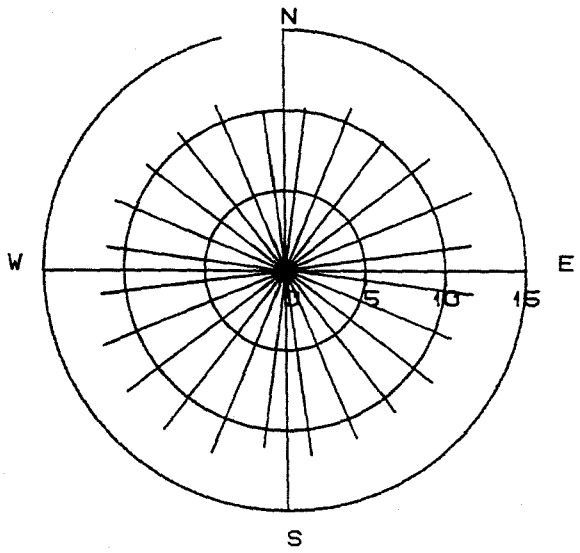
Position : N 74° 29.75' E 43° 00.59'

Instrument depths : 20, 45, 150 and 275 m.

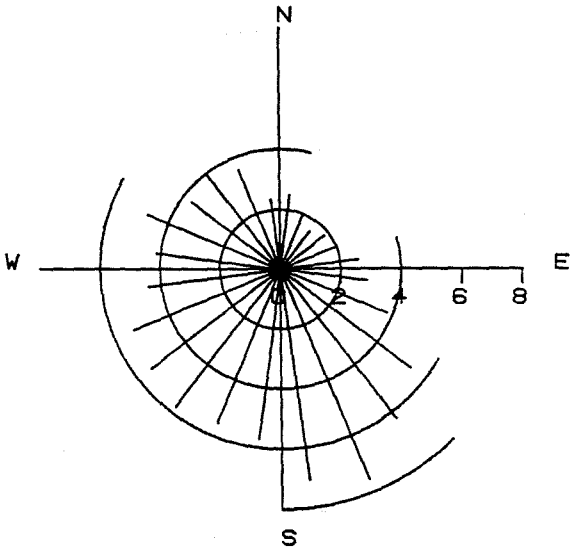
CURRENT VELOCITY DISTRIBUTION



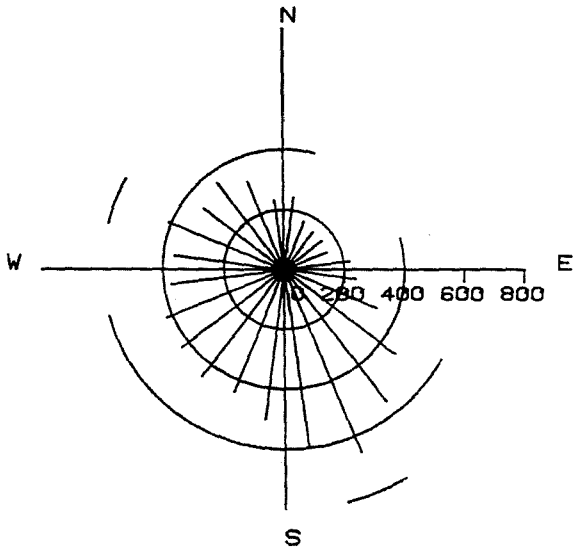
Maksimum velocity (cm/s)



Mean velocity (cm/s)



Relative flux in %



Number measured

Number of observations : 8566

The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

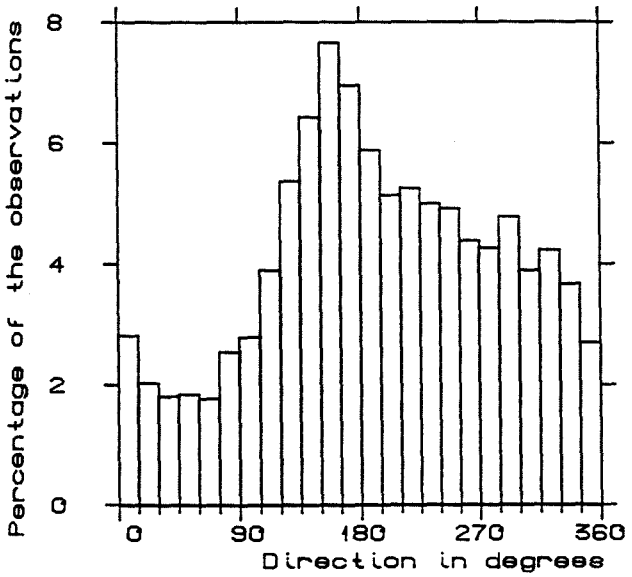
Time interval : 10.00 minutes.

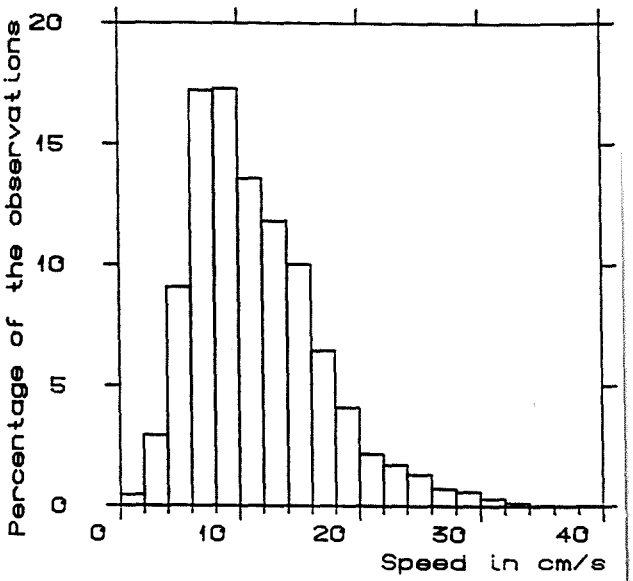
Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

H 1

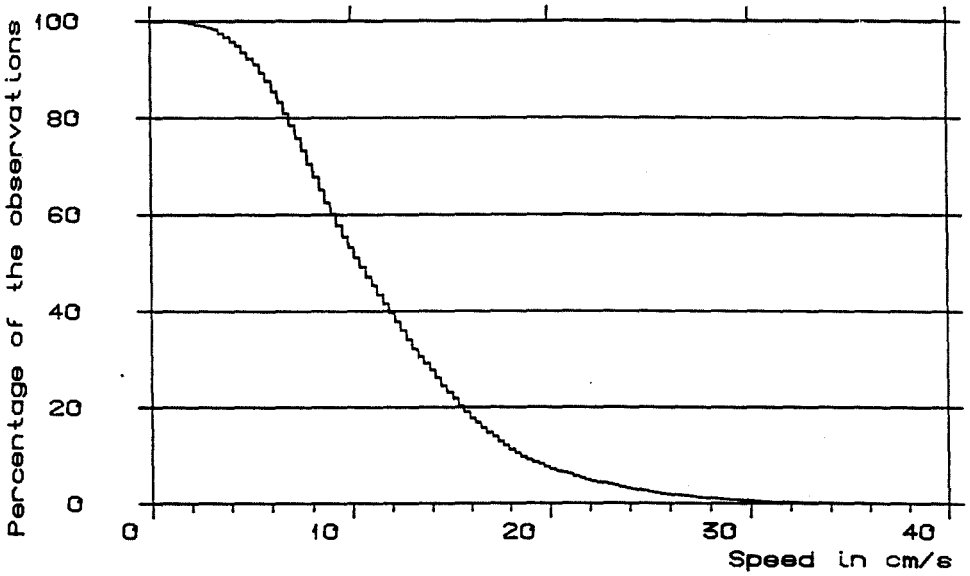
Fig. 3-1-1 Current velocity distribution.

HISTOGRAM





CURRENT SPEED DISTRIBUTION



Number of observations : 8566

The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

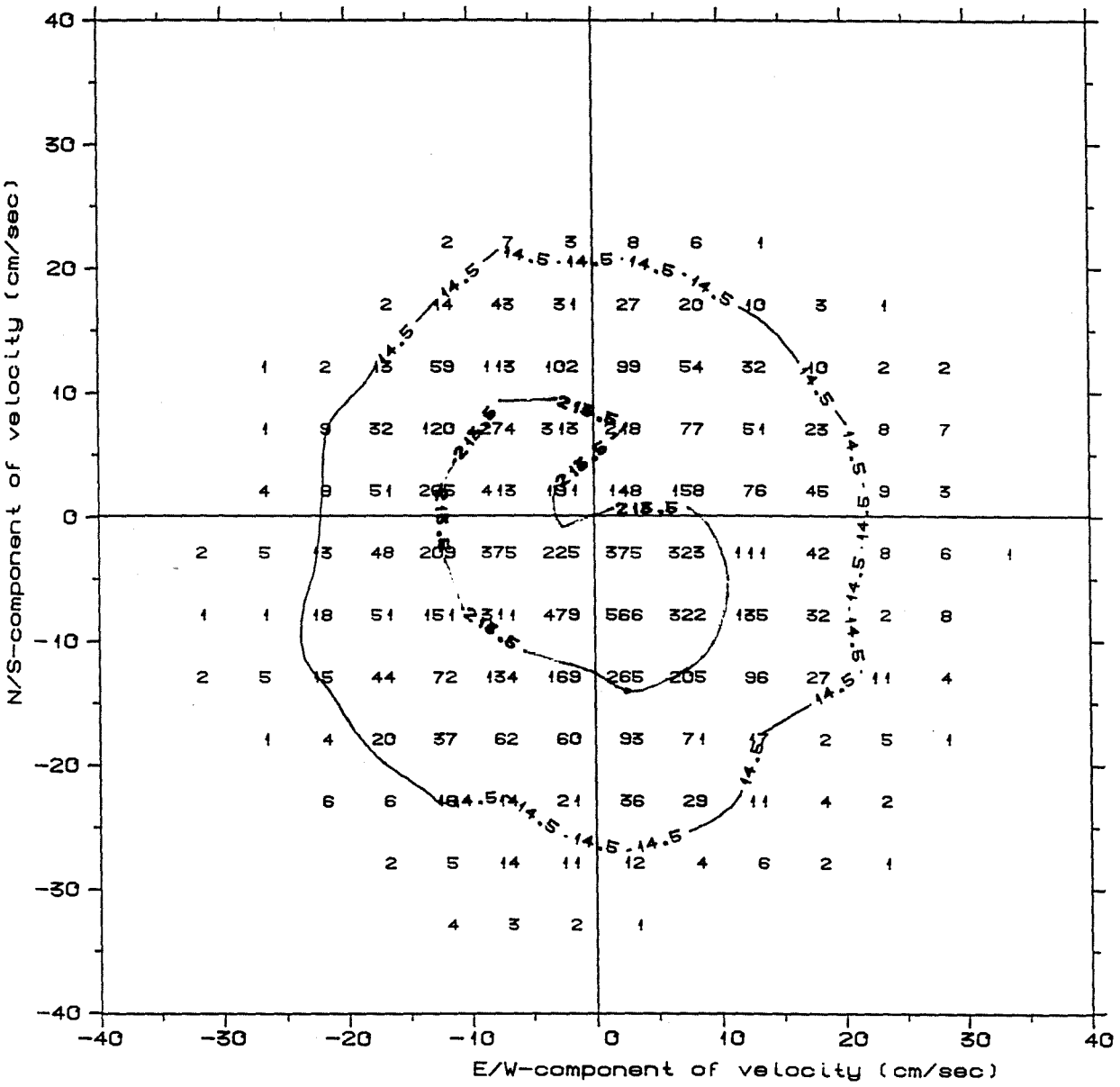
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

H 1

Fig. 3-1-2 Histogram of speed and direction.
Current speed distribution.

VELOCITY DISTRIBUTION DIAGRAM



Number of observations : 8566

Isoline for 50% and 96%

Number of observations : 8566

The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

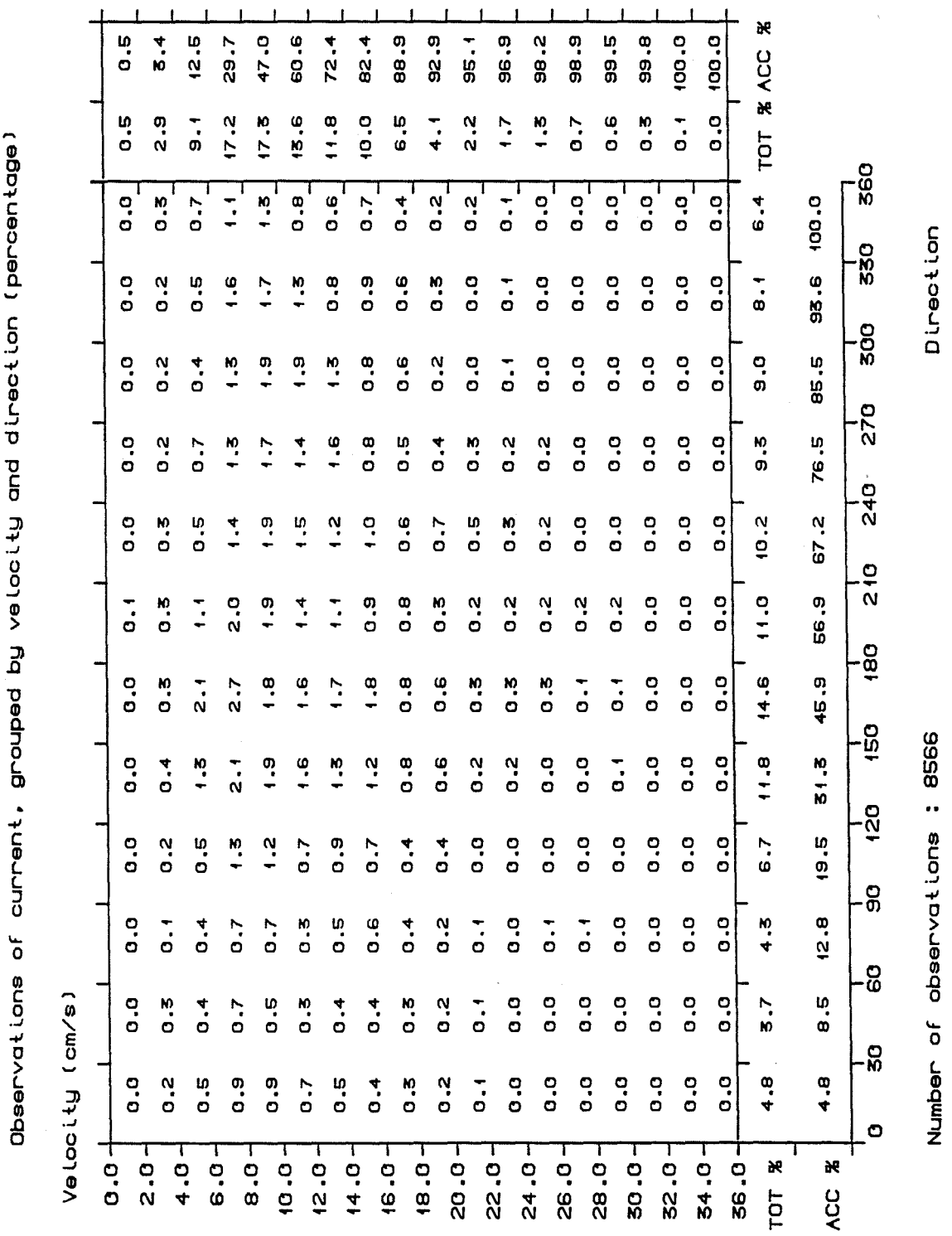
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

H I

Fig. 3-1-3 Velocity distribution diagram.

DIRECTION DISTRIBUTION OF CURRENT VELOCITY



Number of obeervations : 8566

The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

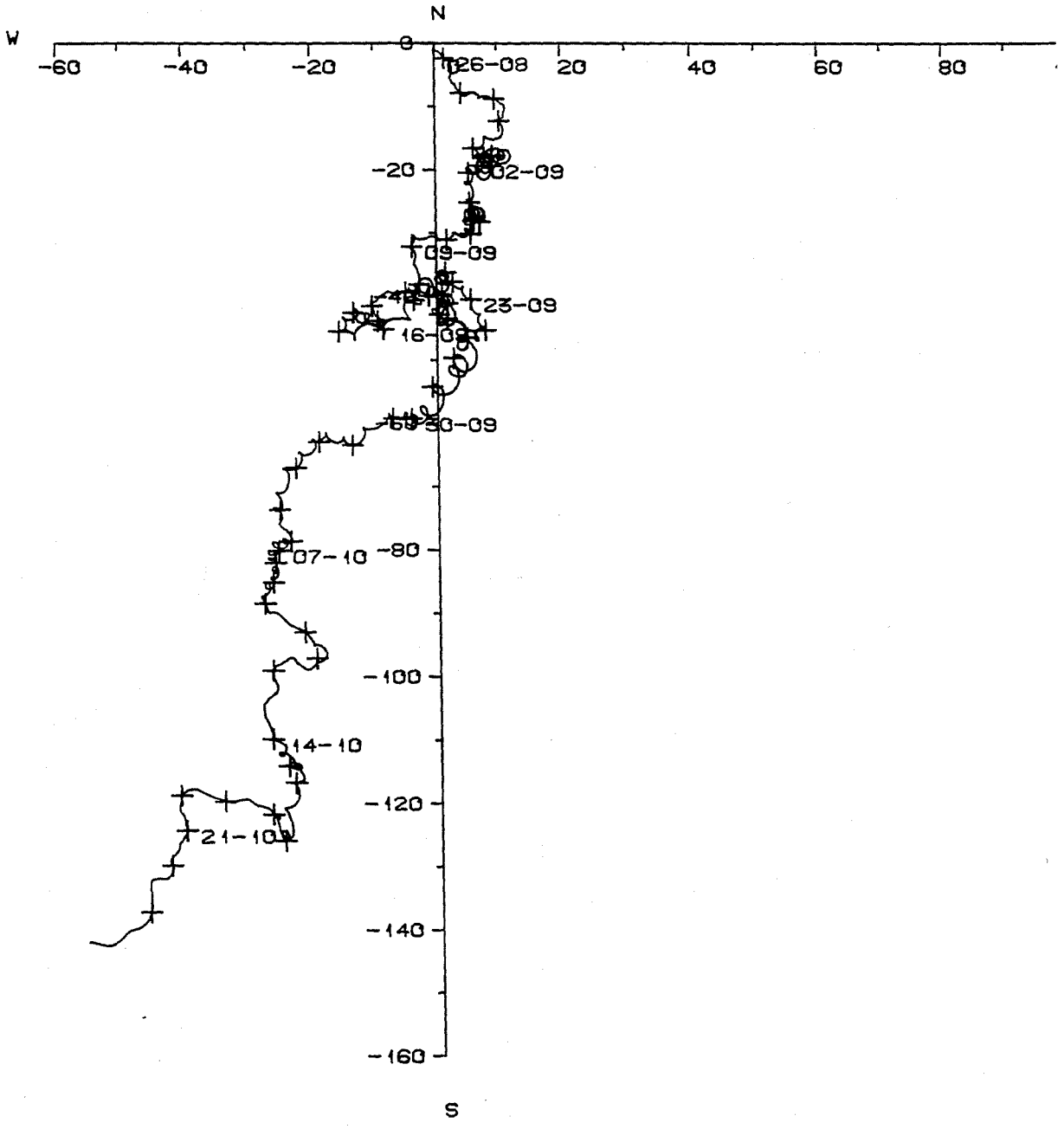
Instrument depth : 20.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Obeervation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

Fig. 3-1-4 Velocity distribution table.

PROGRESSIVE VECTOR DIAGRAM



Units in km

Number of observations : 8566

The Barents Sea

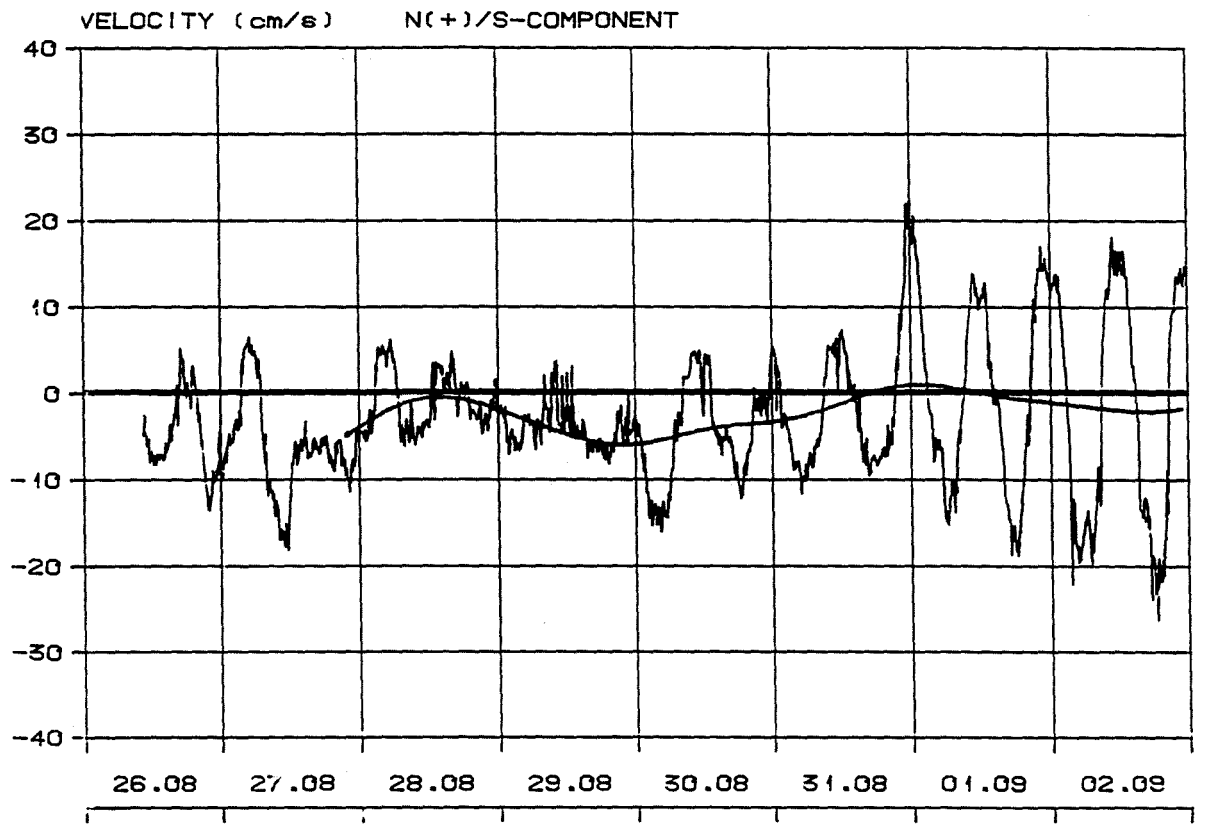
Position : N 74° 29.70' E 43° 0.60'

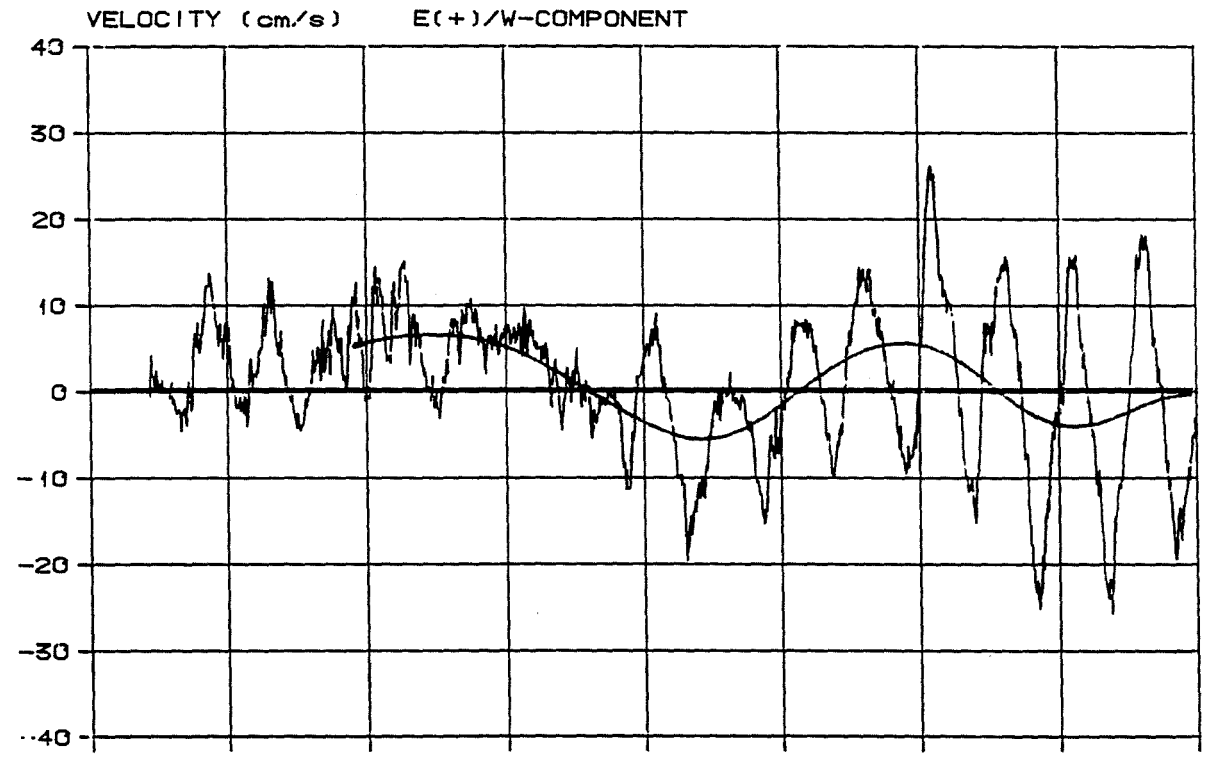
Instrument depth : 20.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

Fig. 3-1-5 Progressive vector diagram.





The Barents Sea

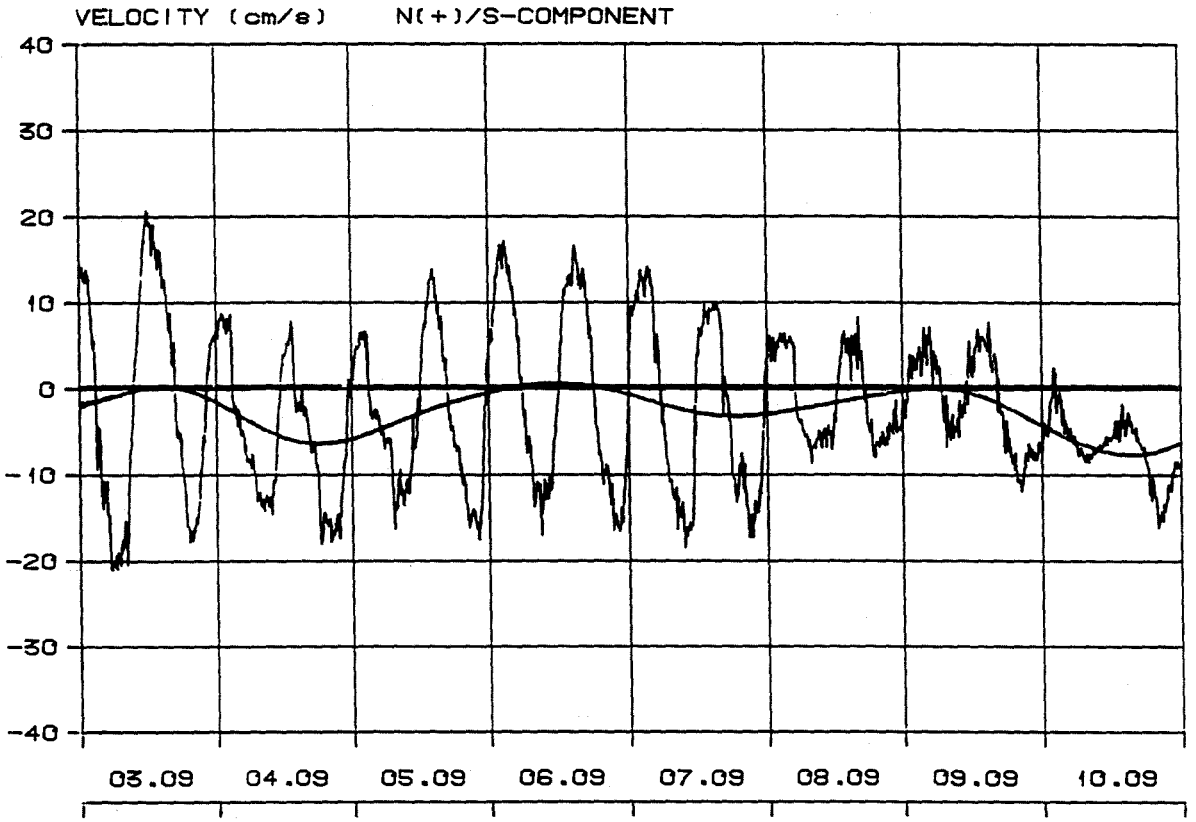
Position : N 74° 29.70' E 43° 0.60'

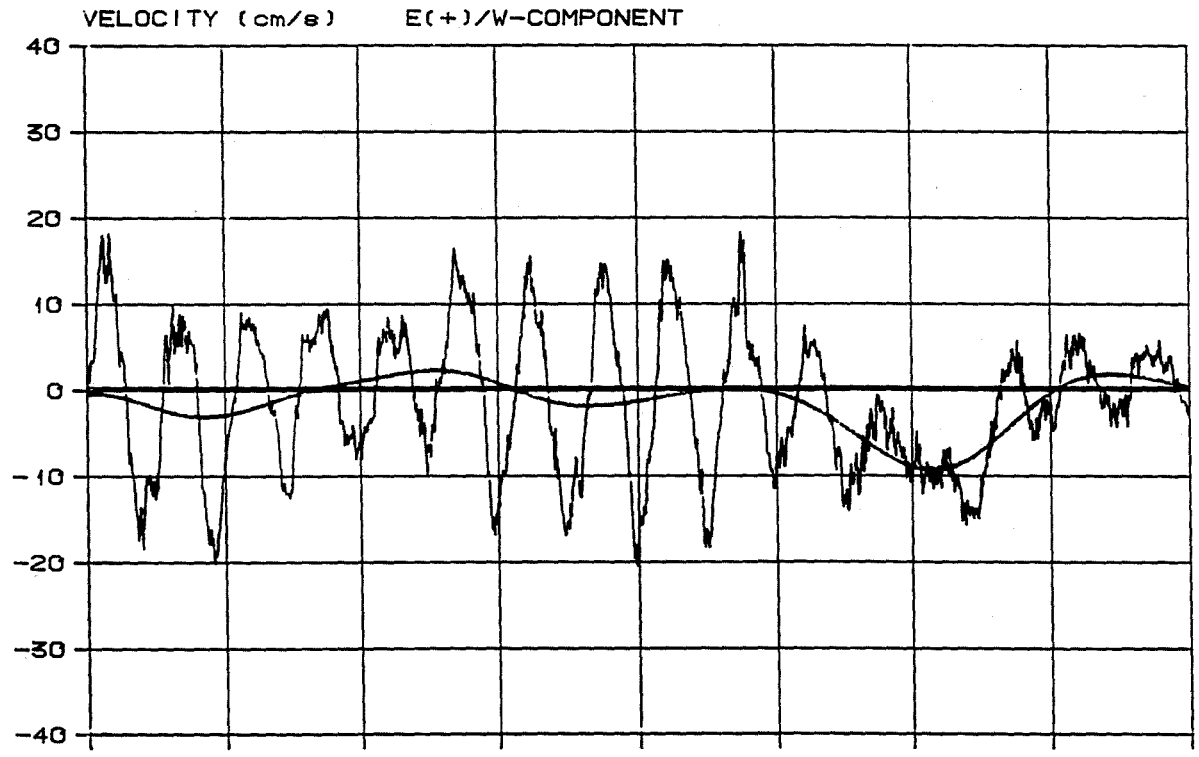
Instrument depth : 20.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

Fig. 3-1-6 N/S and E/W components of current.





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

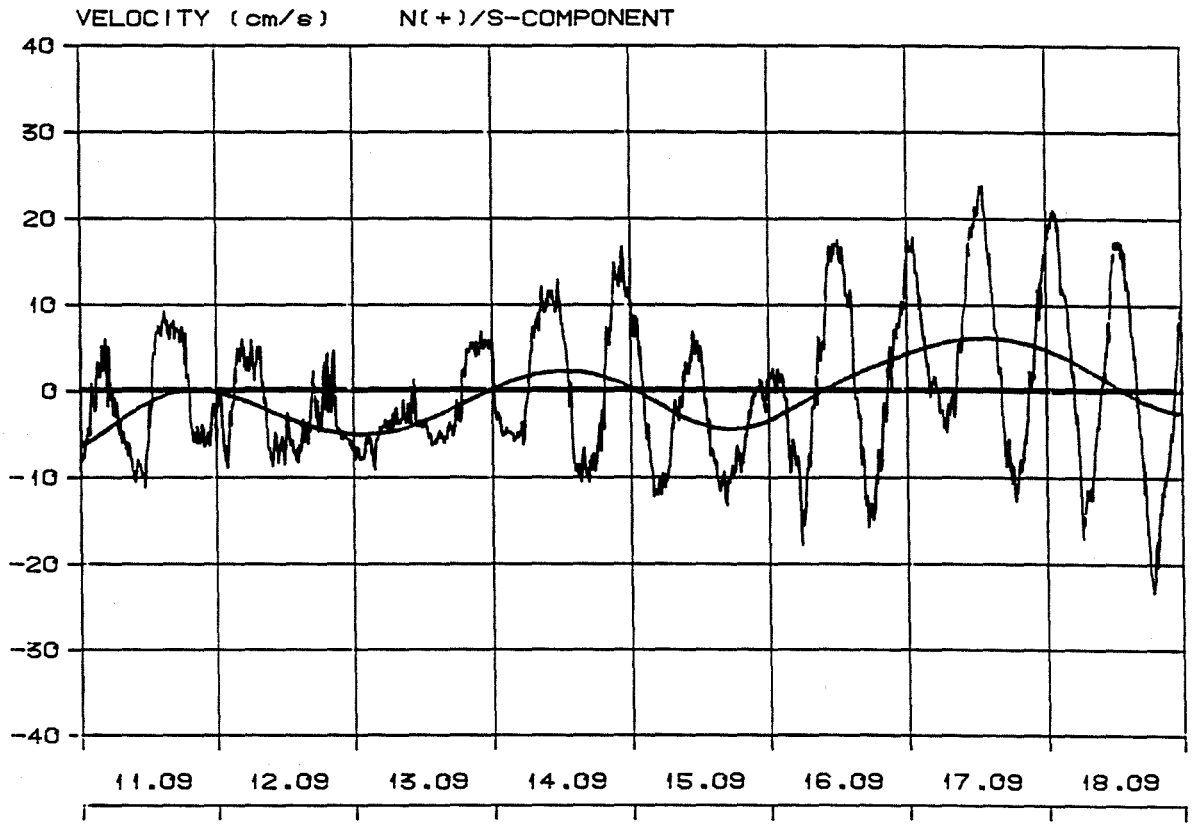
Time interval : 10.00 minutes.

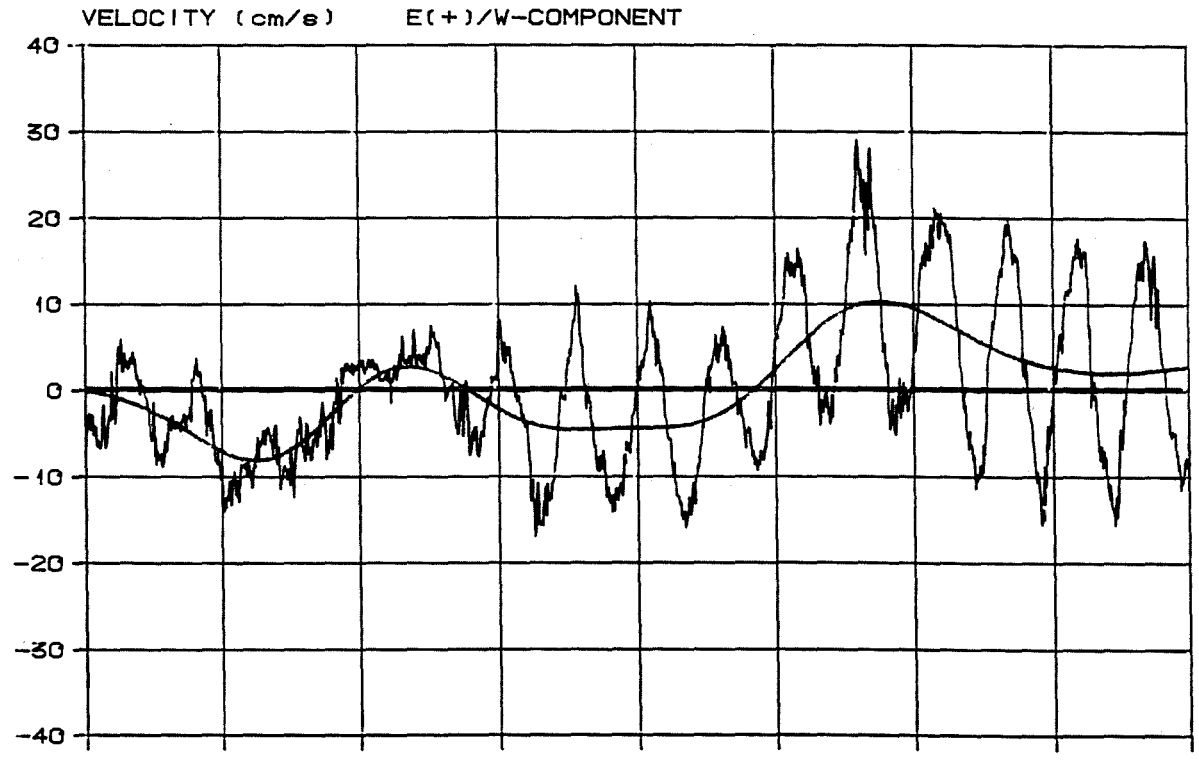
Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

H 1

Fig. 3-1-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

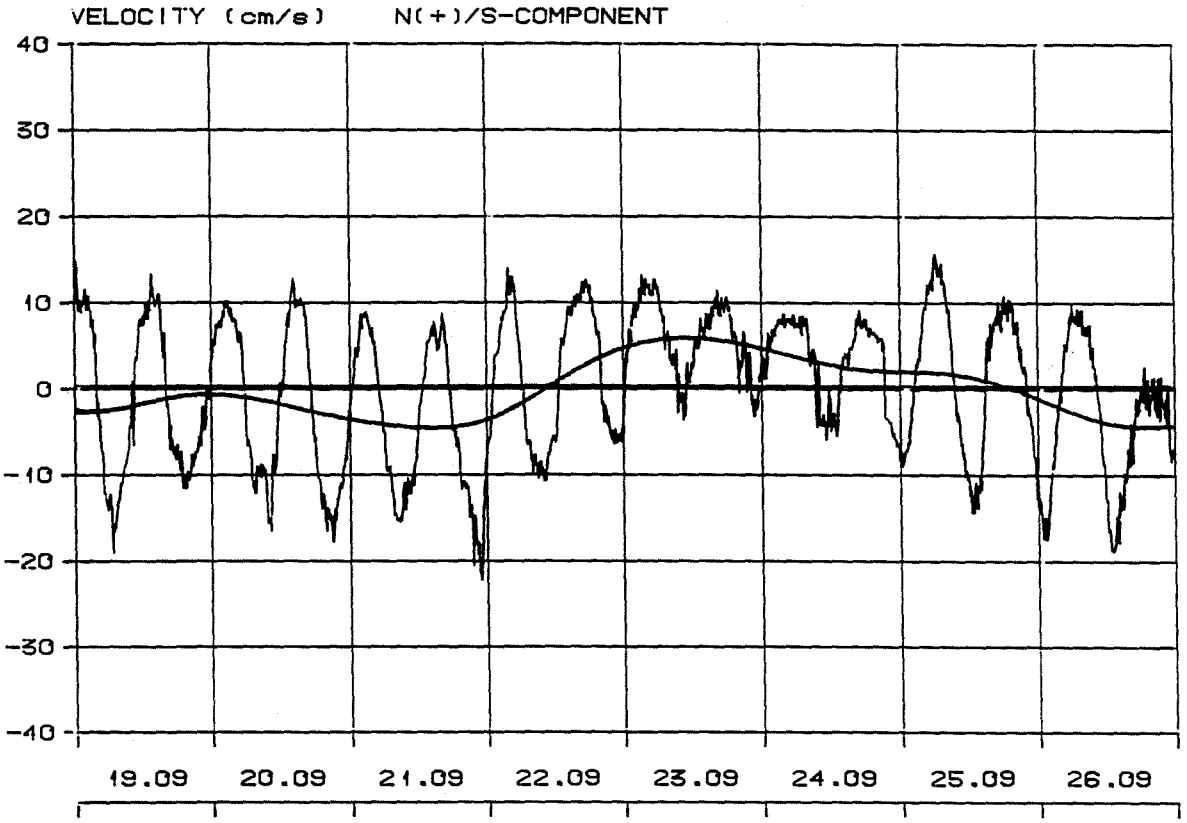
Time interval : 10.00 minutes.

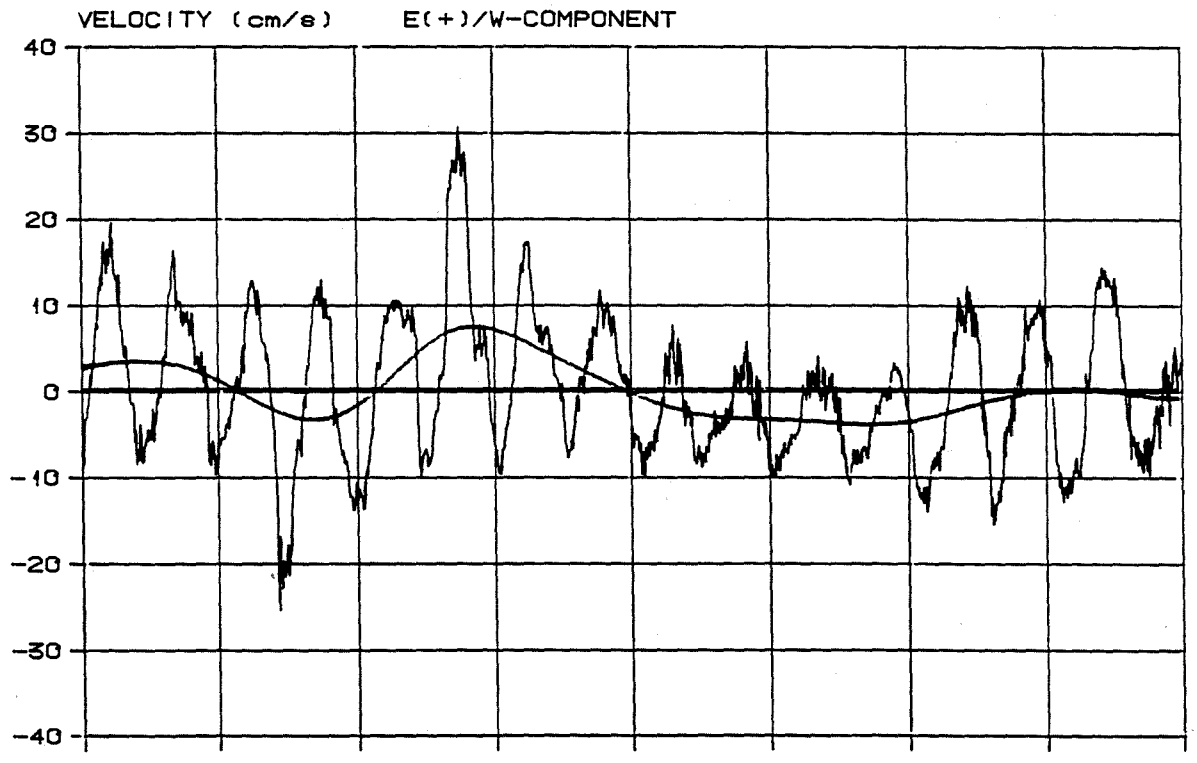
Observation period: 1989 26.08 H. 1020 -- 1989 24.10 H. 2150

H 1

Fig. 3-1-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

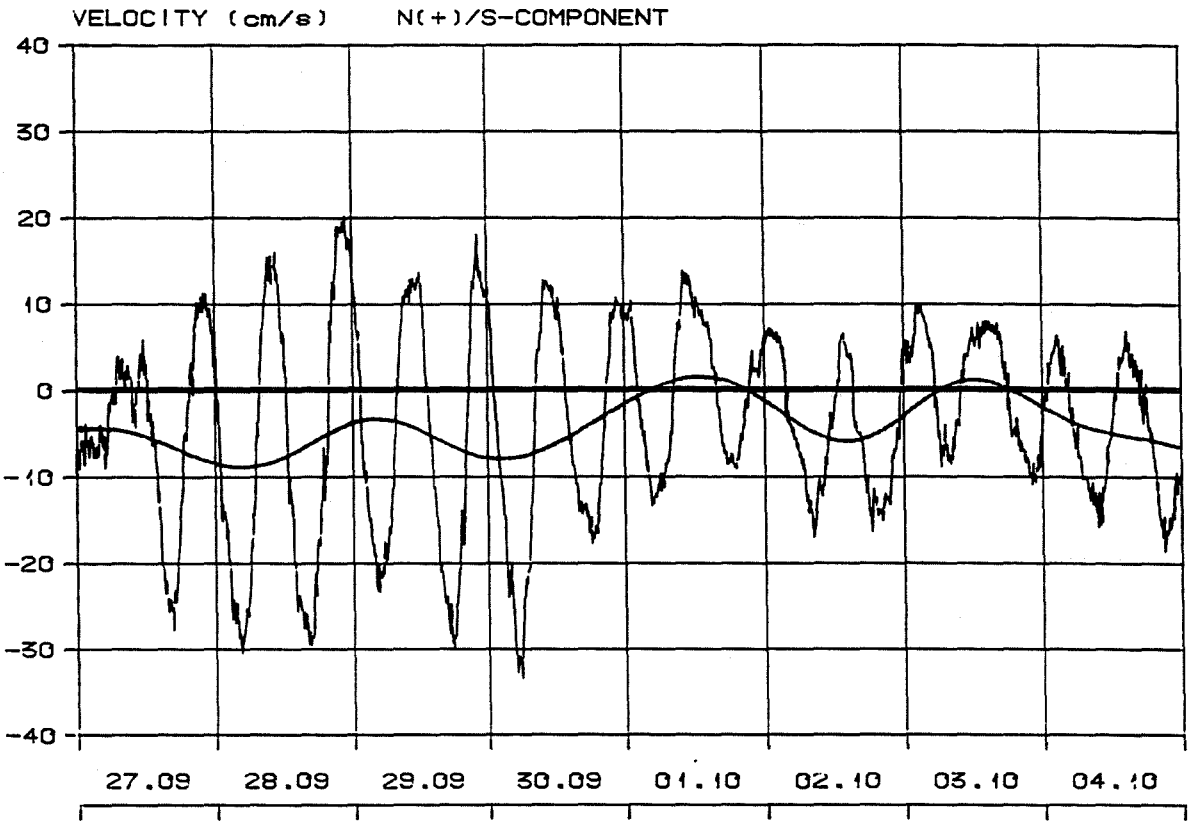
Instrument depth : 20.0 m Bottom depth : 285.0 m

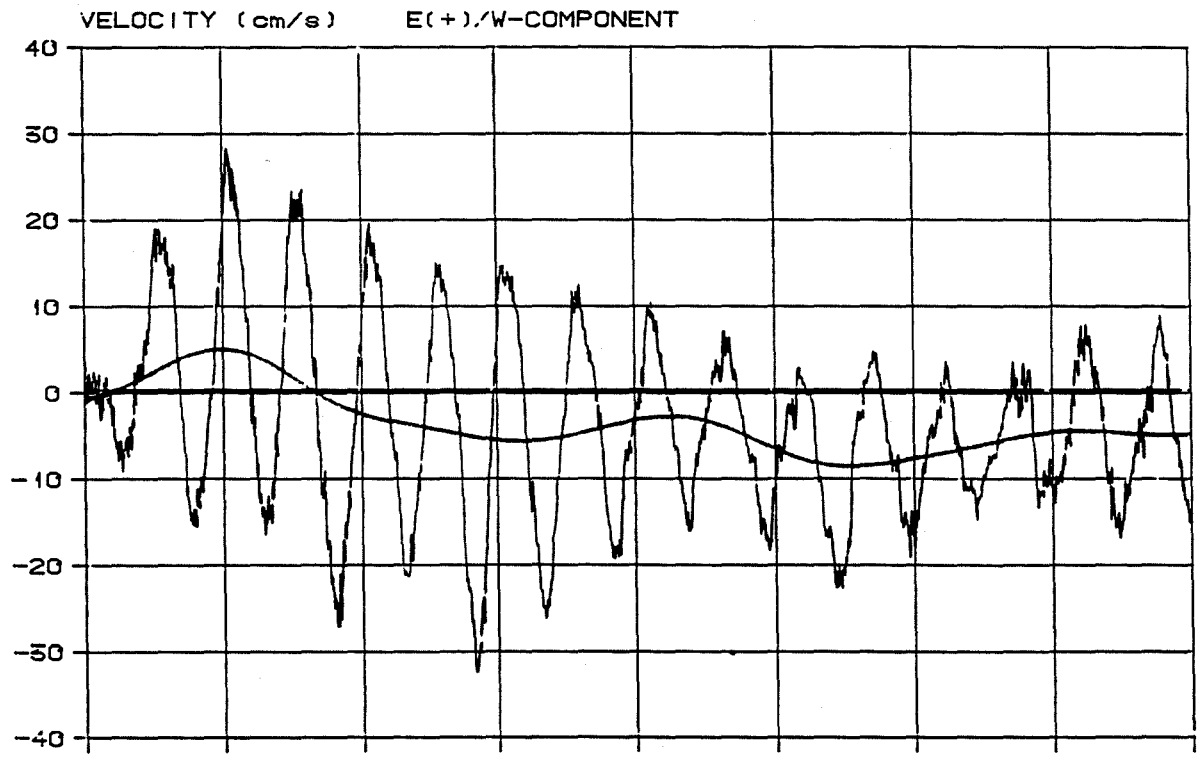
Time interval : 10.00 minutes.

Obeervation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

Fig. 3-1-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

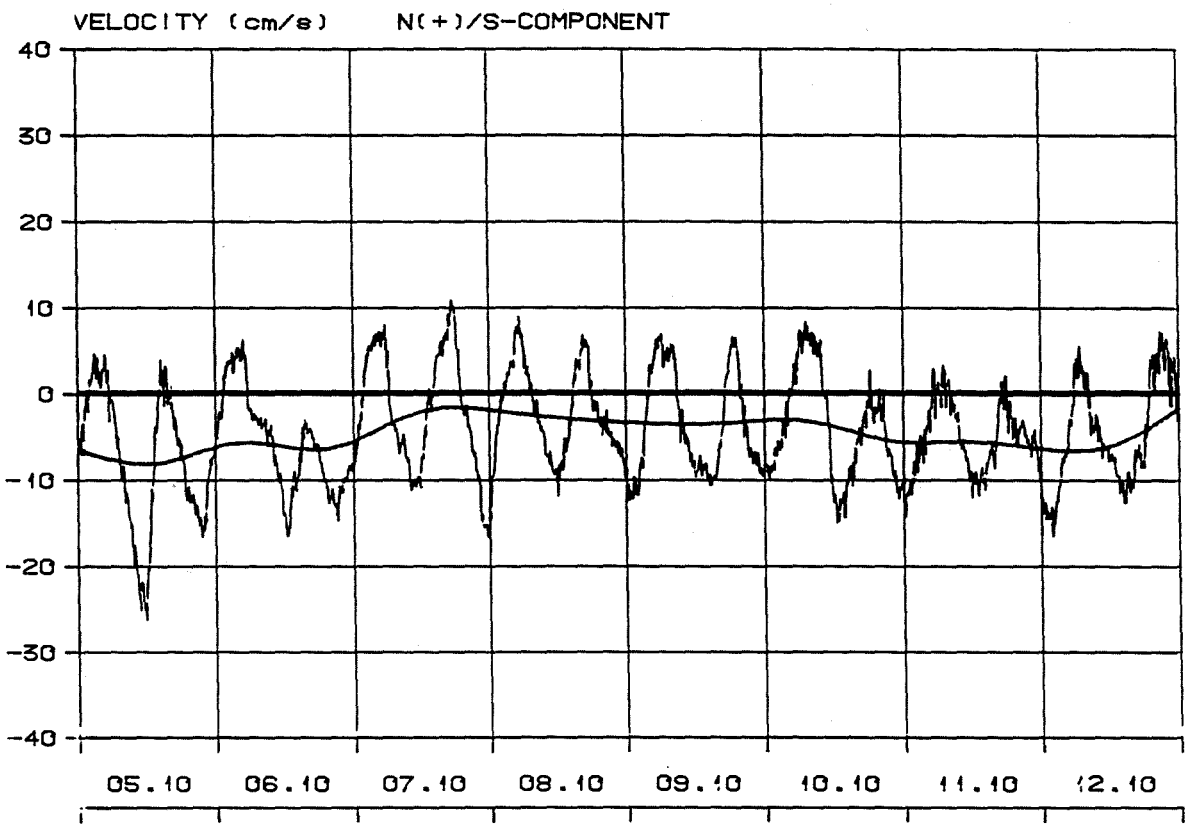
Time interval : 10.00 minutes.

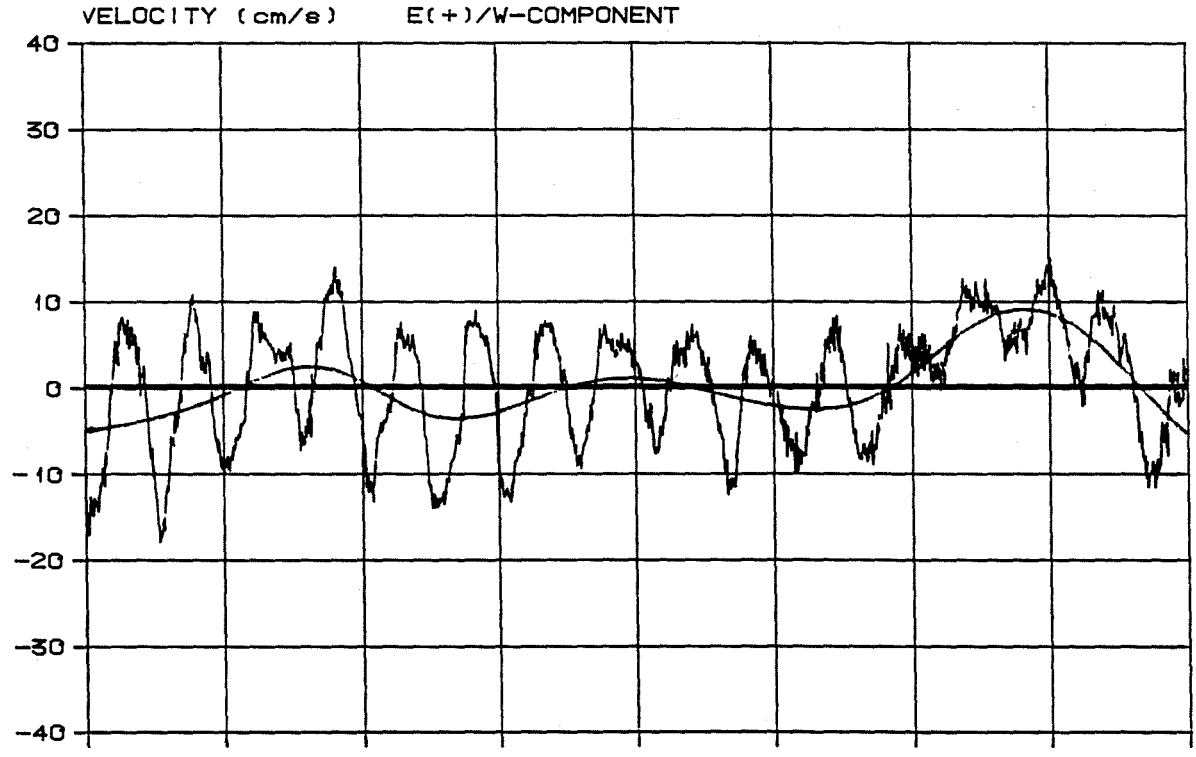
Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

H I

Fig. 3-1-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

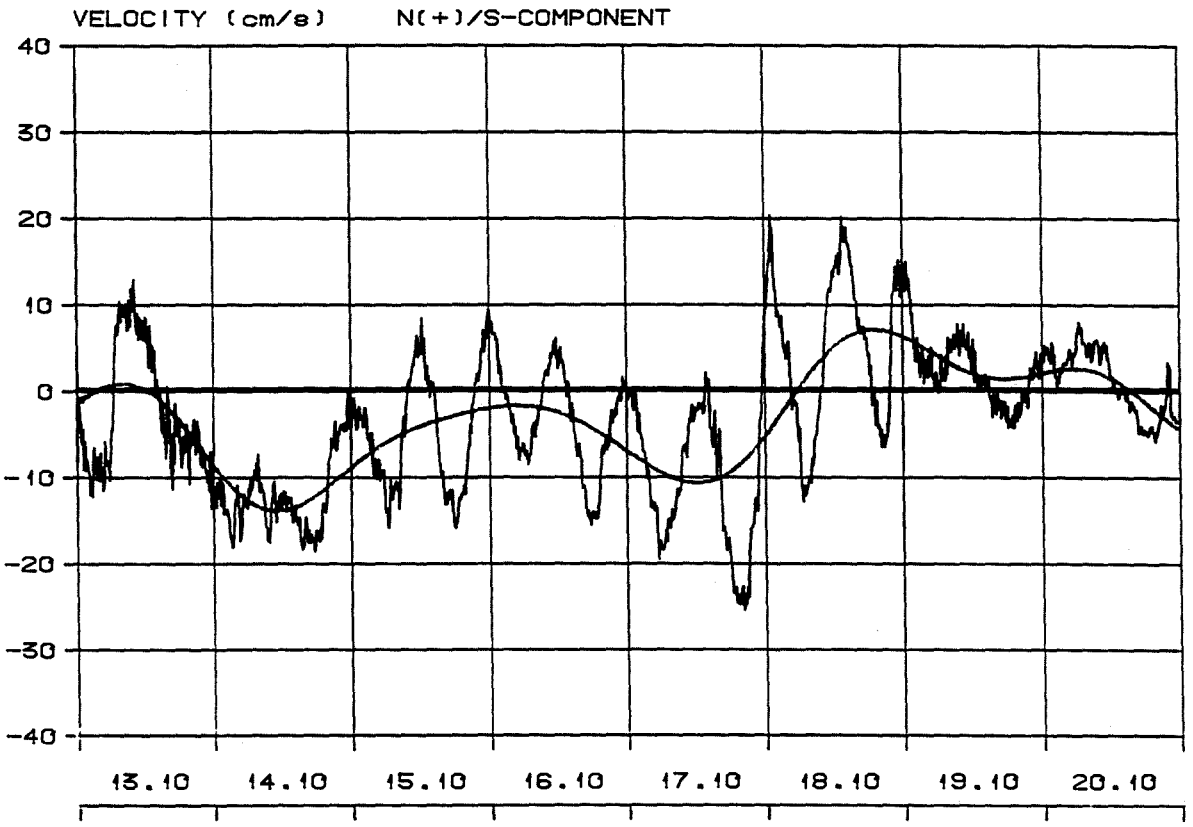
Time interval : 10.00 minutes.

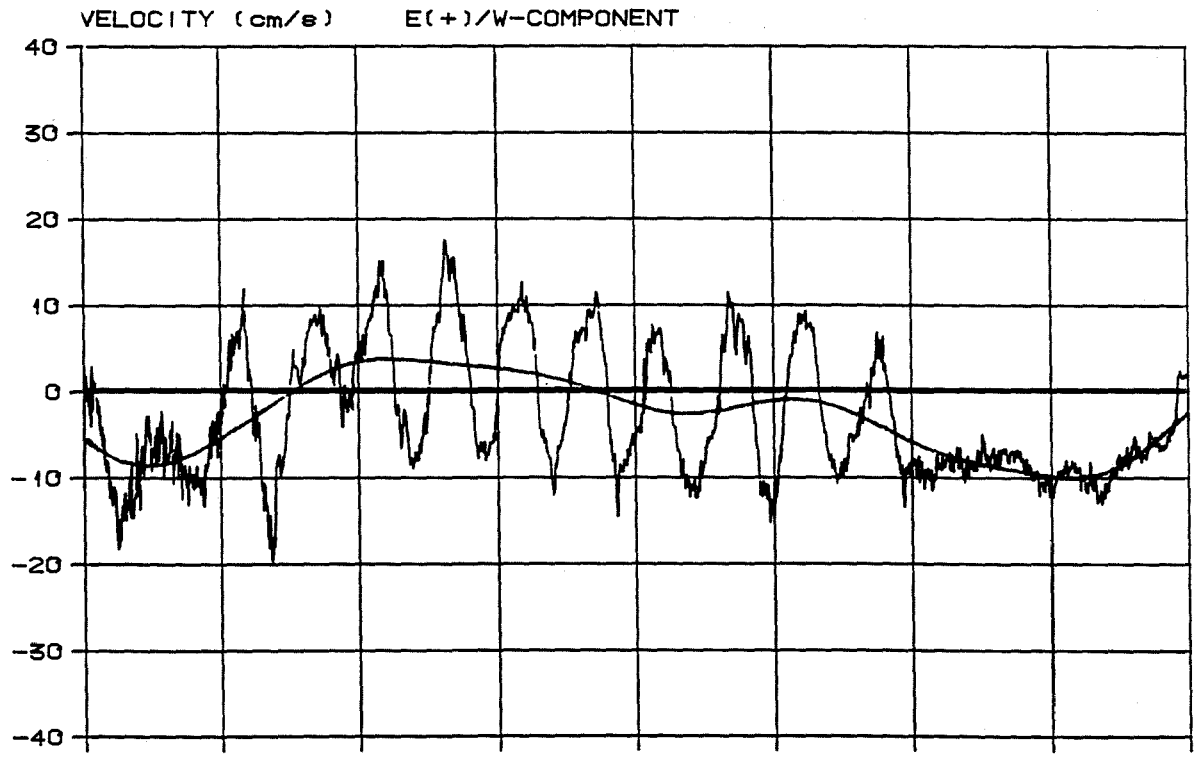
Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

H 1

Fig. 3-1-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

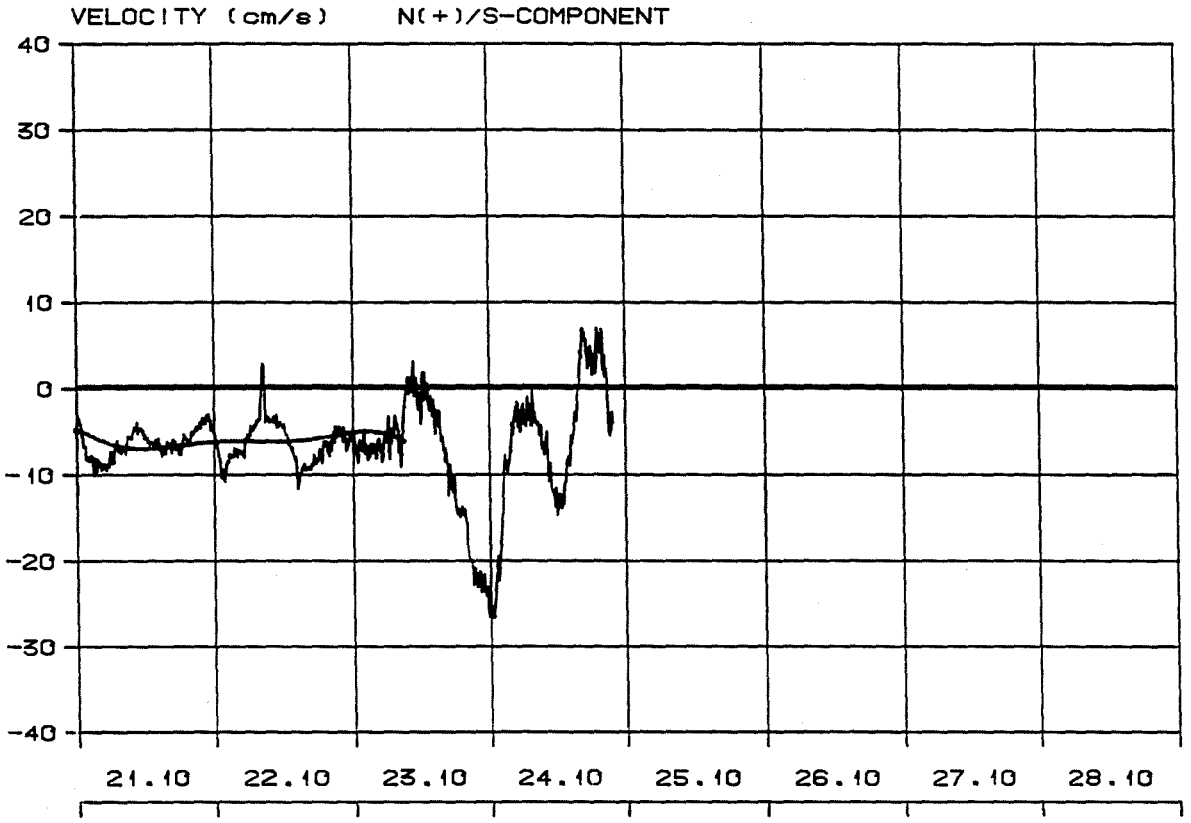
Time interval : 10.00 minutes.

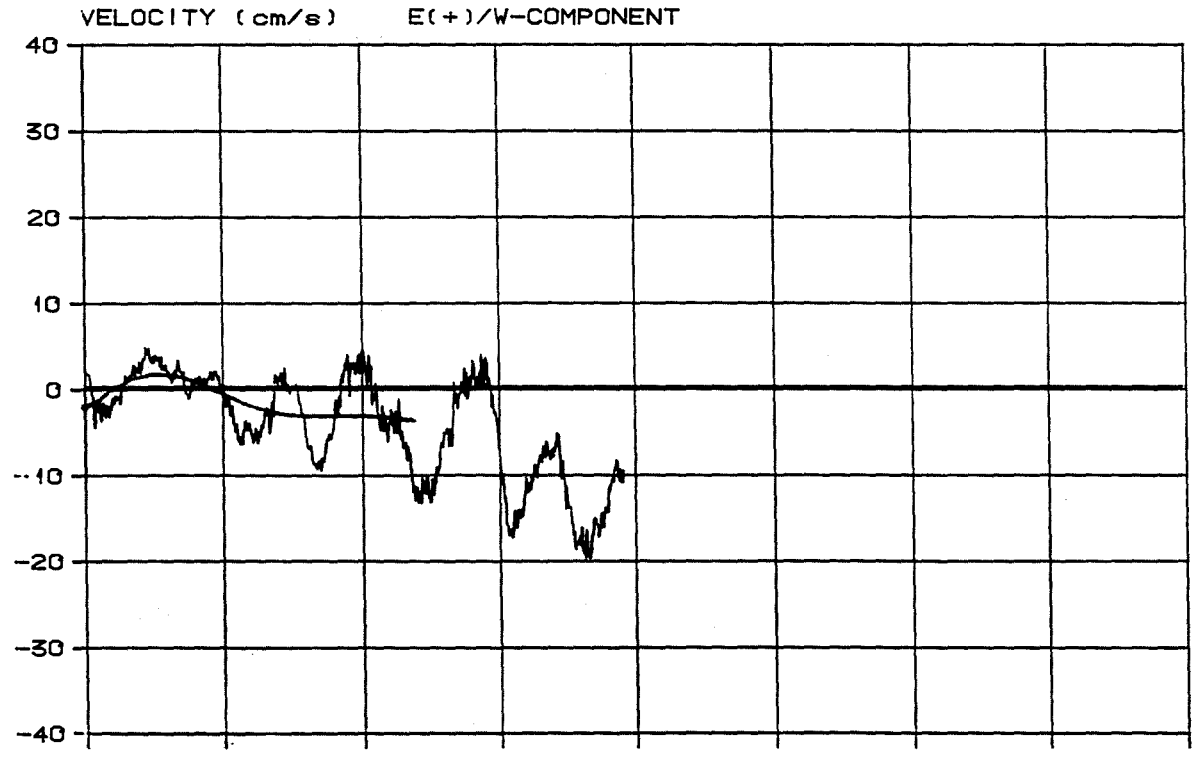
Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

H 1

Fig. 3-1-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

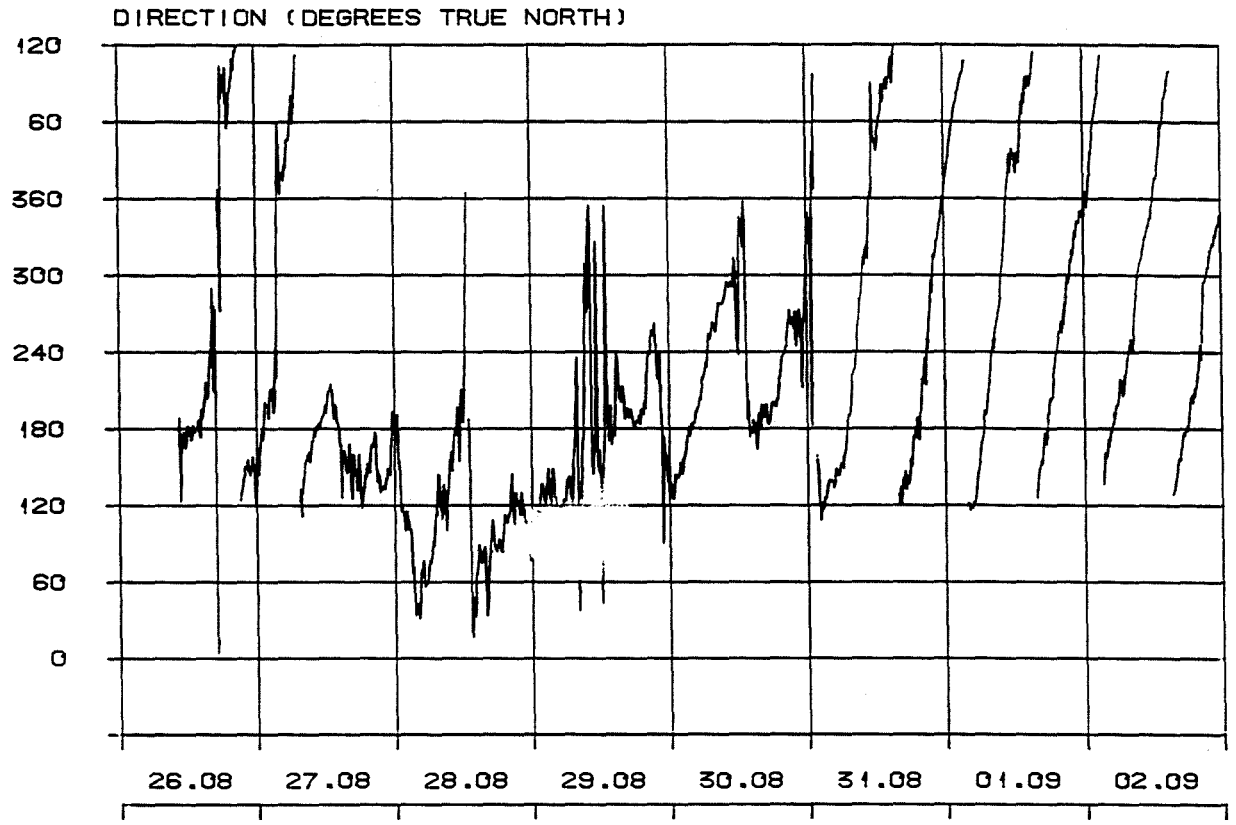
Time interval : 10.00 minutes.

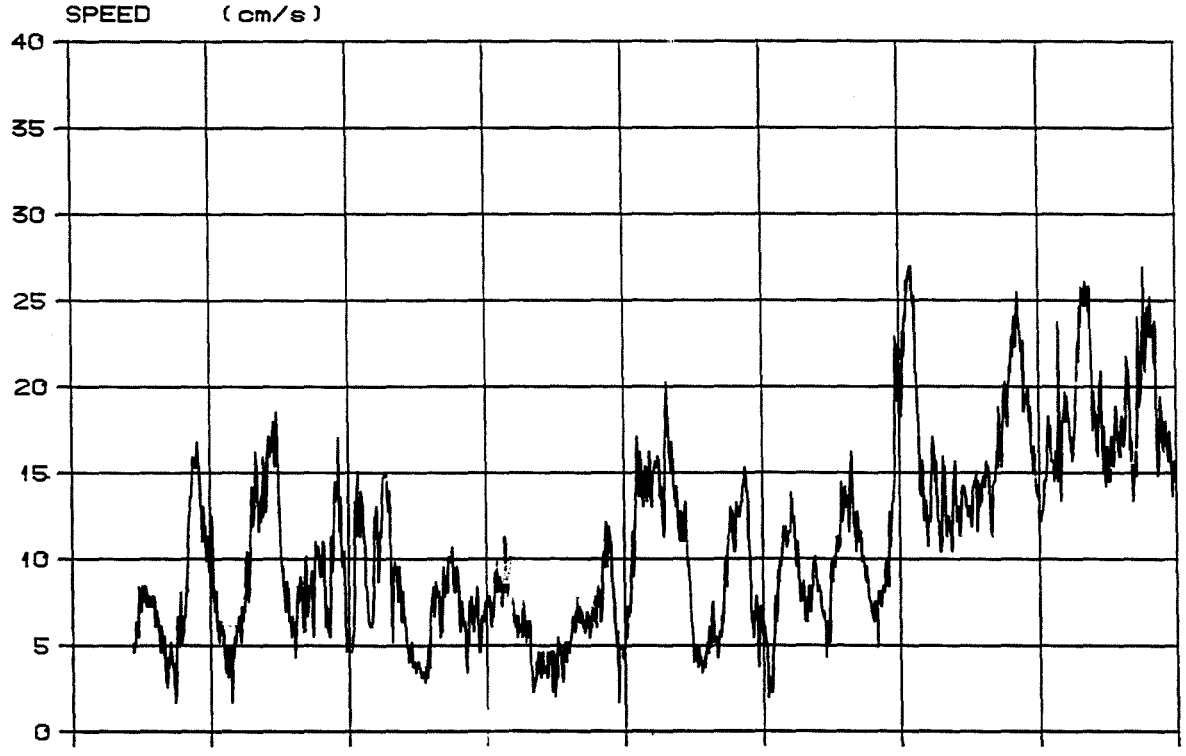
Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

H 1

Fig. 3-1-6

Continues.....





The Barents Sea

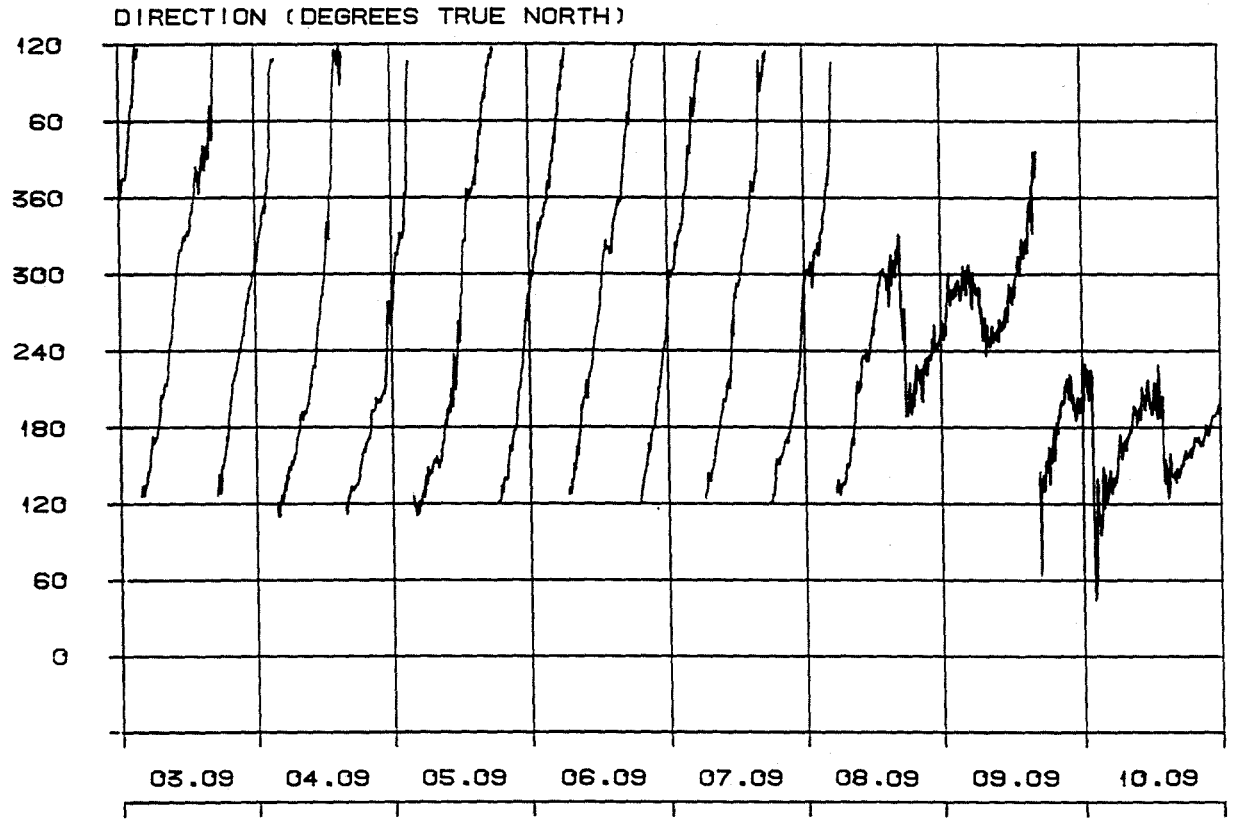
Position : N 74° 29.70' E 43° 0.60'

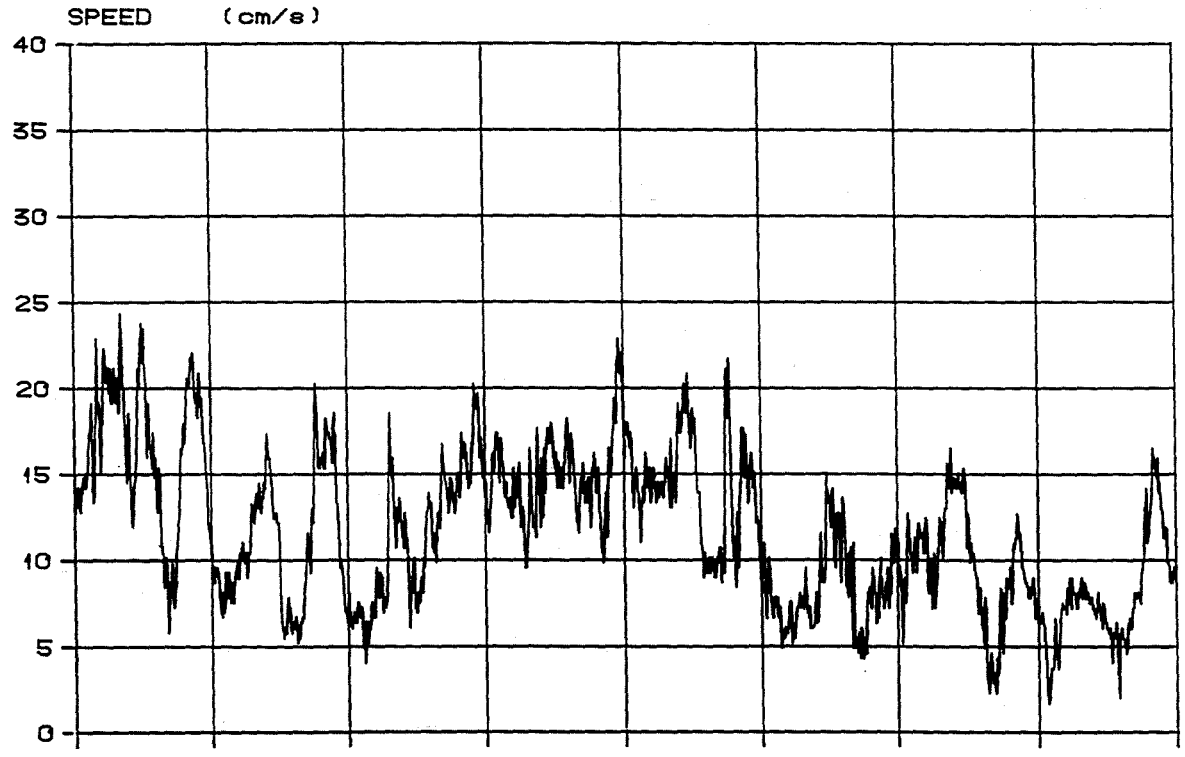
Instrument depth : 20.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

Fig. 3-1-7 Speed and direction of current.





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

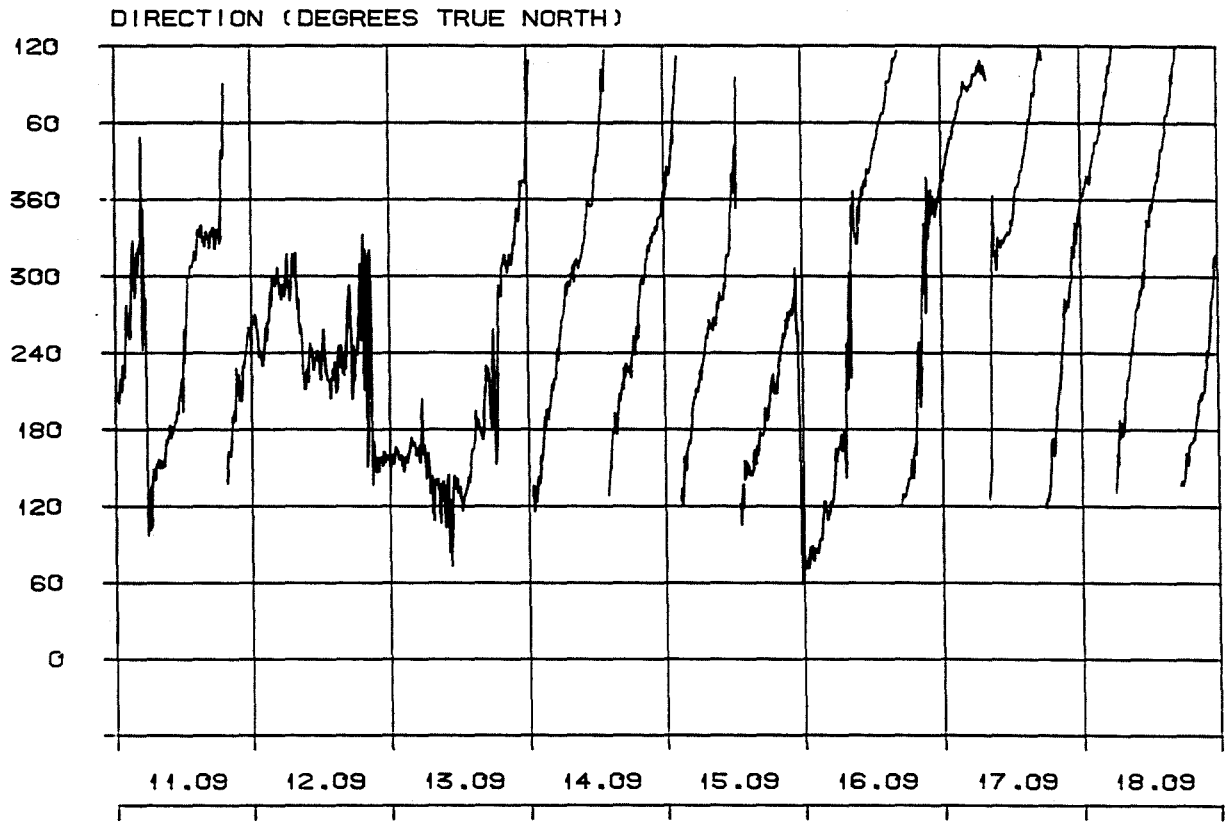
Time interval : 10.00 minutes.

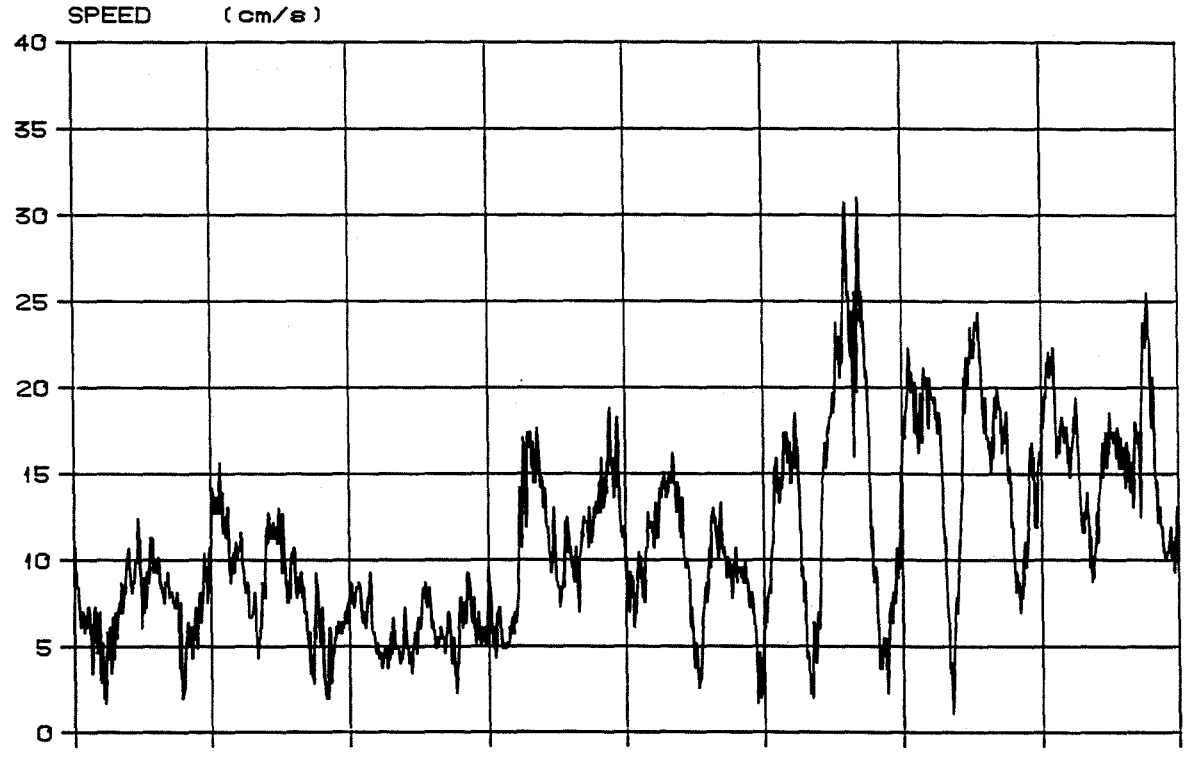
Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

H 1

Fig. 3-1-7

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

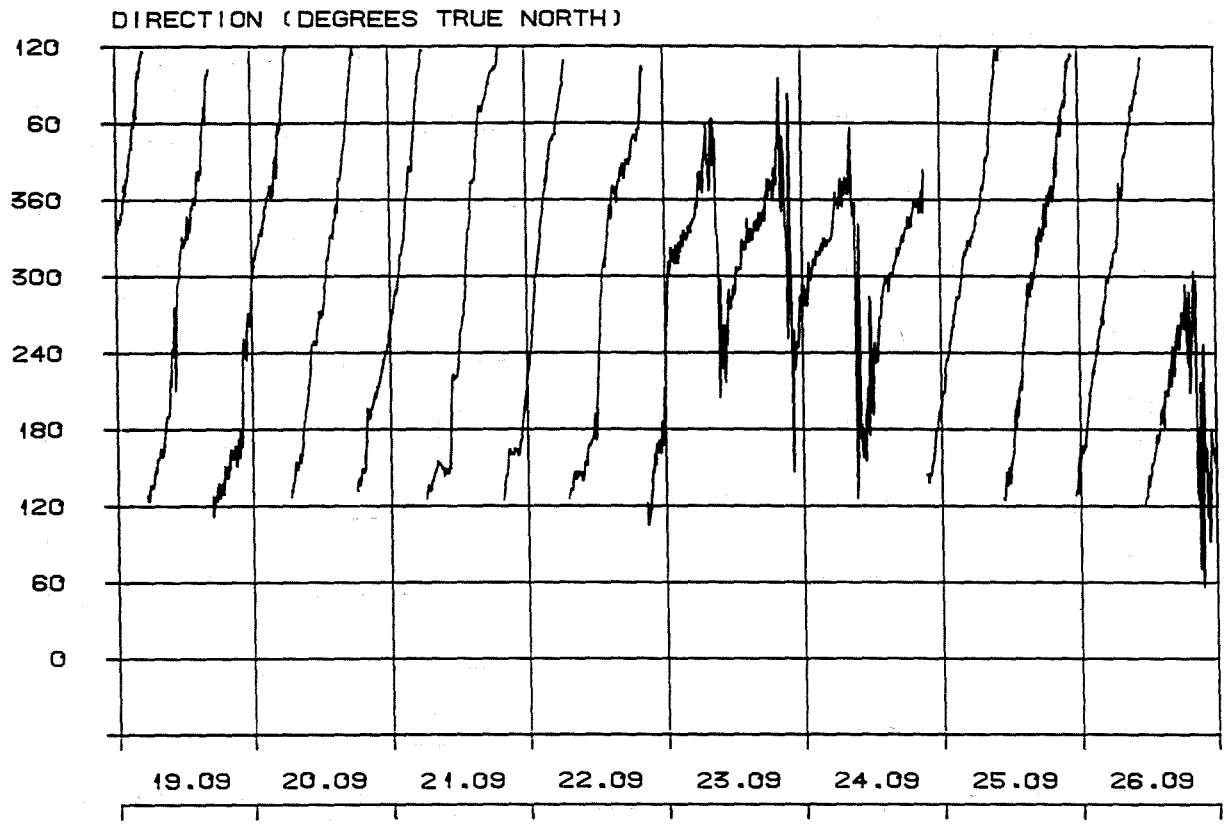
Instrument depth : 20.0 m Bottom depth : 285.0 m

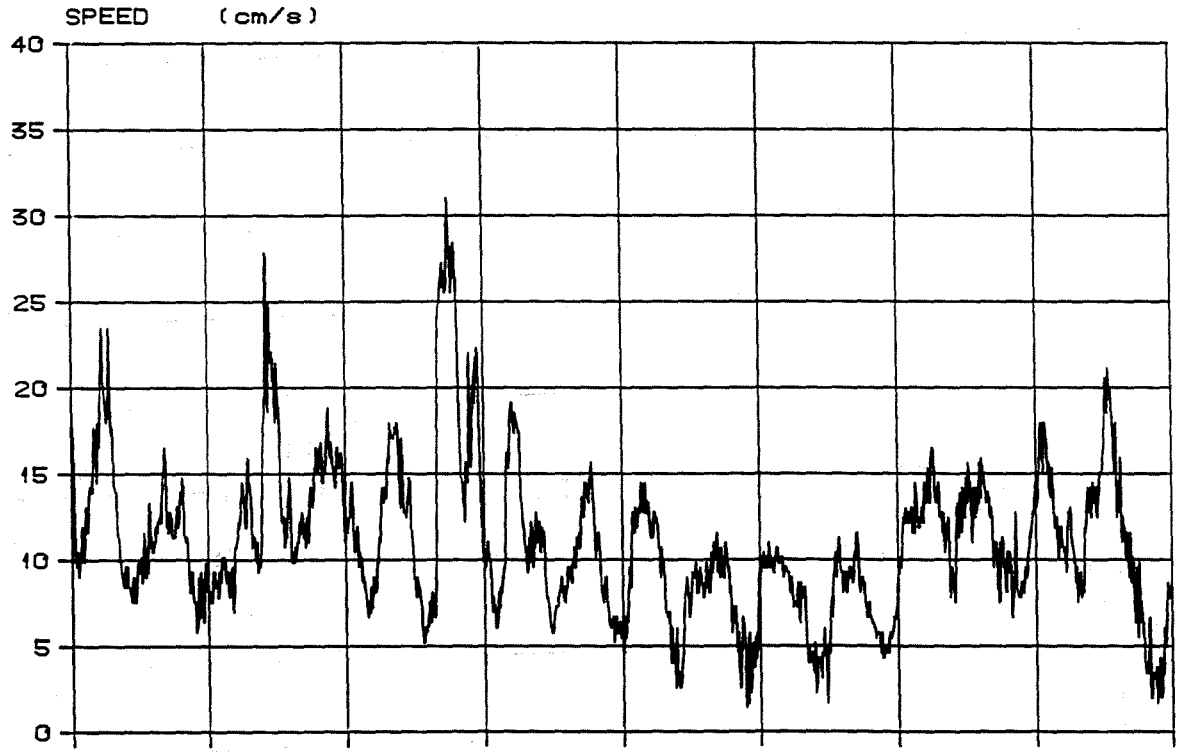
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

Fig. 3-1-7

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

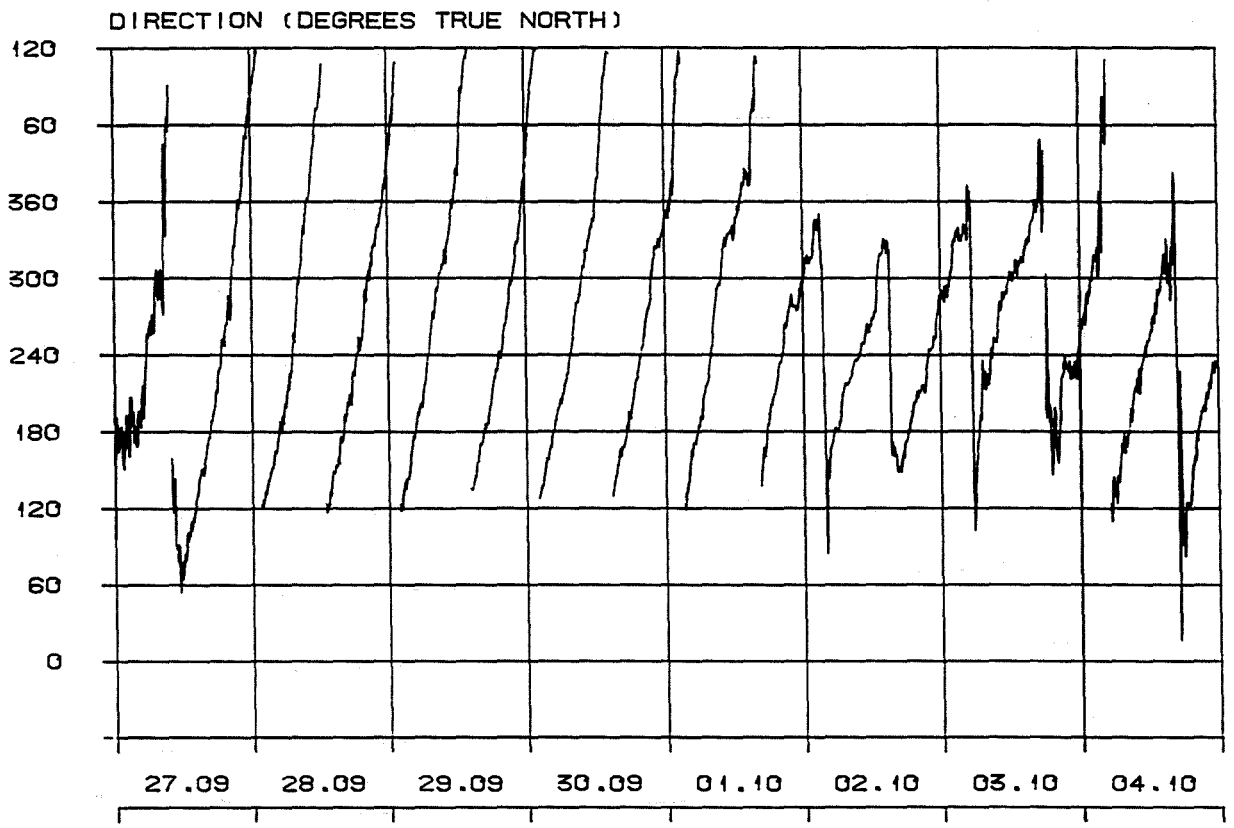
Time interval : 10.00 minutes.

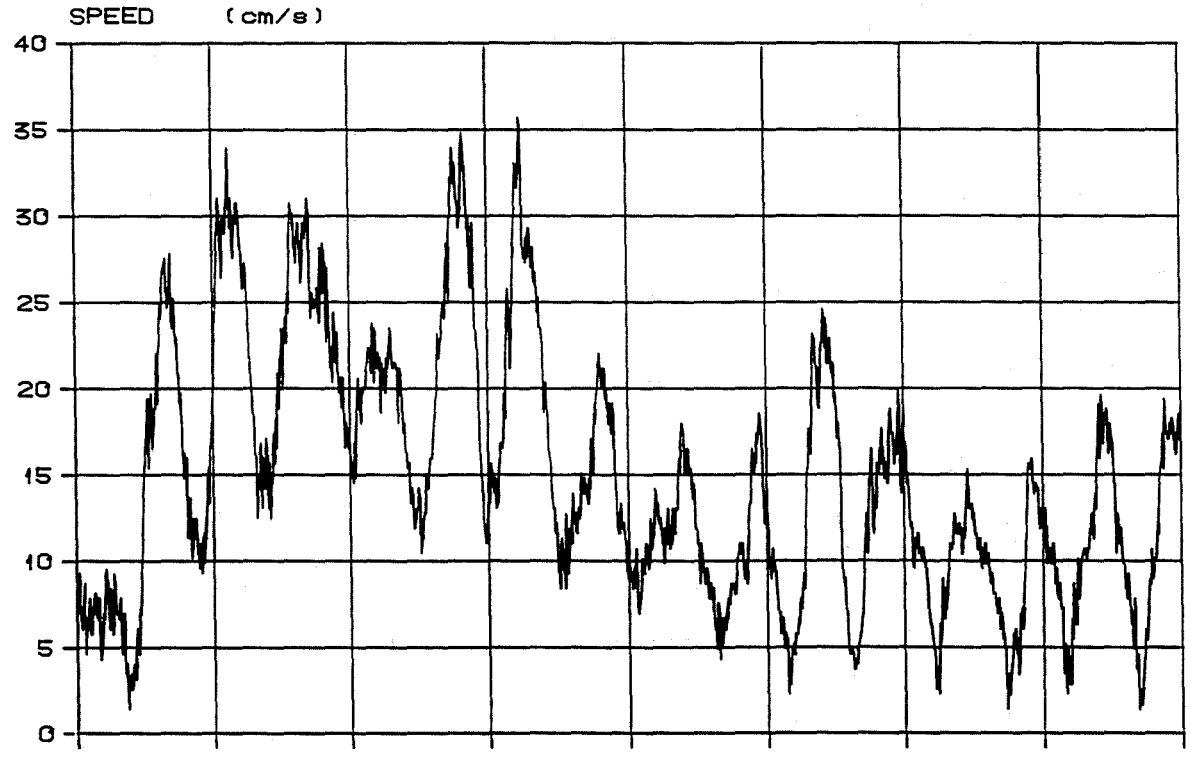
Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

H I

Fig. 3-1-7

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

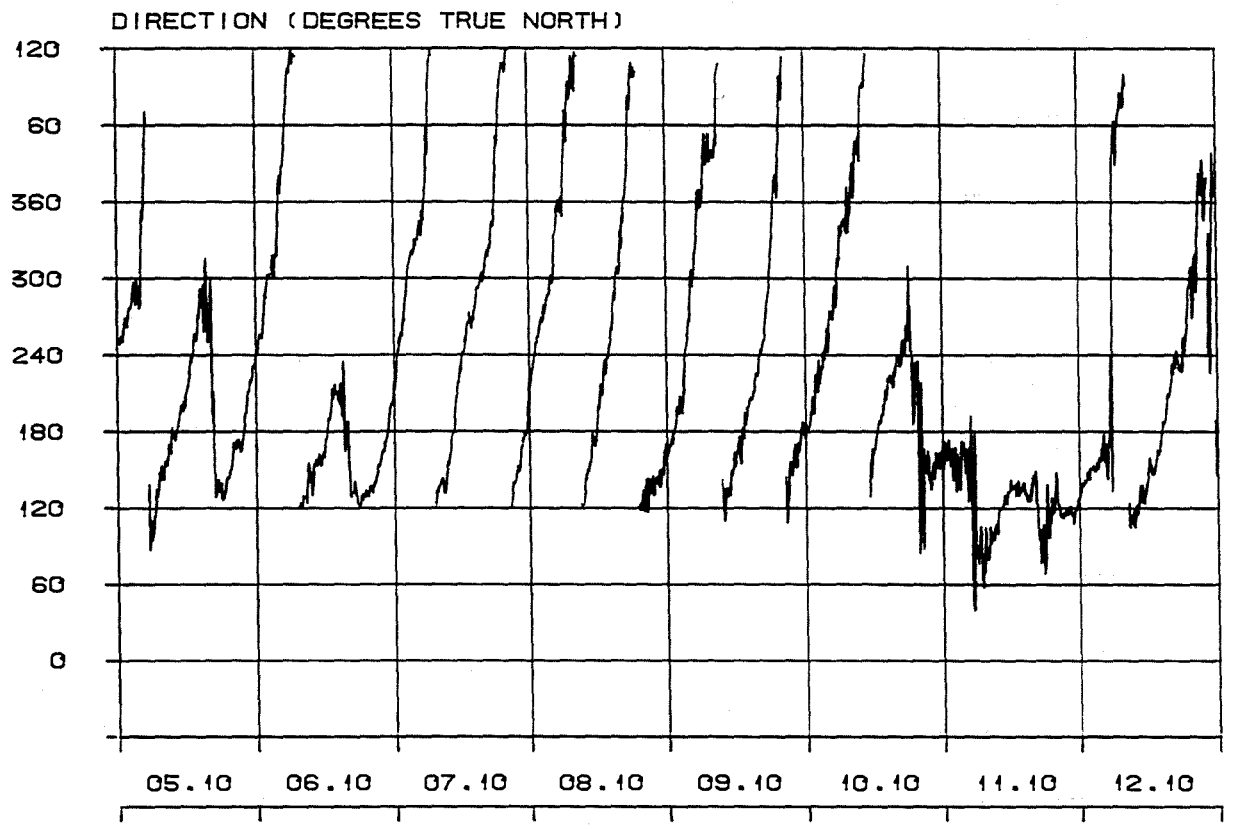
Time interval : 10.00 minutes.

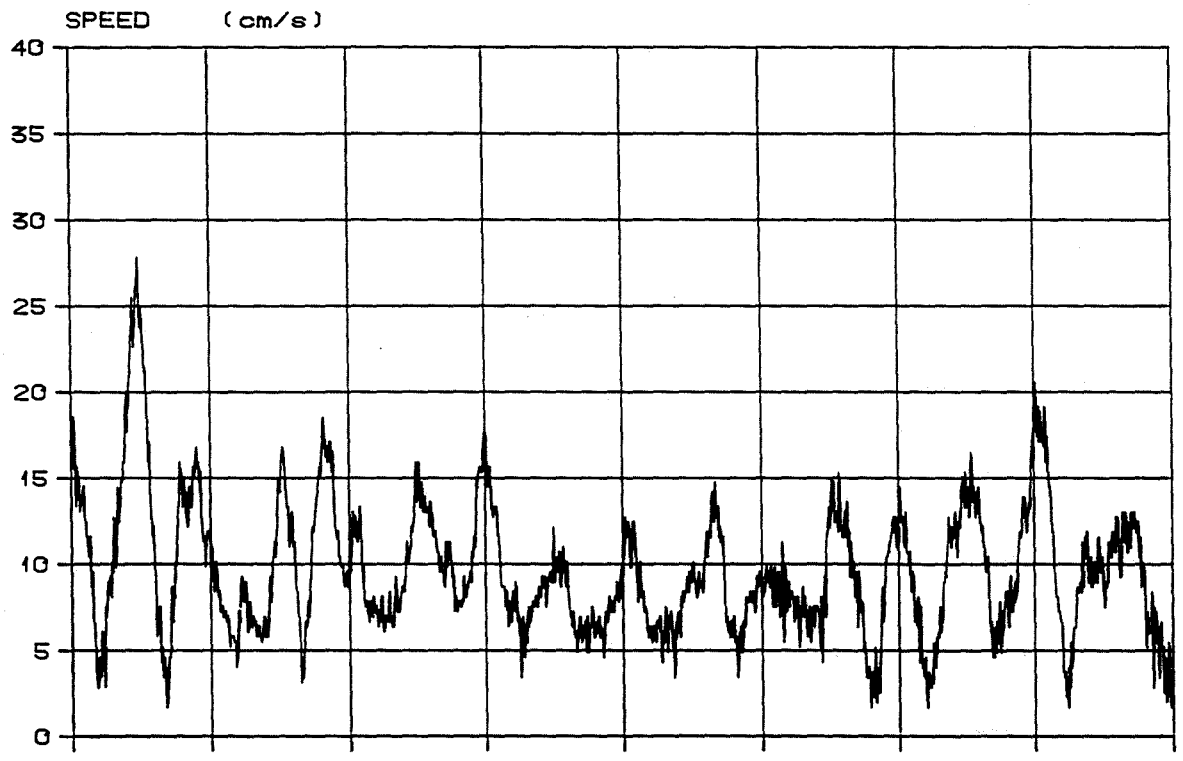
Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

H 1

Fig. 3-1-7

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

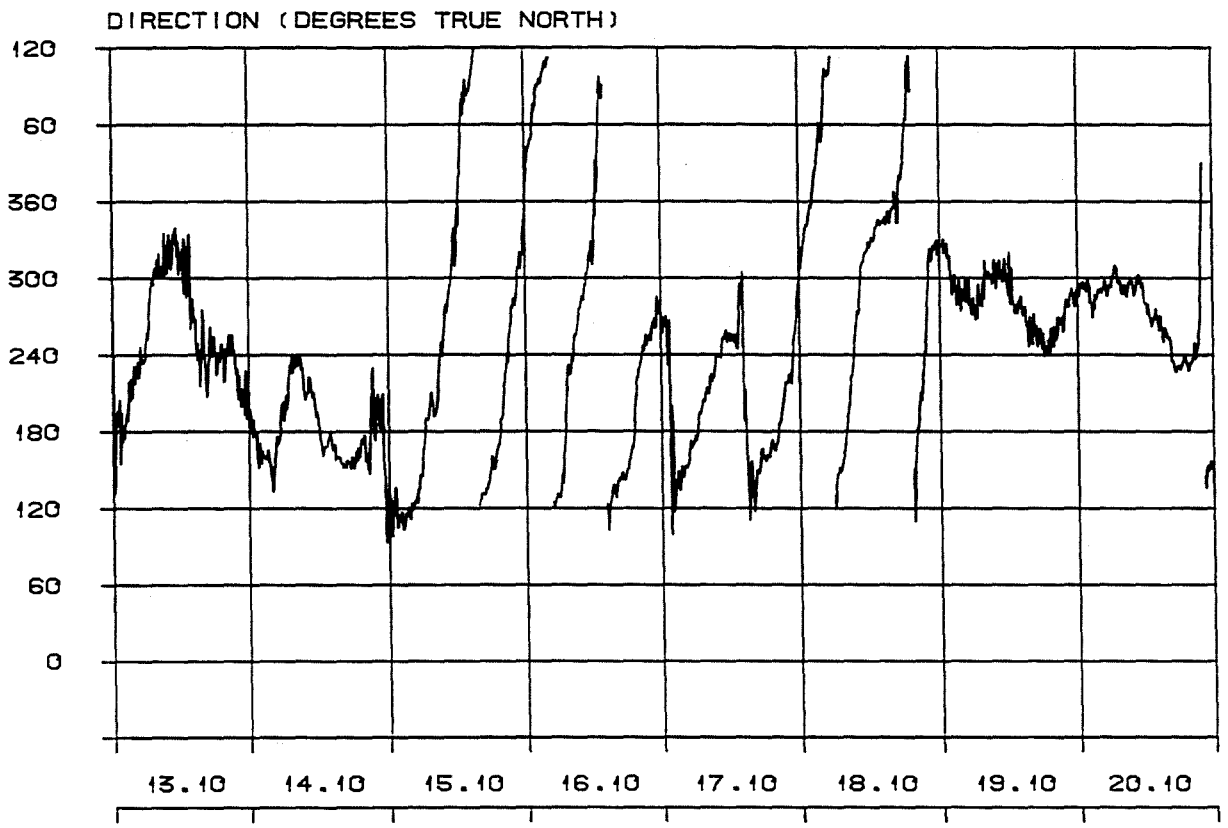
Time interval : 10.00 minutes.

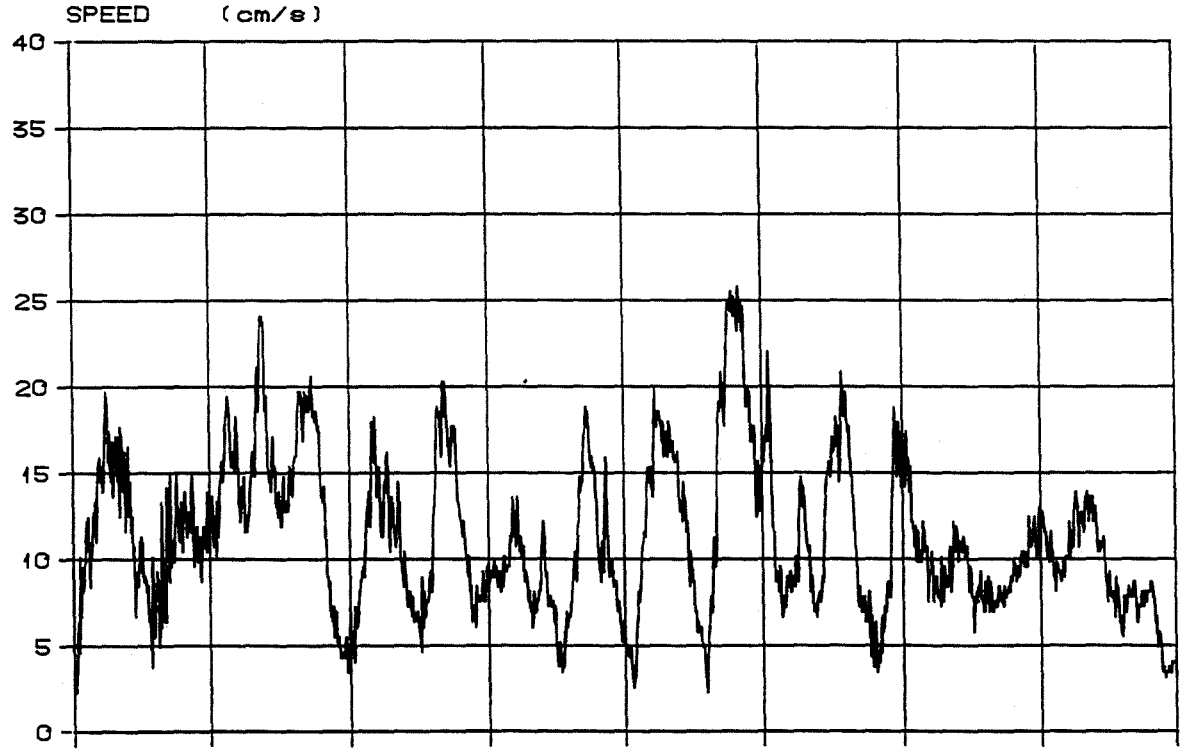
Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

H 1

Fig. 3-1-7

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

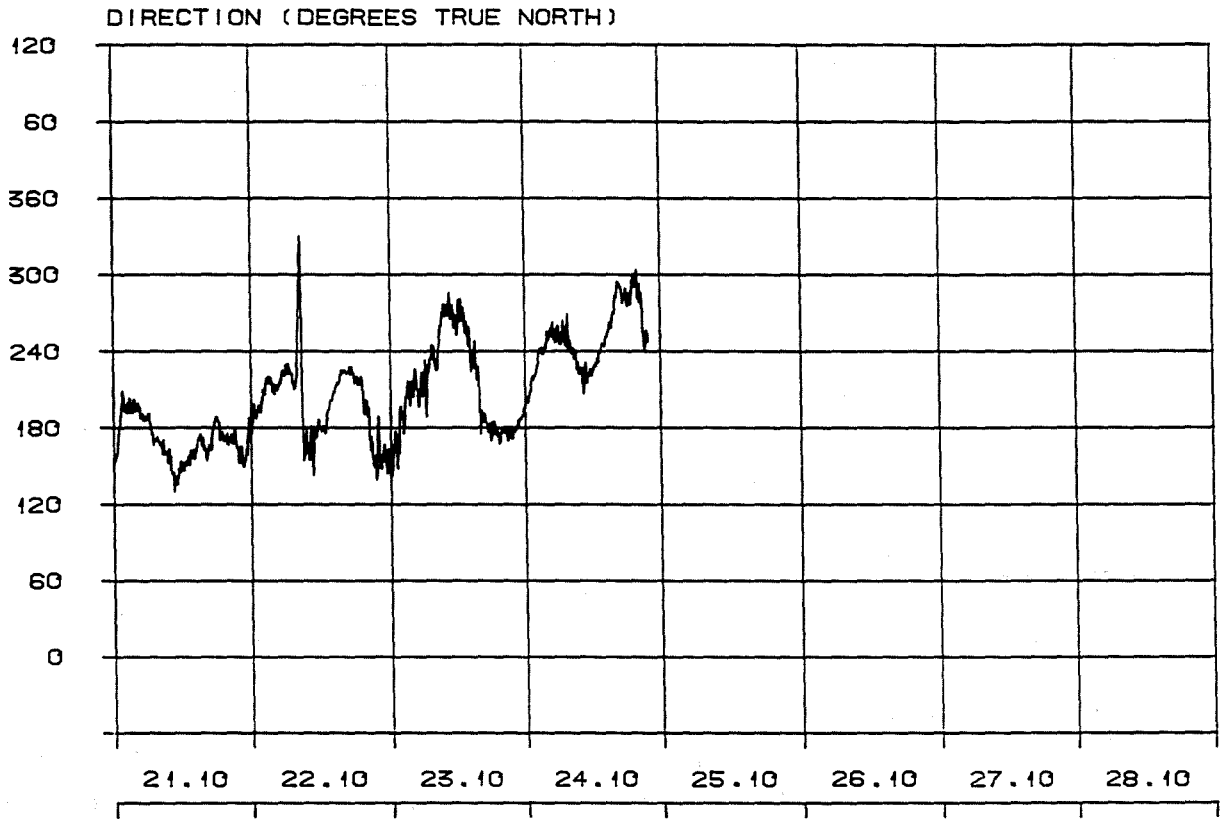
Instrument depth : 20.0 m Bottom depth : 285.0 m

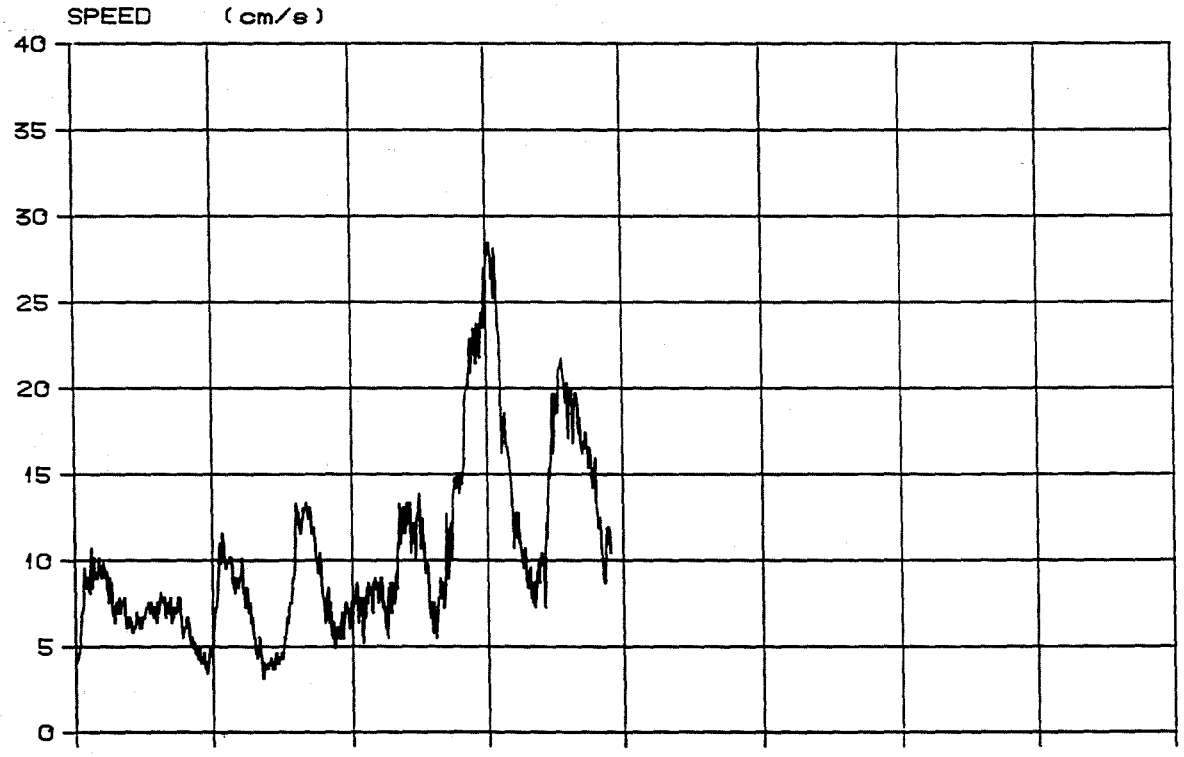
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

Fig. 3-1-7

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

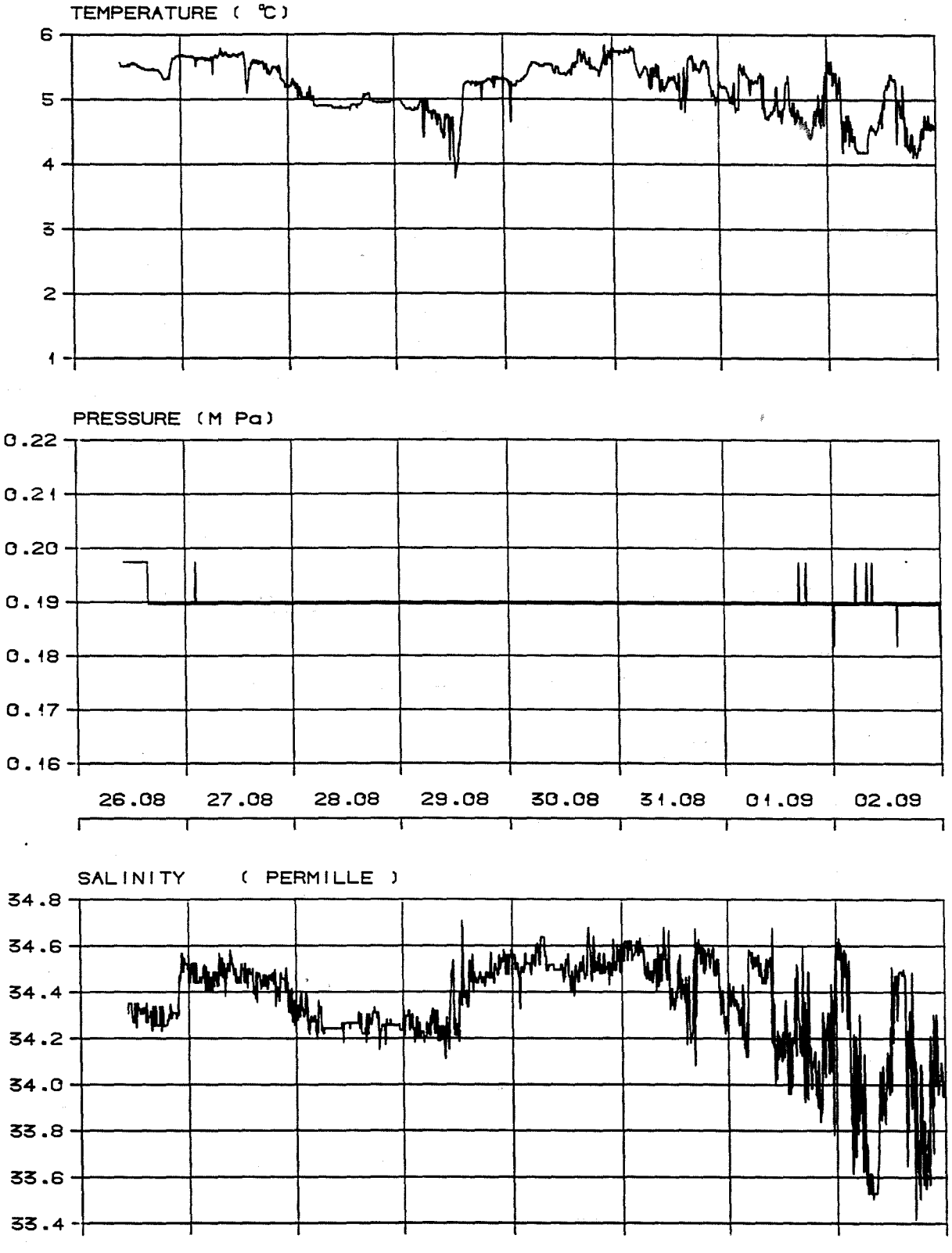
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

H 1

Fig. 3-1-7

Continues.....



The Barents Sea

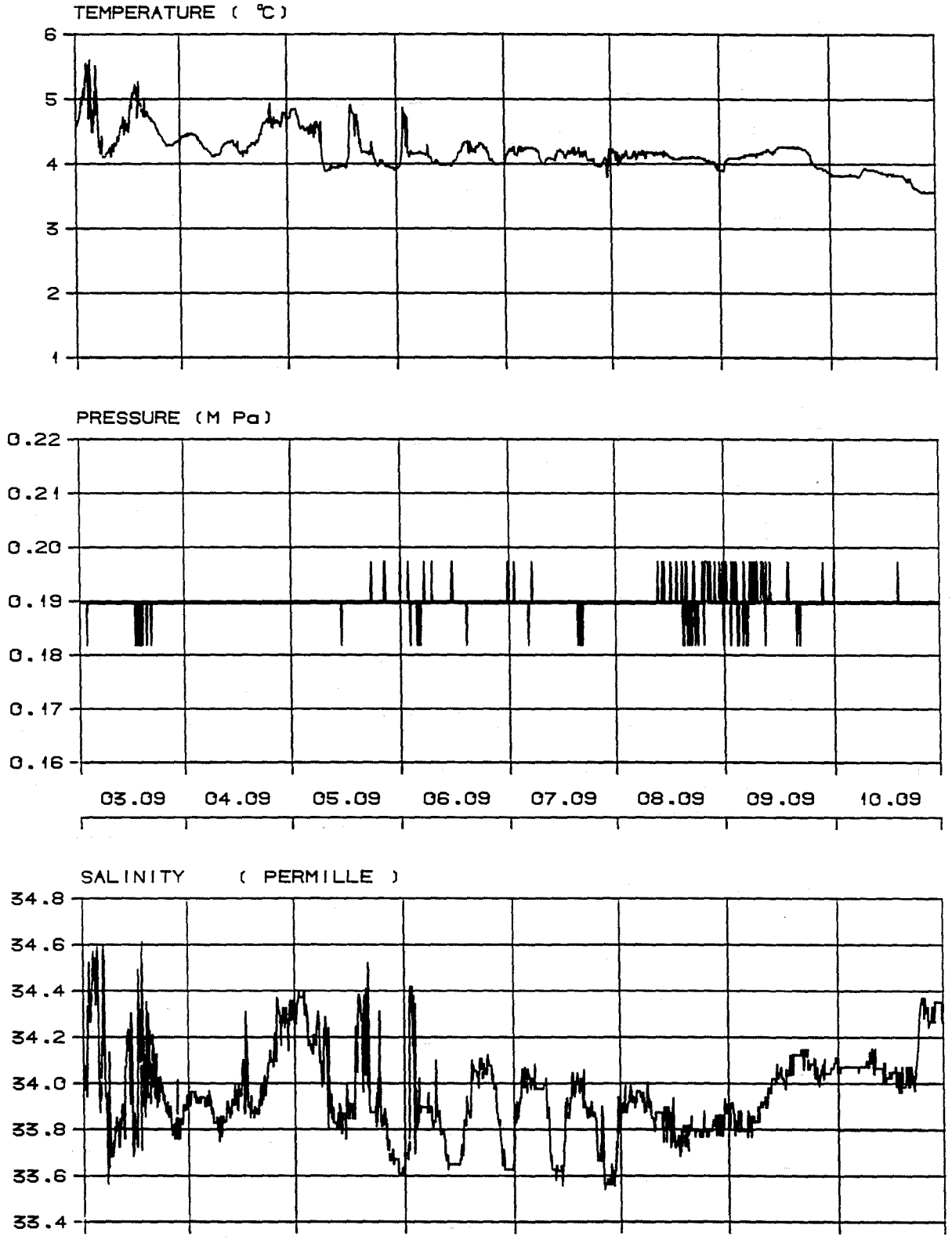
Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

Fig. 3-1-8 Temperature, pressure and salinity.



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

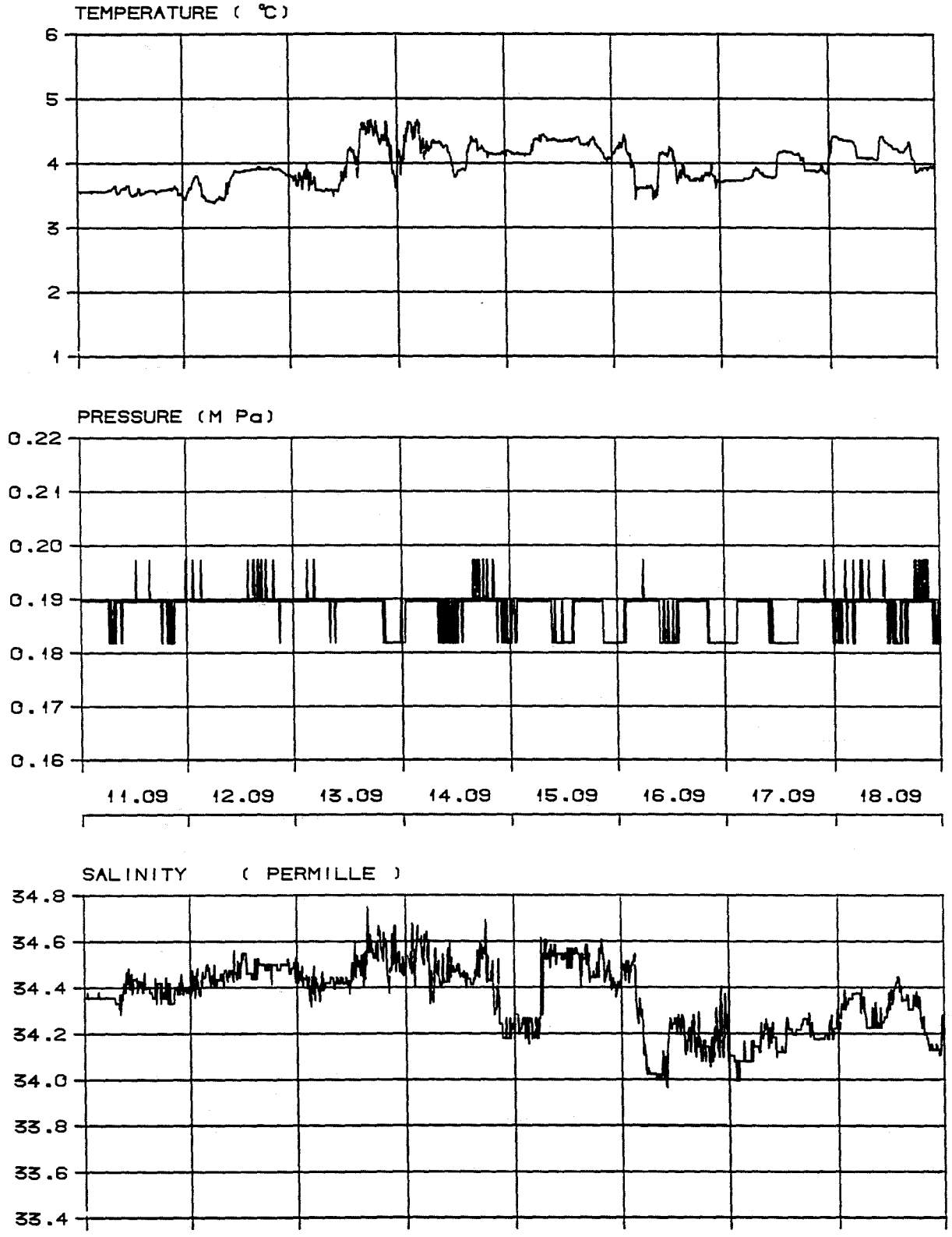
Instrument depth : 20.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

Fig. 3-1-8

Continues.....



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

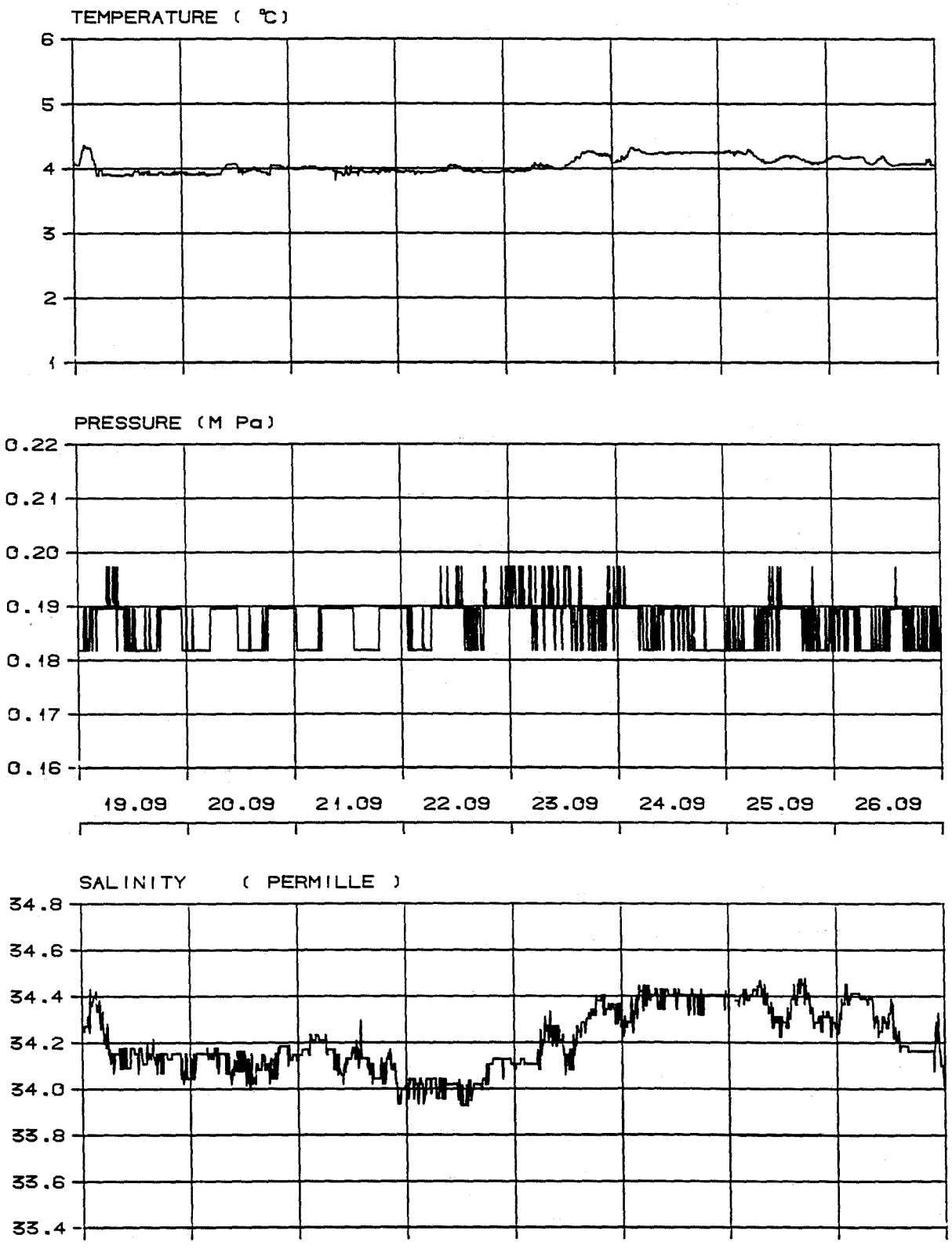
Instrument depth : 20.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

Fig. 3-1-8

Continues.....



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

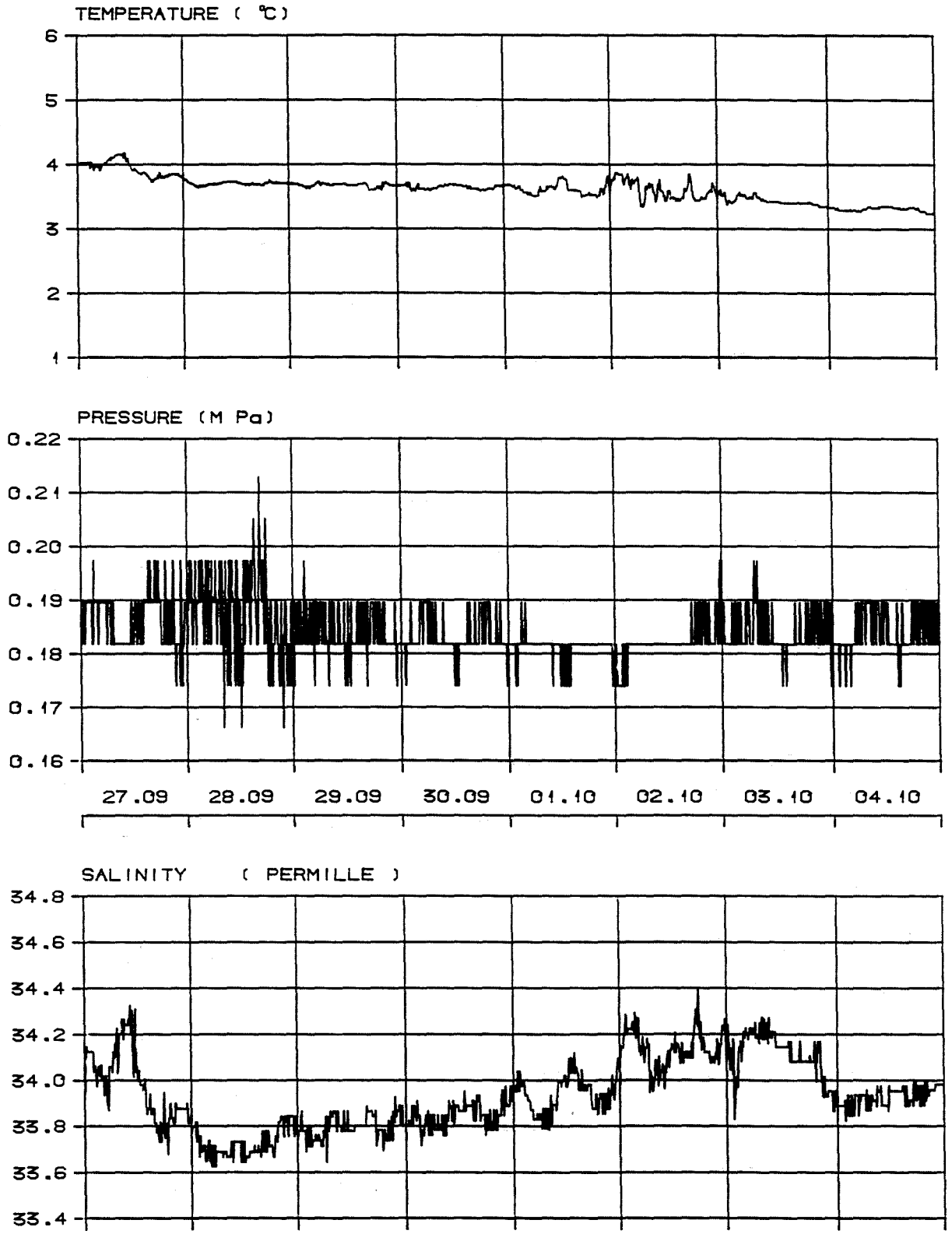
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

H 1

Fig. 3-1-8

Continues.....



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

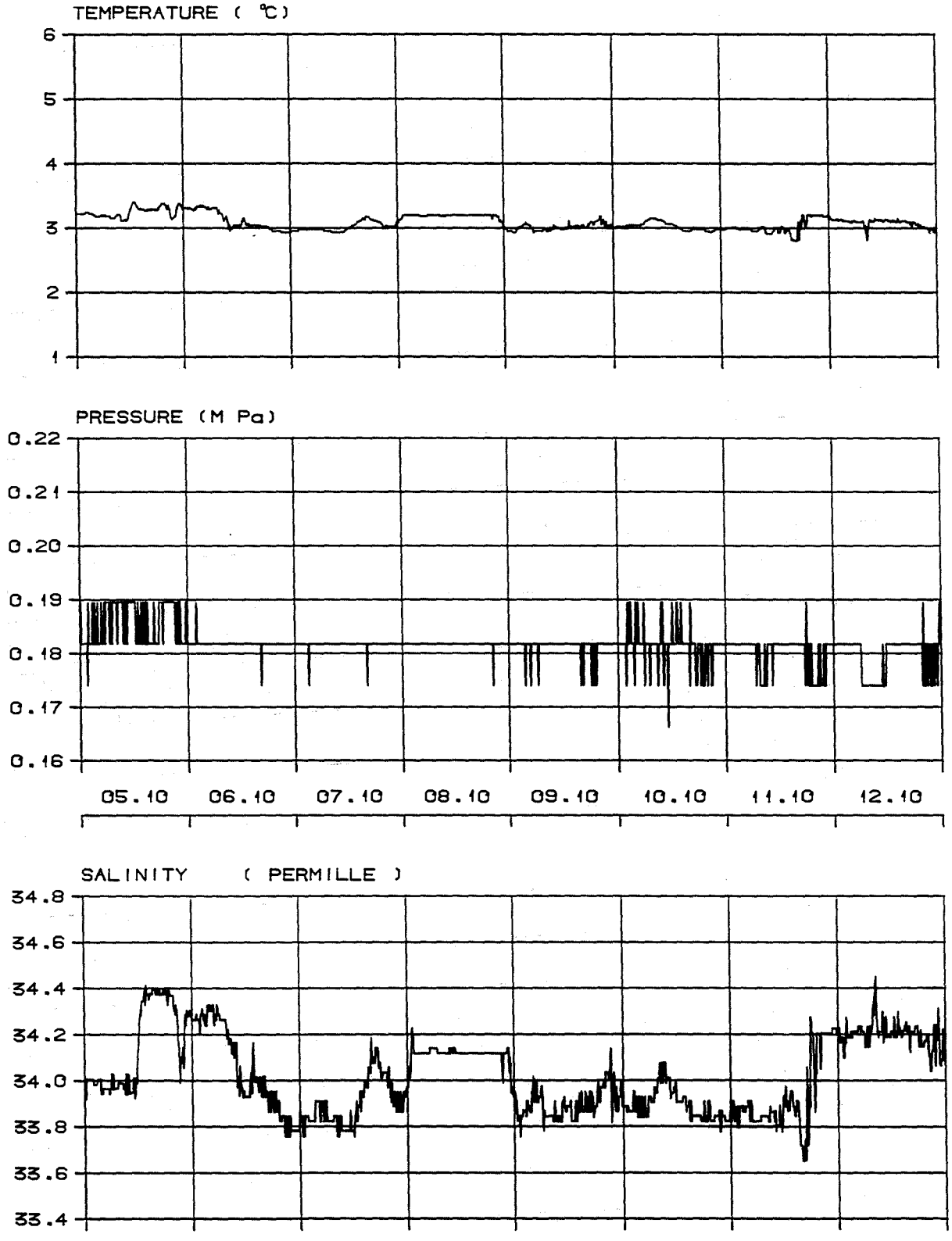
Instrument depth : 20.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

Fig. 3-1-8

Continues.....



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

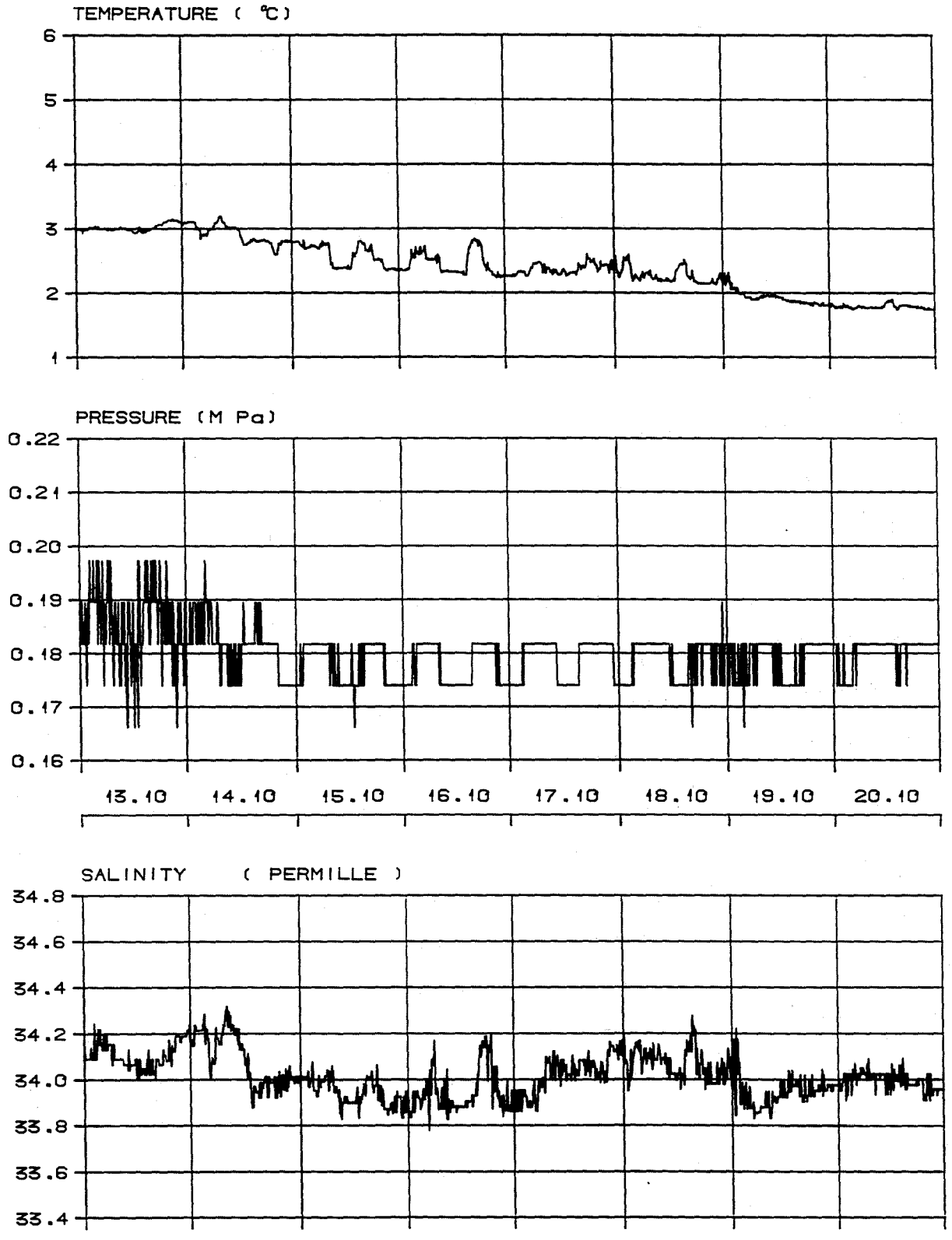
Time interval : 10.00 minutes.

Obeervation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

H 1

Fig. 3-1-8

Continues.....



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

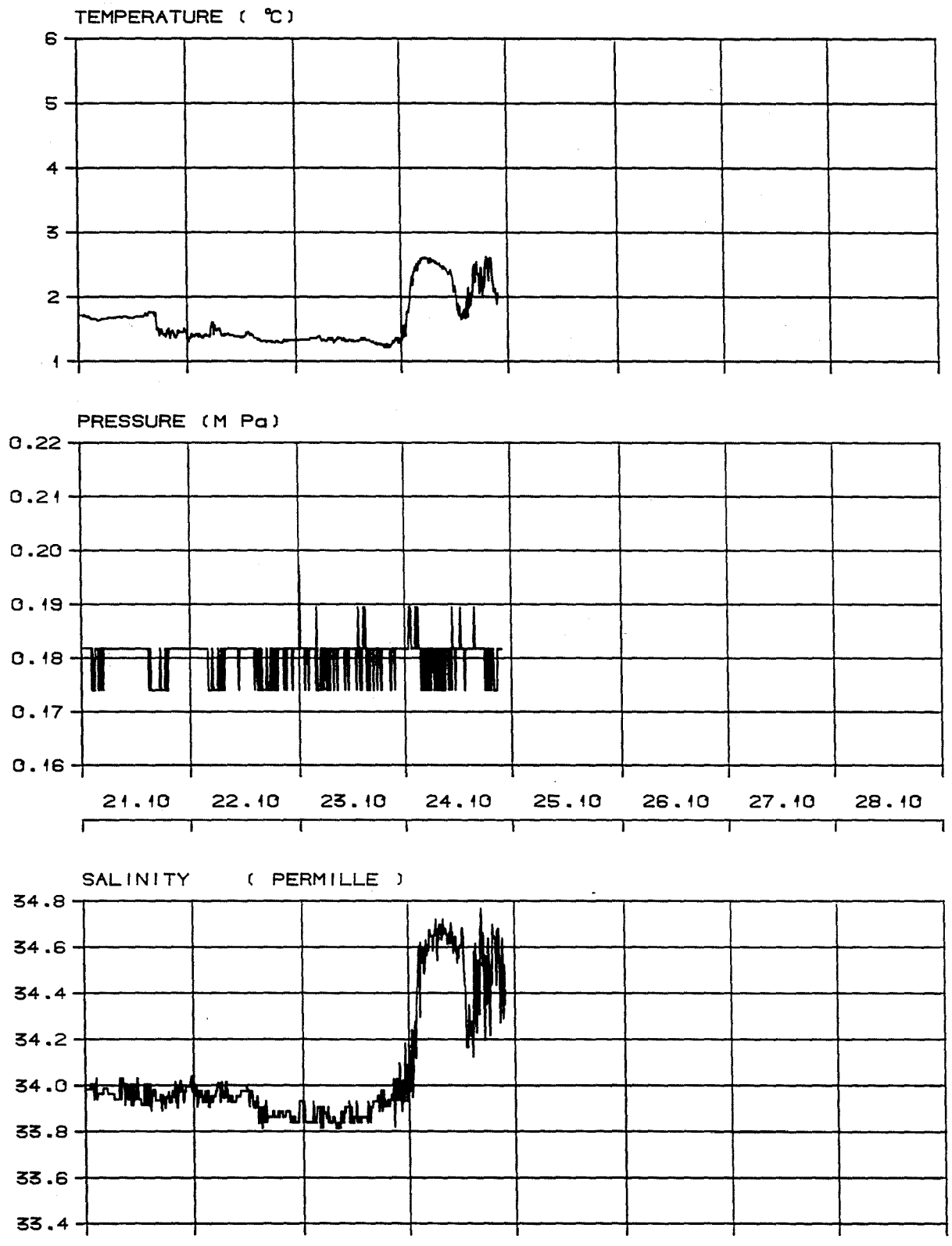
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

H 1

Fig. 3-1-8

Continues.....



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

H 1

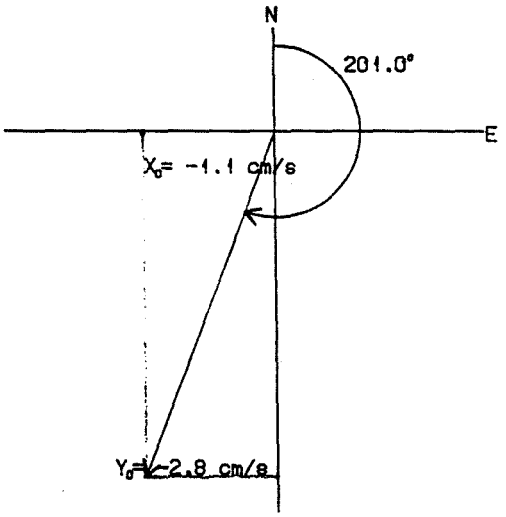
Fig. 3-1-8

Continues.....

HARMONIC ANALYSIS OF CURRENTS

CONSTITUENTS			DECOMPOSED CURRENT				TIDAL CURRENT ELLIPSE				
			E/W		N/S						
Symbol	Period houres	Frequense °/hour	X_j cm/s	g_{xj} °	Y_j cm/s	g_{yj} °	Major axis A_1 cm/s	Minor axis B_1 cm/s	θ_j °	g_j °	BETA. °
MM	661.31	0.5	1.7	11.0	0.9	25.0	1.9	0.2	63.1	13.9	97.0
MSF	354.37	1.0	0.7	315.1	1.2	104.3	1.4	0.3	153.2	290.8	53.9
MU2	12.87	28.0	1.6	57.8	1.8	316.9	1.9	-1.5	151.0	113.1	104.2
N2	12.66	28.4	0.6	243.1	0.9	192.0	1.0	-0.4	24.6	202.3	54.8
M2	12.42	29.0	7.4	62.5	7.8	321.0	8.6	-7.0	321.6	288.2	44.0
L2	12.19	29.5	1.2	34.7	1.2	319.9	1.5	-1.2	218.2	170.8	30.6
S2	12.00	30.0	3.0	129.6	2.9	30.7	3.1	-2.7	131.1	166.3	46.4
ETA2	11.75	30.6	1.6	194.8	1.4	113.9	1.0	-0.8	65.4	174.4	126.4

MEAN CURRENT



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

H 1

Fig. 3-1-9 Harmonic analysis of currents.

A discription of the model and its definitions :

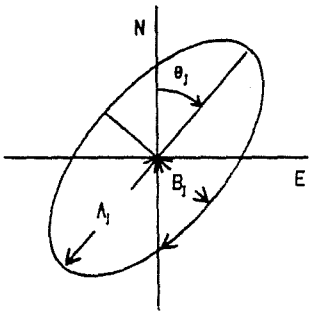
Current-vector decomposed in E/W (real) - and N/S (imaginary) - direction :

$$Z(t)=X_0+\sum_{j=1}^{n}(X_j\cos(\sigma_j t+(V_0+u)_j-g_{xj})+i(Y_0+\sum_{j=1}^{n}Y_j\cos(\sigma_j t+(V_0+u)_j-g_{yj}))$$

g_{xj} , g_{yj} : Greenwich-phase for E/W- and N/S-components of each constituent.

With ellipseparameters :

$$Z(t)=\sum_{j=1}^{n}\exp(i(90^\circ-\theta_j))(A_j\cos(\sigma_j t+(V_0+u)_j-g_j)+iB_j\sin(\sigma_j t+(V_0+u)_j-g_j))$$



g_j : Greenwich phase of the current-vector for each constituent.

Rotationdirection : anticlockwise when $B_j > 0$, clockwise when $B_j < 0$

BETA : The angle between t=0 and major halv axis in the ellipse.

Common for both modles :

σ_j : Frequence in degrees/hour.

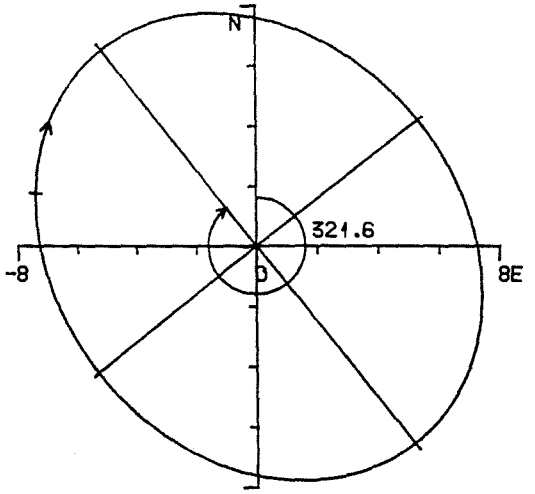
$(V_0+u)_j$: Astronomic argument relative to Greenwich-meridian.

During the calculation of Z(t) will V_0+u be put into the formulas at the time t=0.

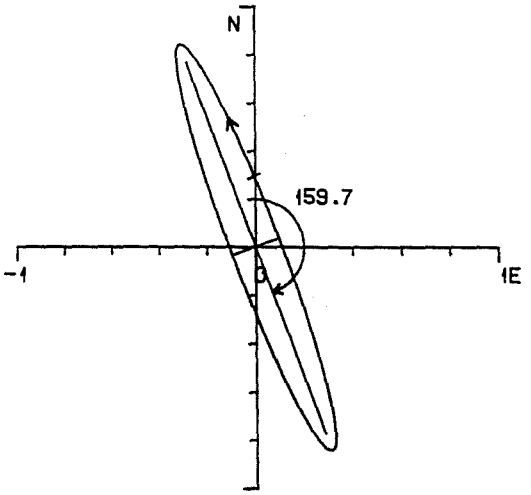
The time t is in houres; the same timezone as the analysed data.

t=0 in the midle of the measurement series : 1989 25.09 H. 0400 , marked with a line on the ellipse.

M2-ellipse



K1-ellipse



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 20.0 m Bottom depth : 285.0 m

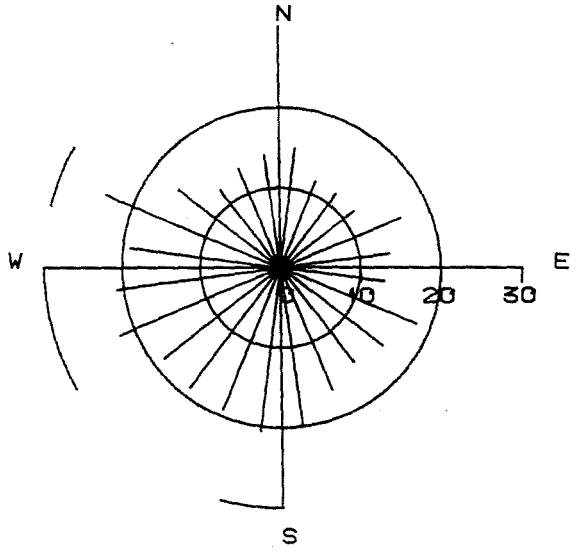
Time interval : 10.00 minutes.

Obeervation period: 1989 26.08 H. 1020 - 1989 24.10 H. 2150

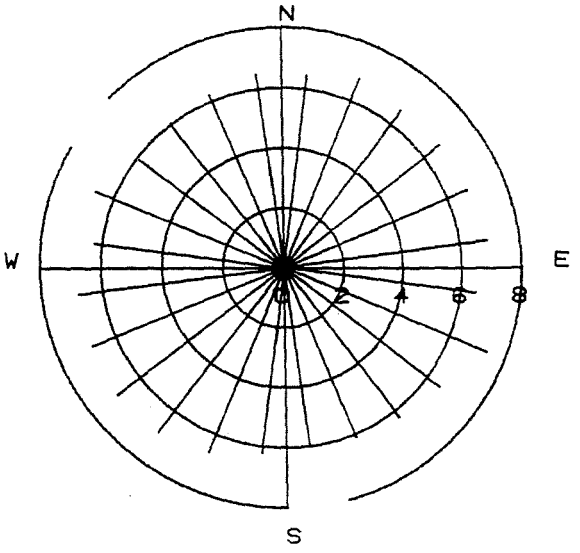
H 1

Fig. 3-1-10 M2 and K1 ellipse.

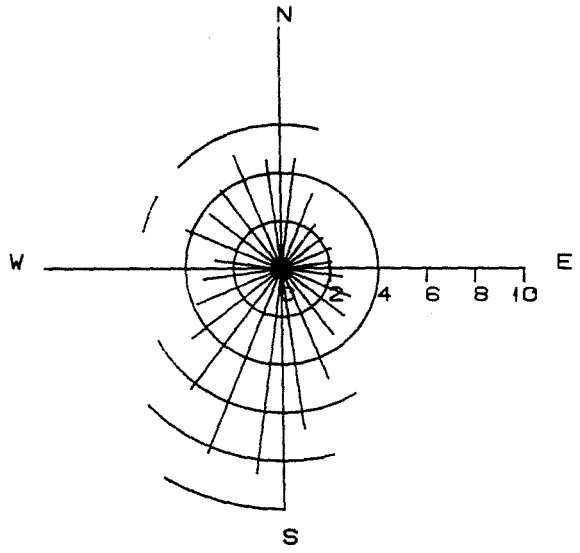
CURRENT VELOCITY DISTRIBUTION



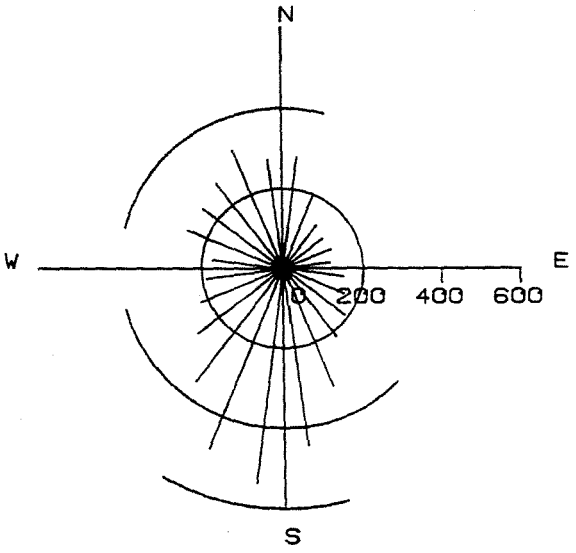
Maksimum velocity (cm/s)



Mean velocity (cm/s)



Relative flux in %



Number measured

Number of observations : 6045

The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 45.0 m Bottom depth : 285.0 m

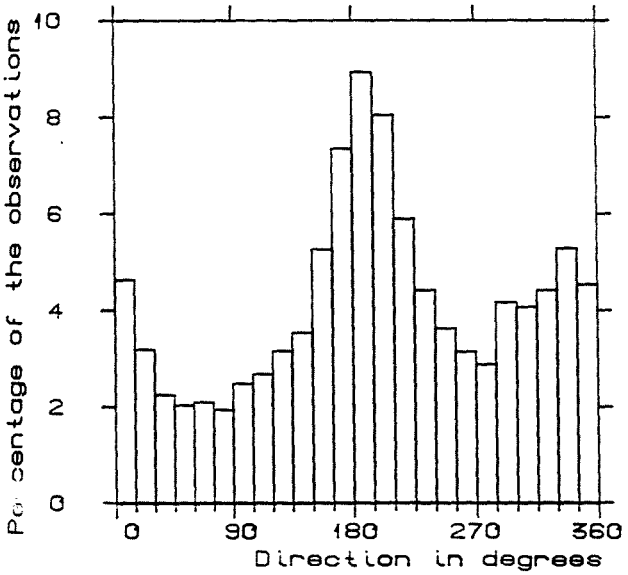
Time interval : 10.00 minutes.

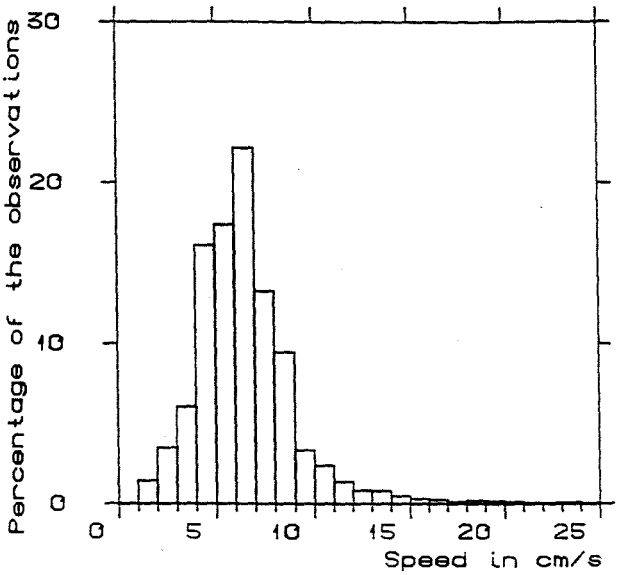
Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

H 1

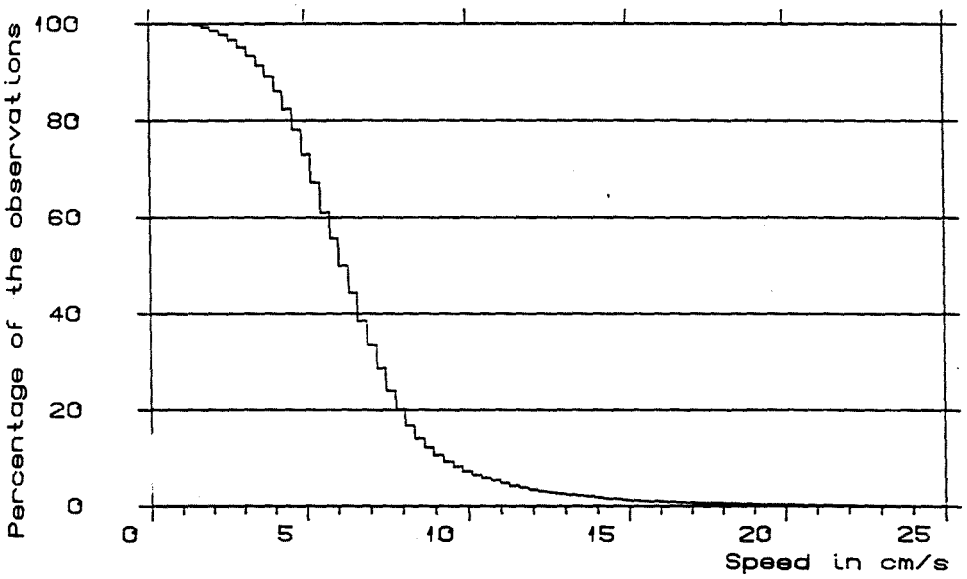
Fig. 3-2-1 Current velocity distribution.

HISTOGRAM





CURRENT SPEED DISTRIBUTION



Number of observations : 6045

The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 45.0 m Bottom depth : 285.0 m

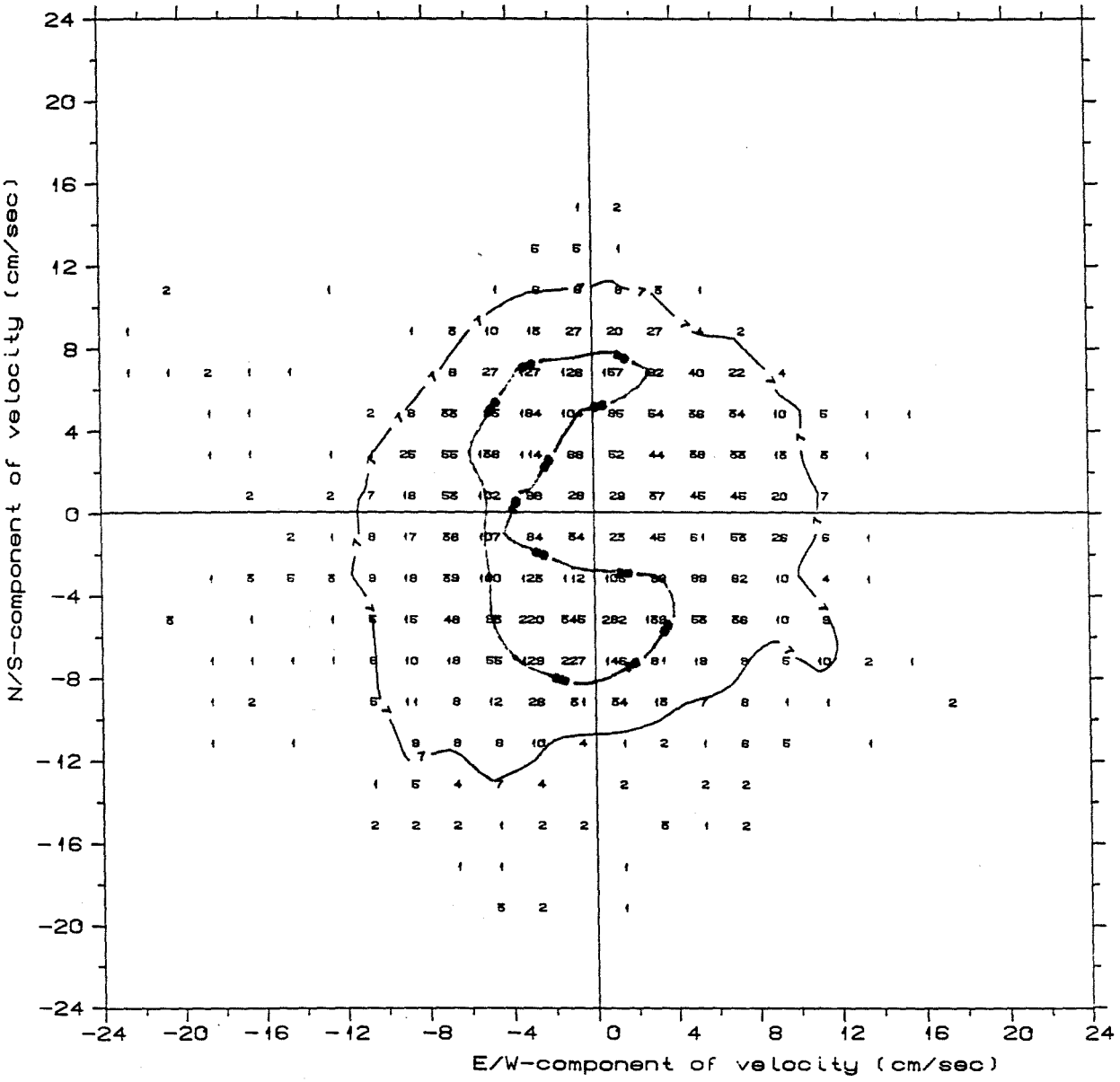
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

H I

Fig. 3-2-2 Histogram of speed and direction.
Current speed distribution.

VELOCITY DISTRIBUTION DIAGRAM



Number of observations : 6045

Isoline for 50% and 96%

Number of observations : 6045

The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 45.0 m Bottom depth : 285.0 m

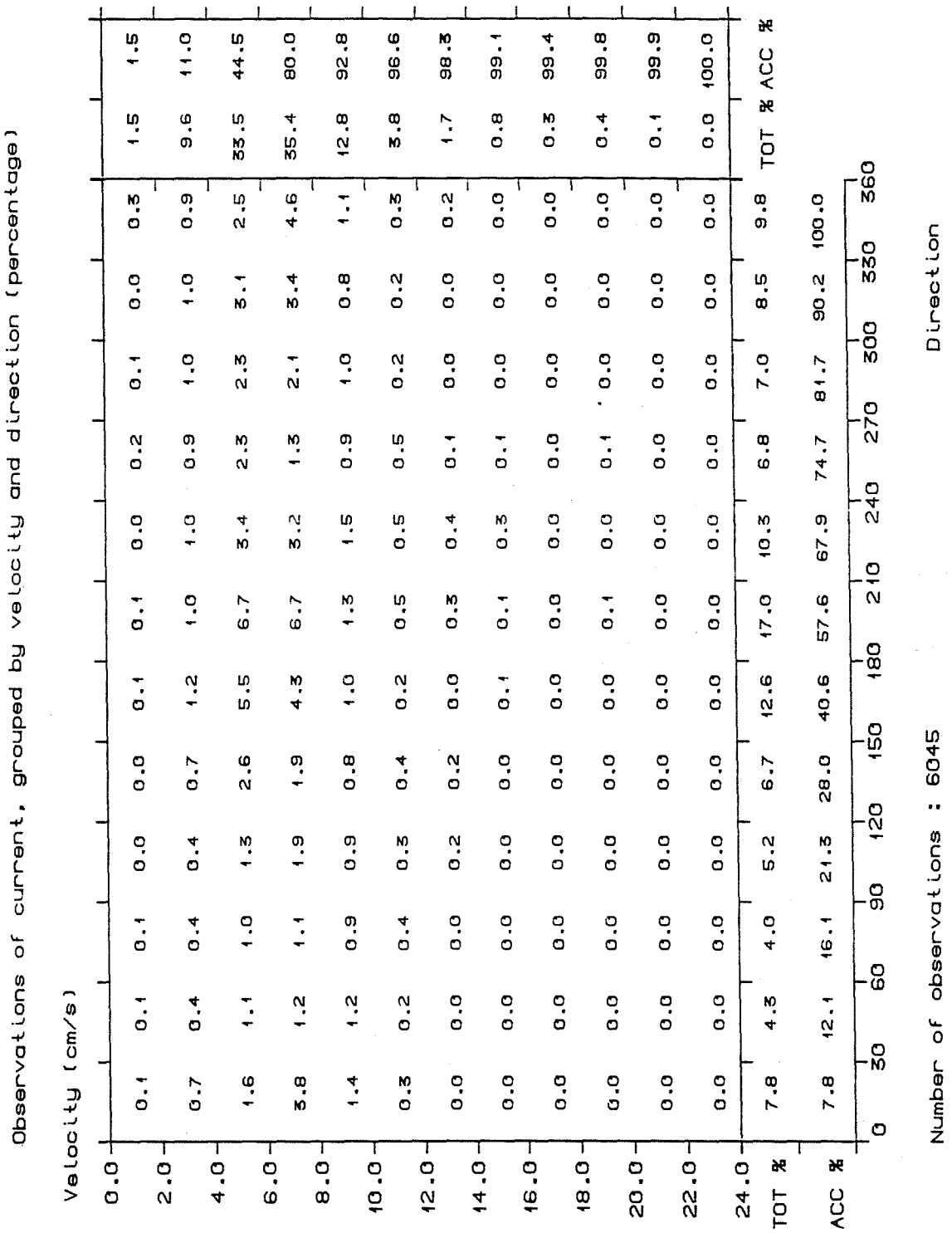
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

H 1

Fig. 3-2-3 Velocity distribution diagram.

DIRECTION DISTRIBUTION OF CURRENT VELOCITY



Number of observations : 6045

The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

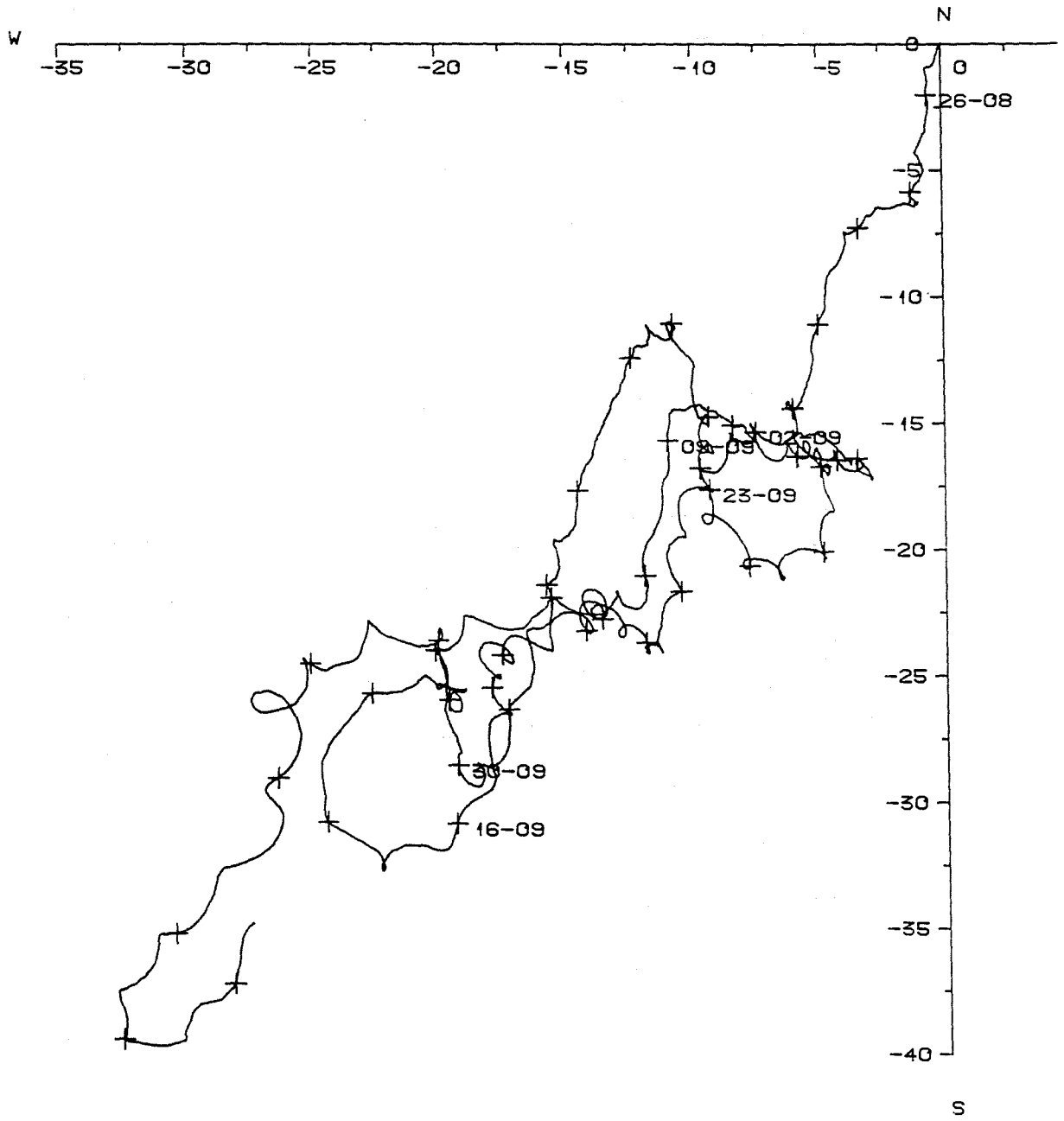
Instrument depth : 45.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

Fig. 3-2-4 Velocity distribution table.

PROGRESSIVE VECTOR DIAGRAM



Units in km

Number of observations : 6045

The Barents Sea

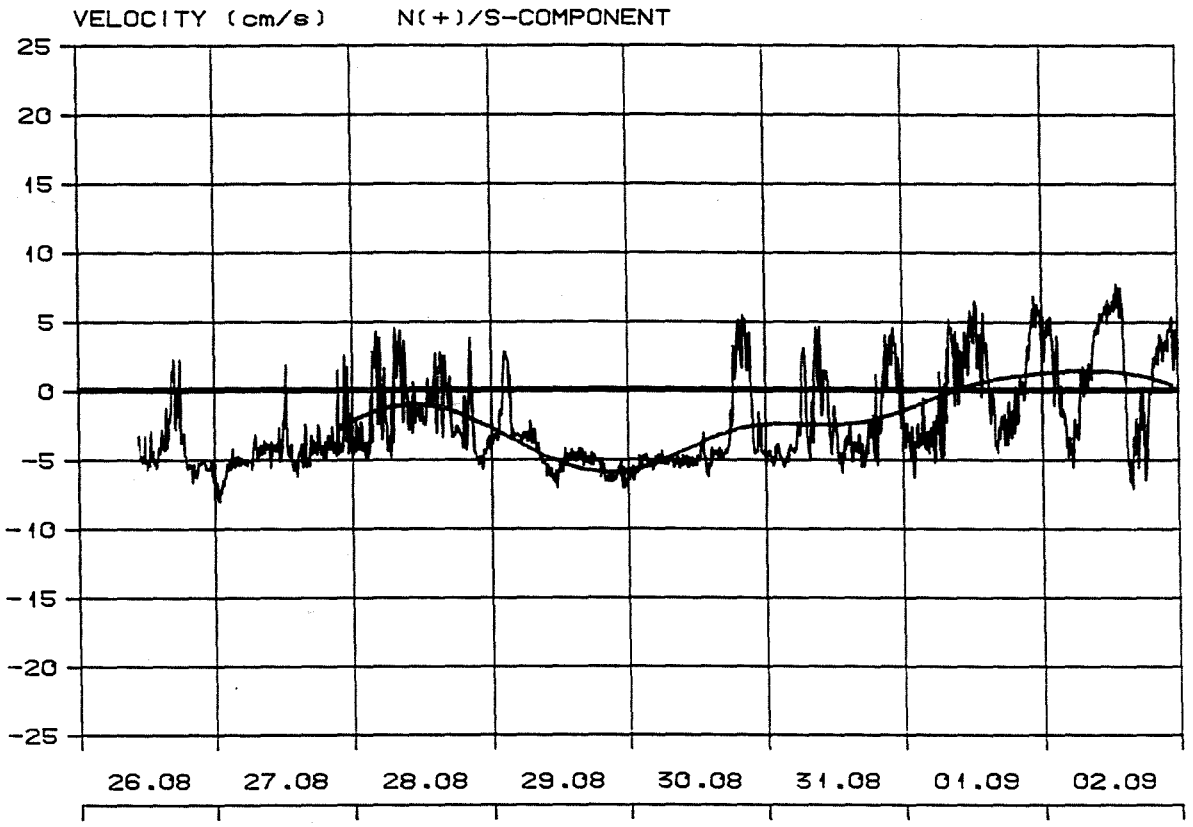
Position : N 74° 29.70' E 43° 0.60'

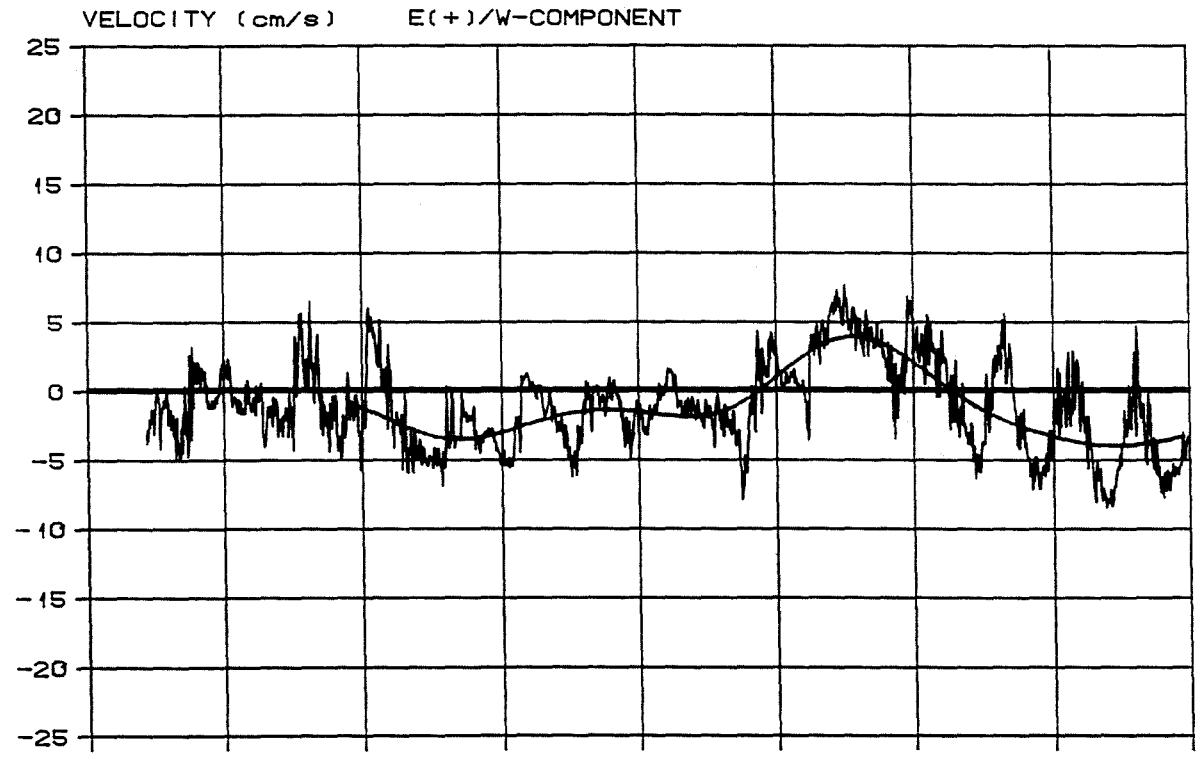
Instrument depth : 45.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

Fig. 3-2-5 Progressive vector diagram.





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

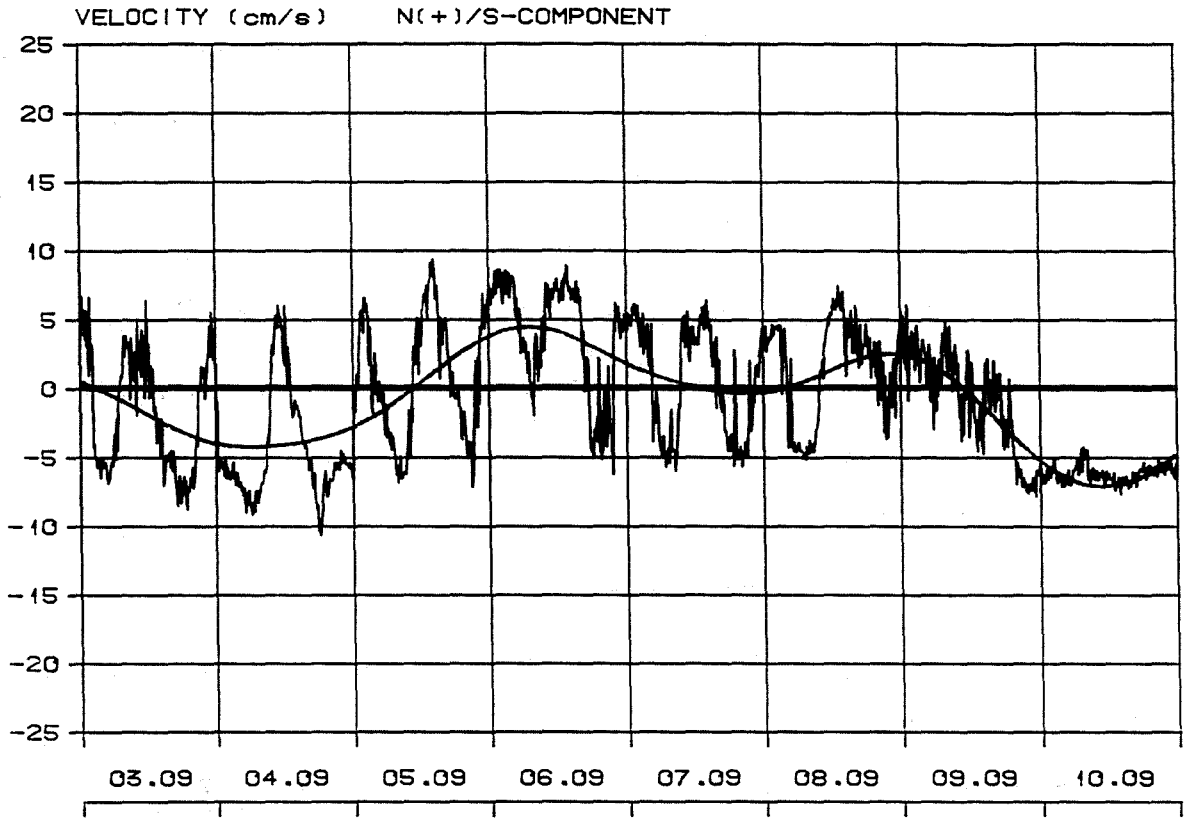
Instrument depth : 45.0 m Bottom depth : 285.0 m

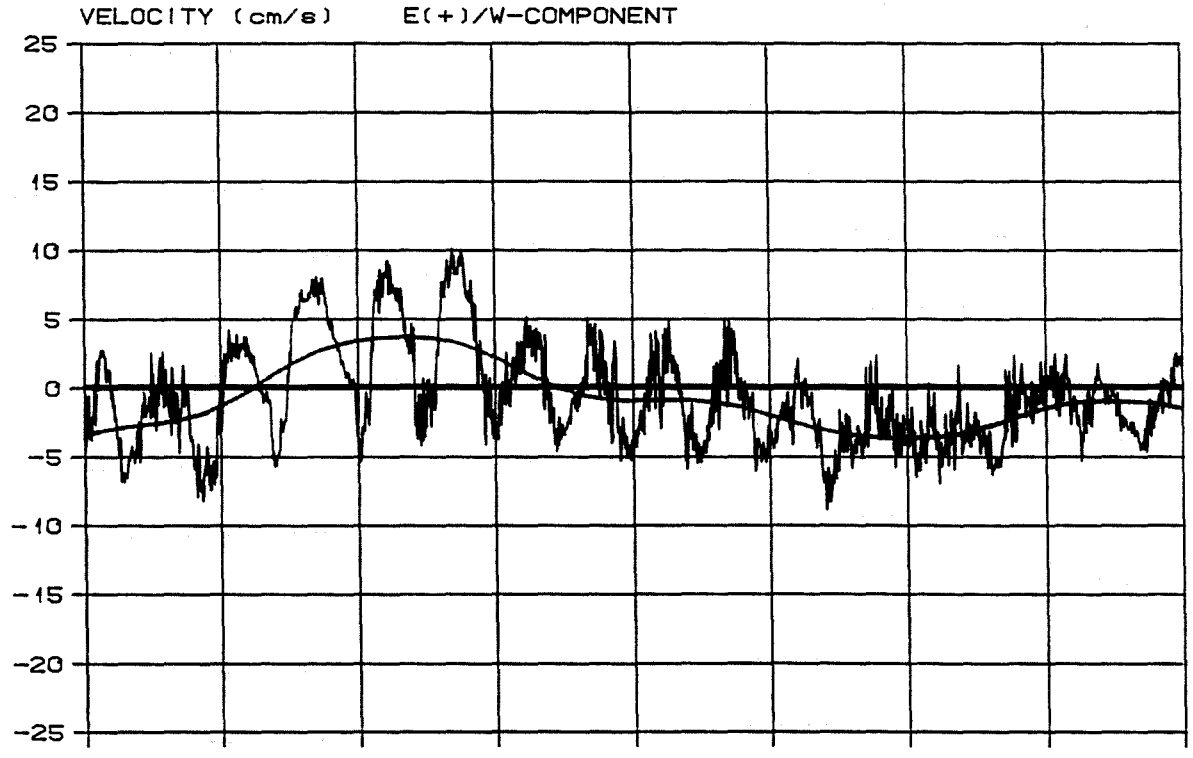
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

H I

Fig. 3-2-6 N/S and E/W components of current.





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 45.0 m Bottom depth : 285.0 m

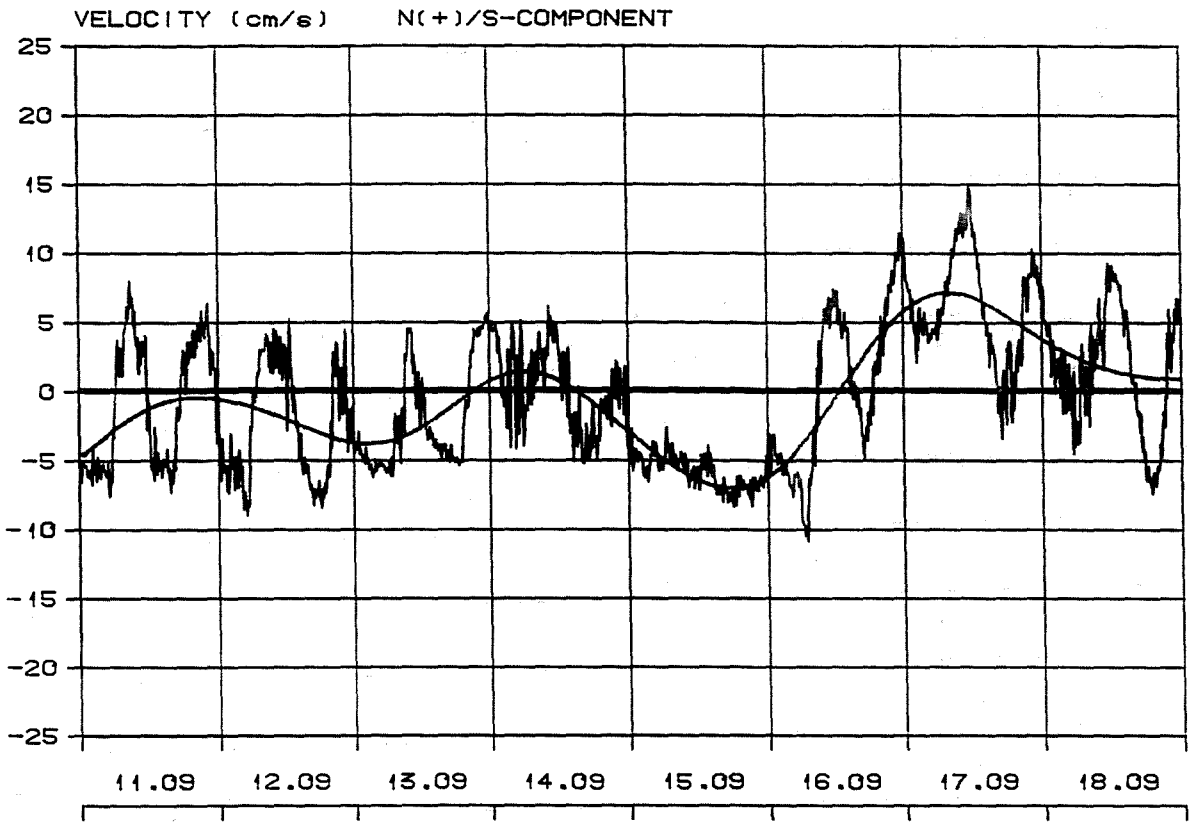
Time interval : 10.00 minutes.

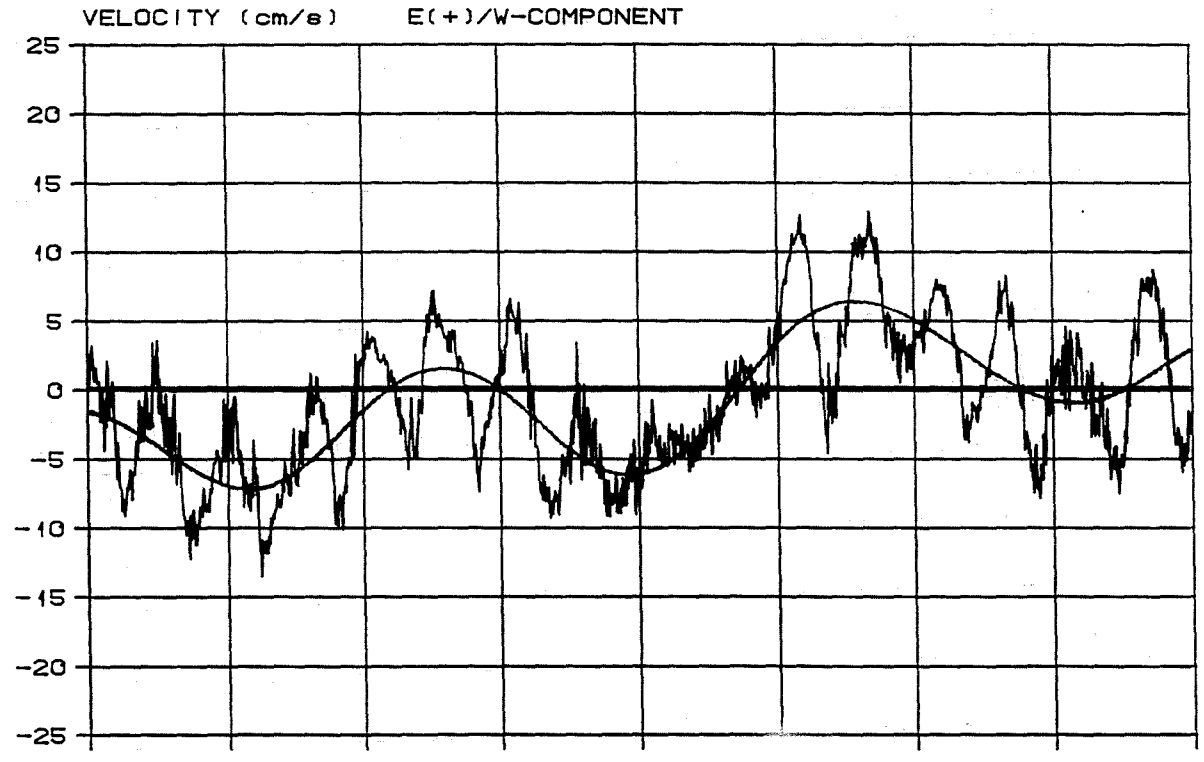
Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

H 1

Fig. 3-2-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 45.0 m Bottom depth : 285.0 m

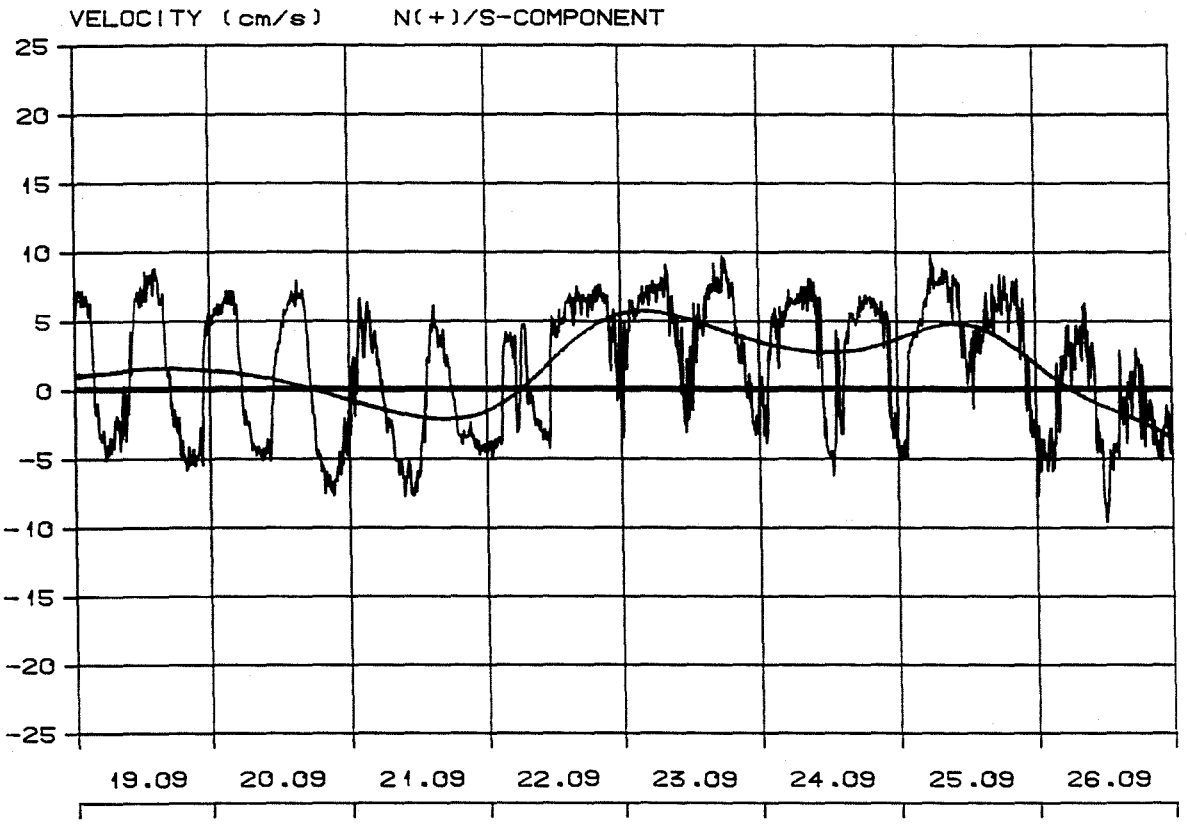
Time interval : 10.00 minutes.

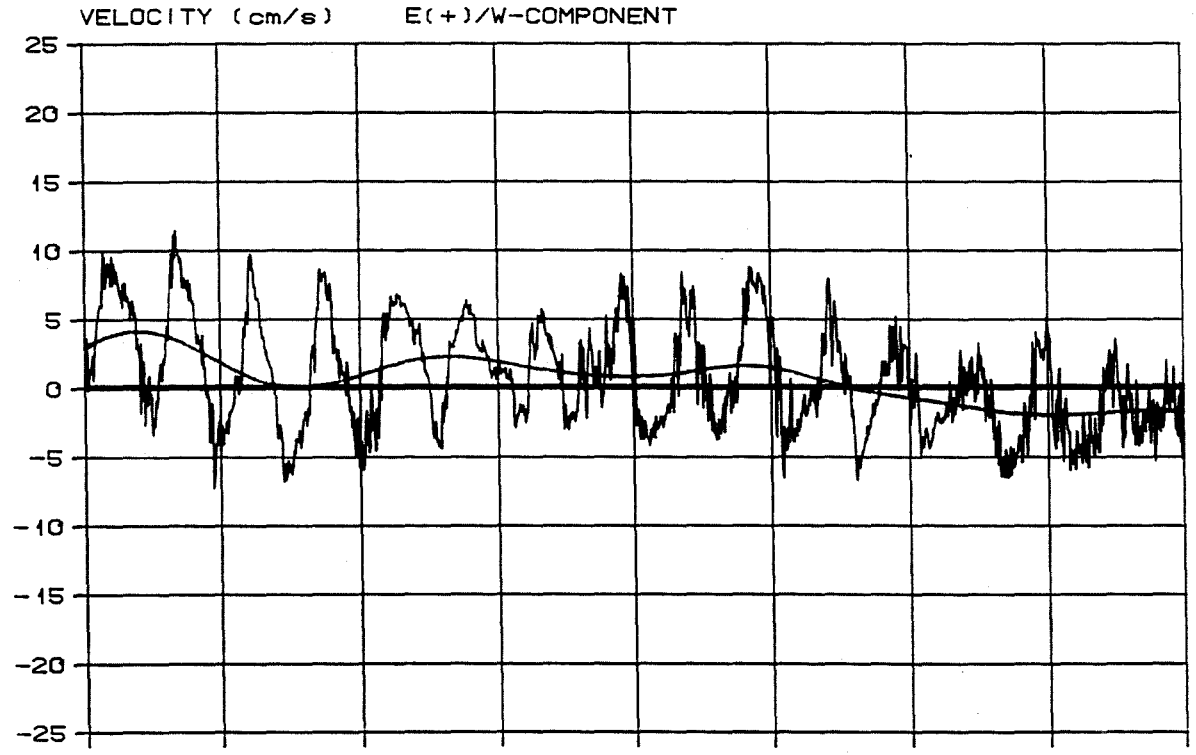
Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

H 1

Fig. 3-2-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 45.0 m Bottom depth : 285.0 m

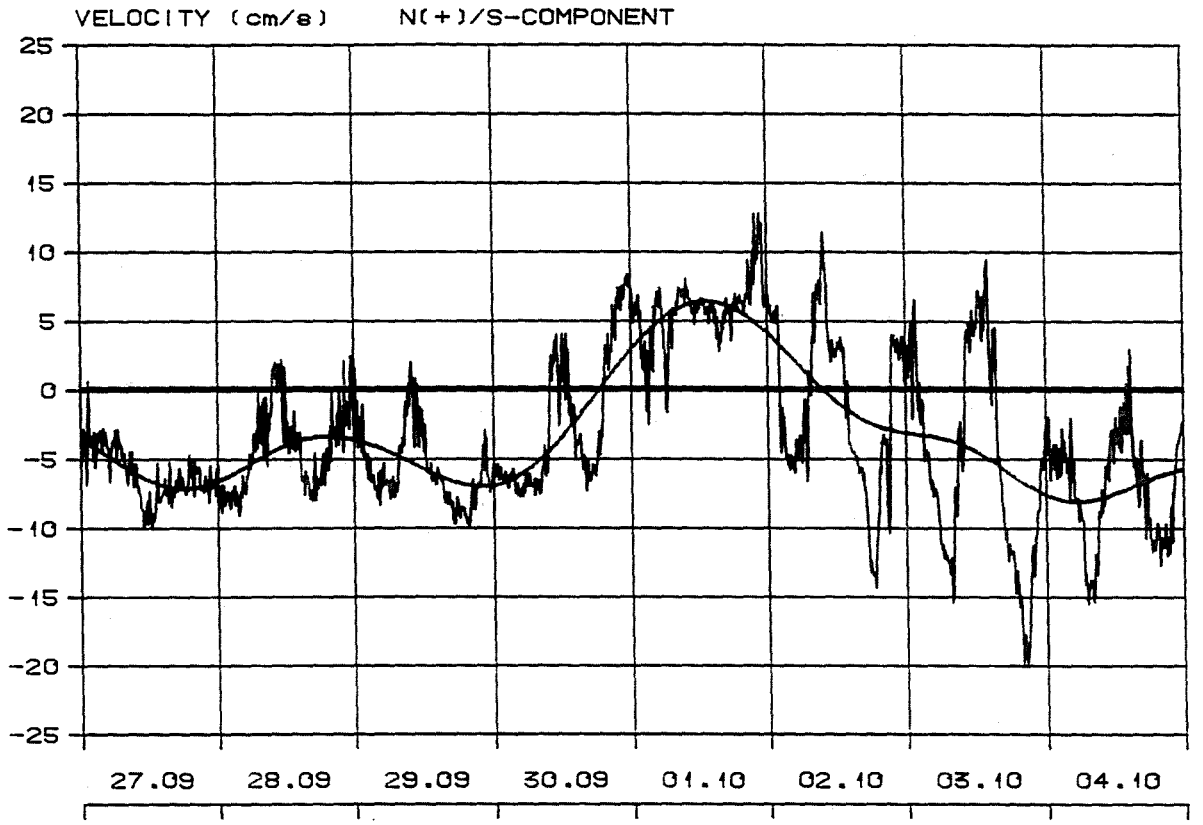
Time interval : 10.00 minutes.

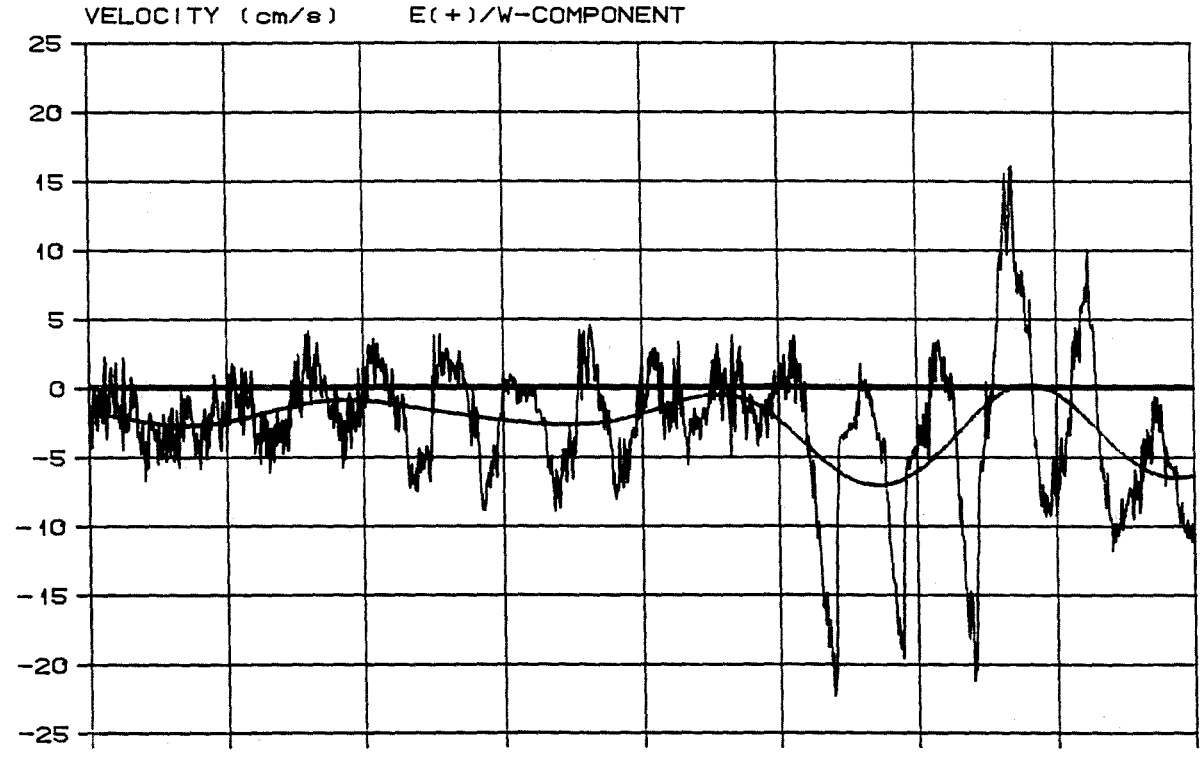
Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

H 1

Fig. 3-2-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

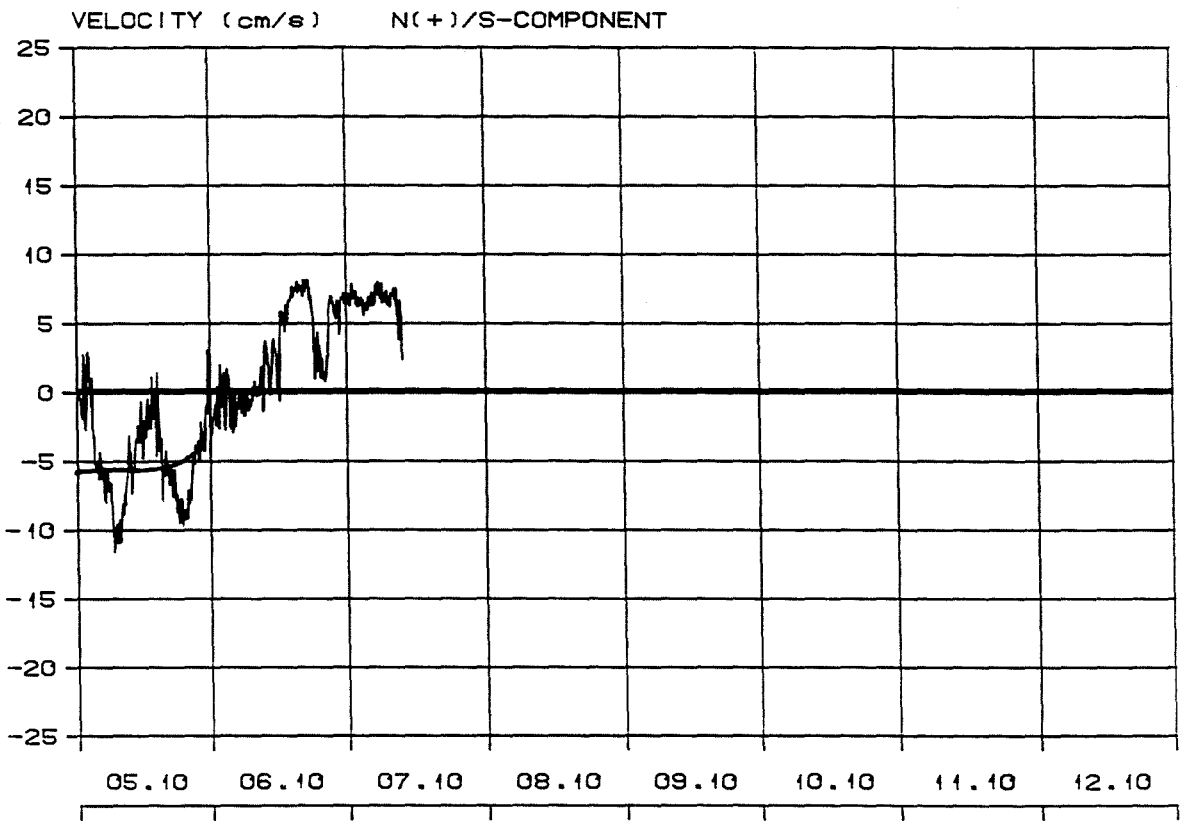
Instrument depth : 45.0 m Bottom depth : 285.0 m

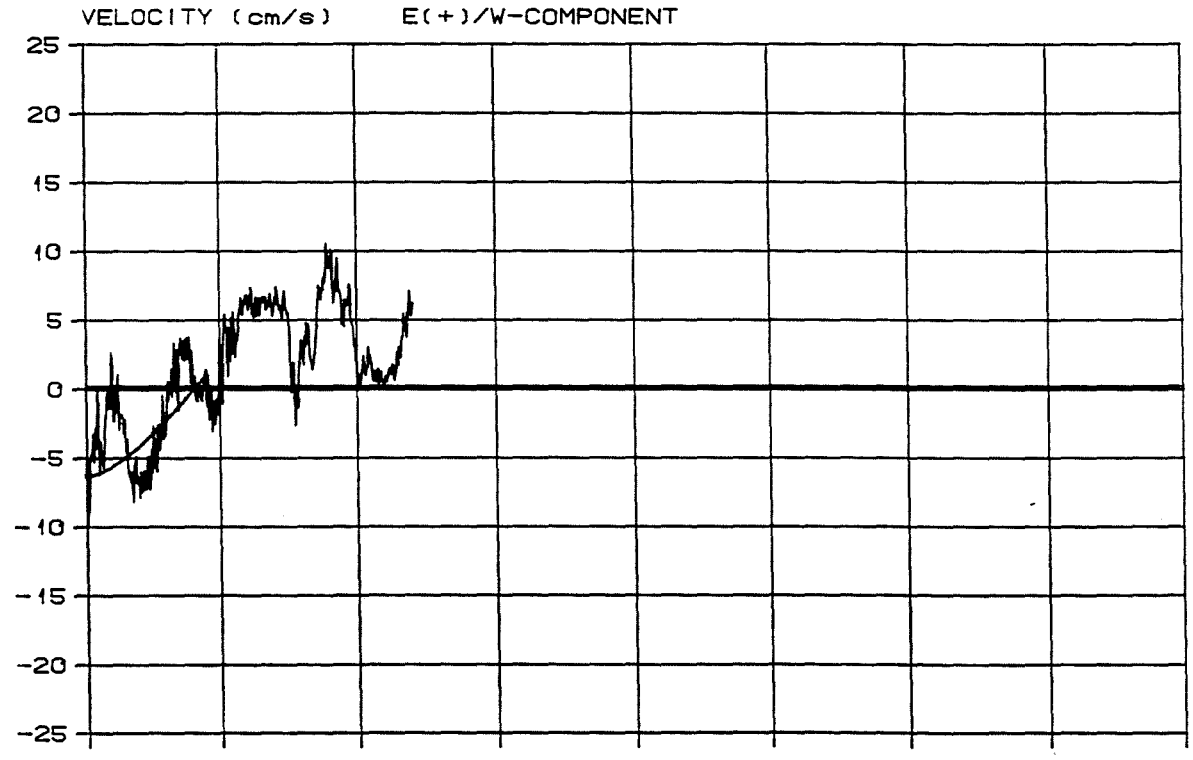
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

Fig. 3-2-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 45.0 m Bottom depth : 285.0 m

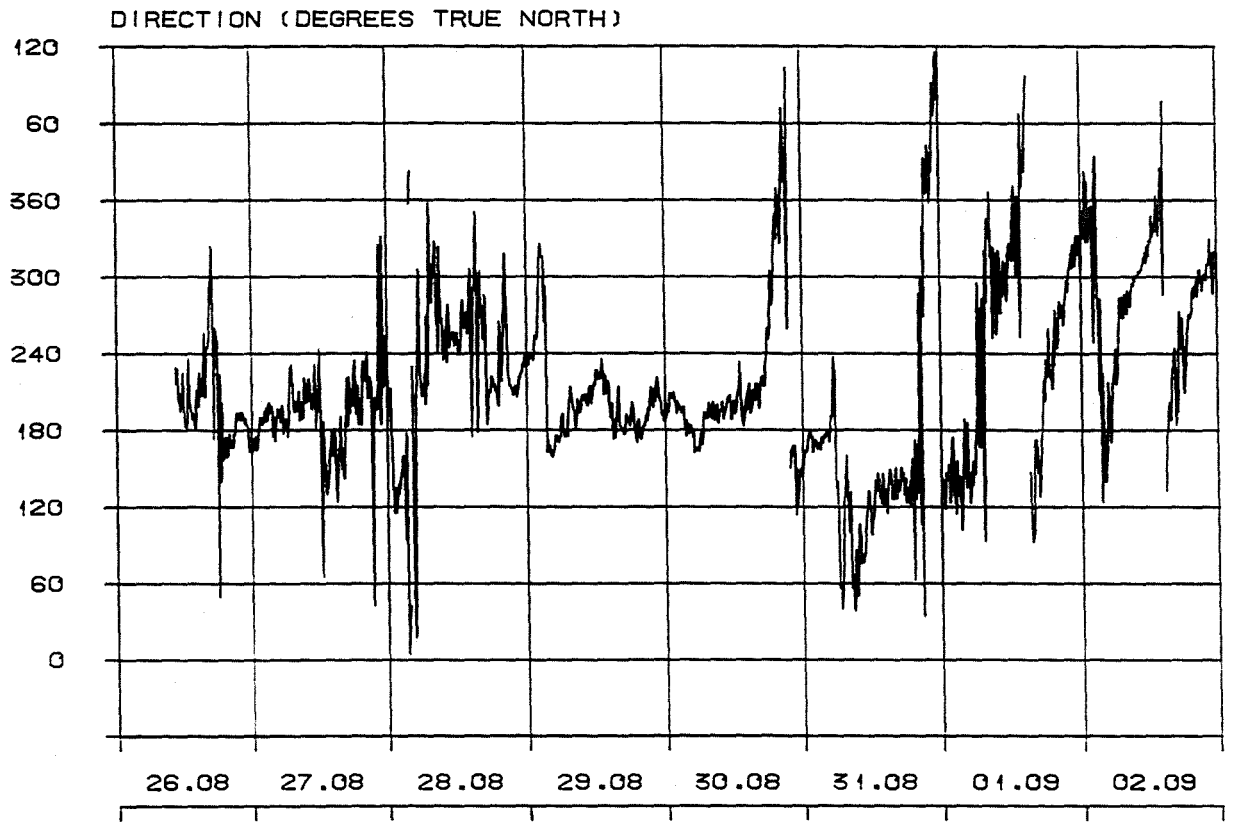
Time interval : 10.00 minutes.

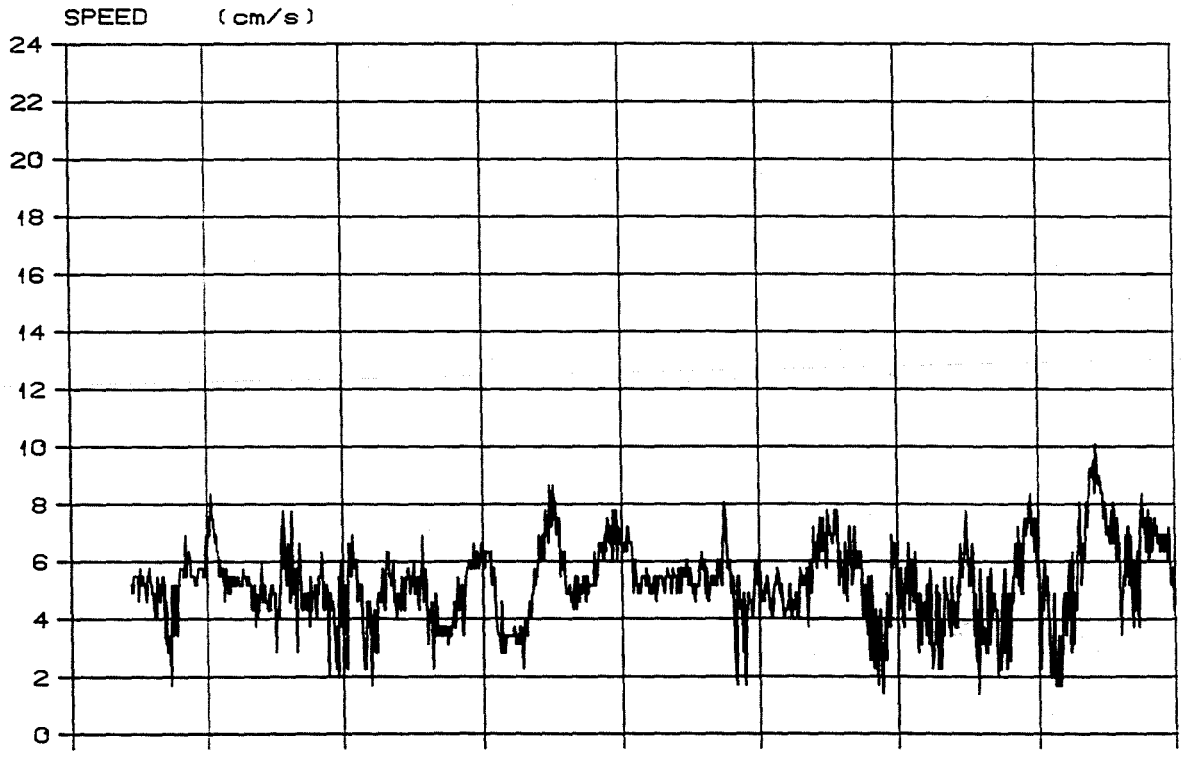
Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

H 1

Fig. 3-2-6

Continues.....





The Barents Sea

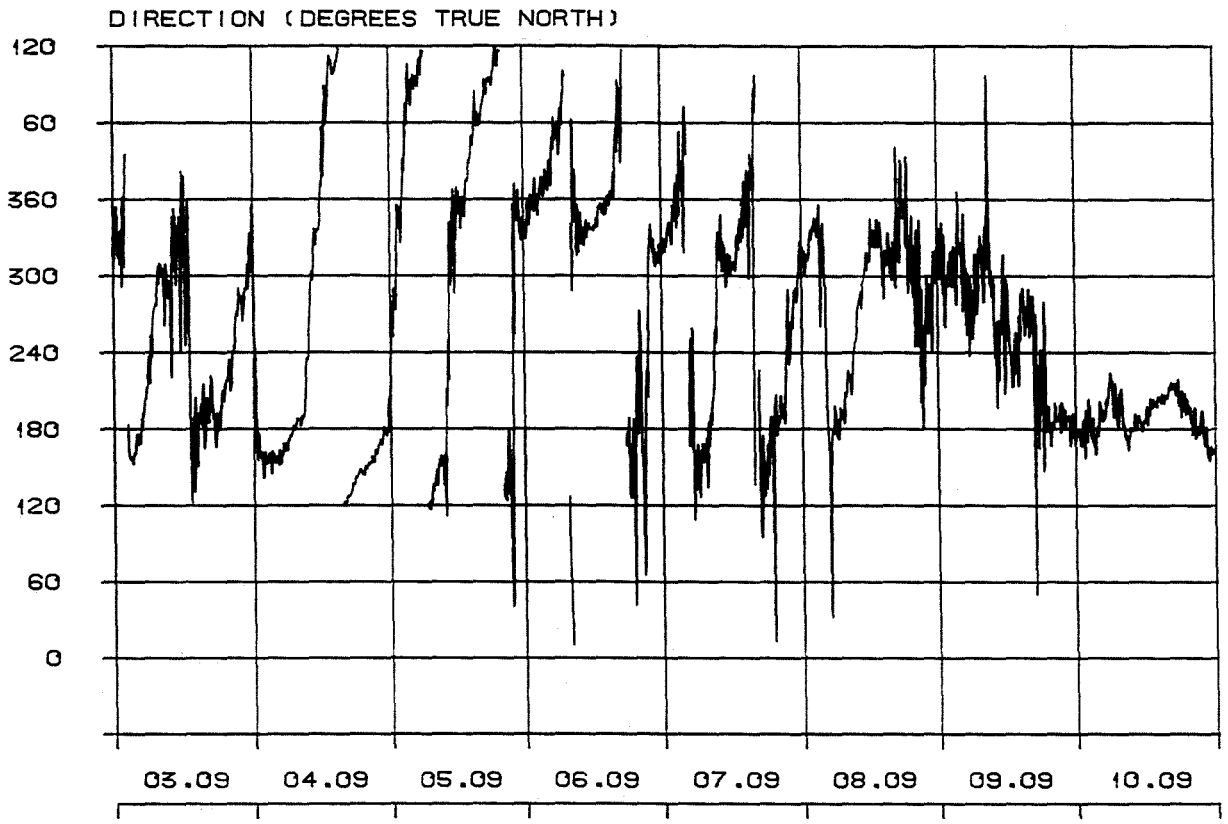
Position : N 74° 29.70' E 43° 0.60'

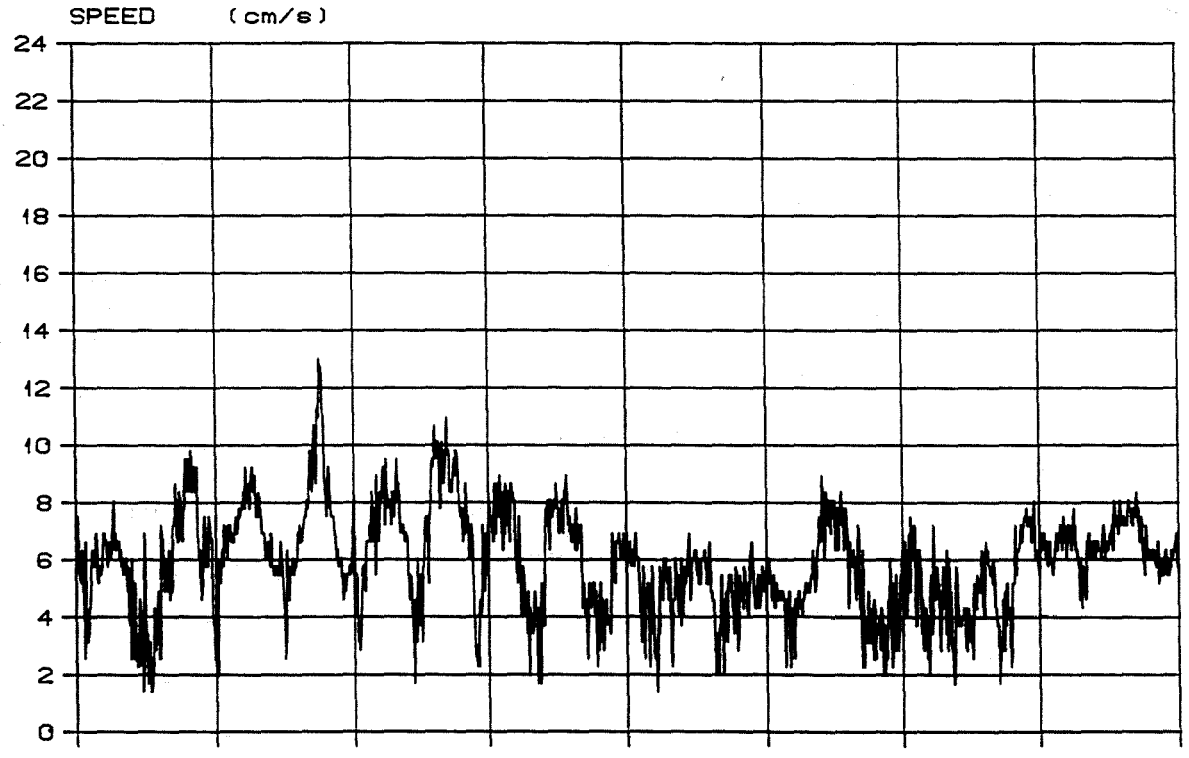
Instrument depth : 45.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

Fig. 3-2-7 Speed and direction of current.





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 45.0 m Bottom depth : 285.0 m

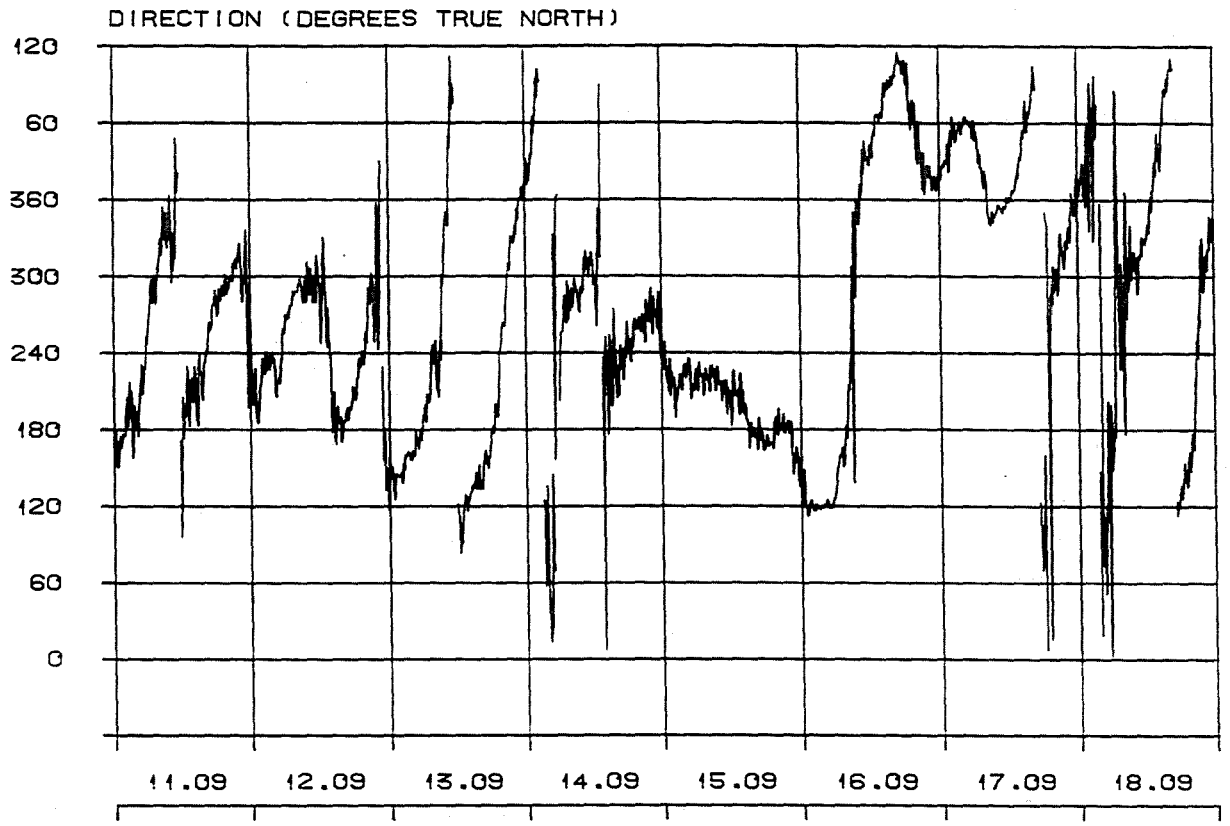
Time interval : 10.00 minutes.

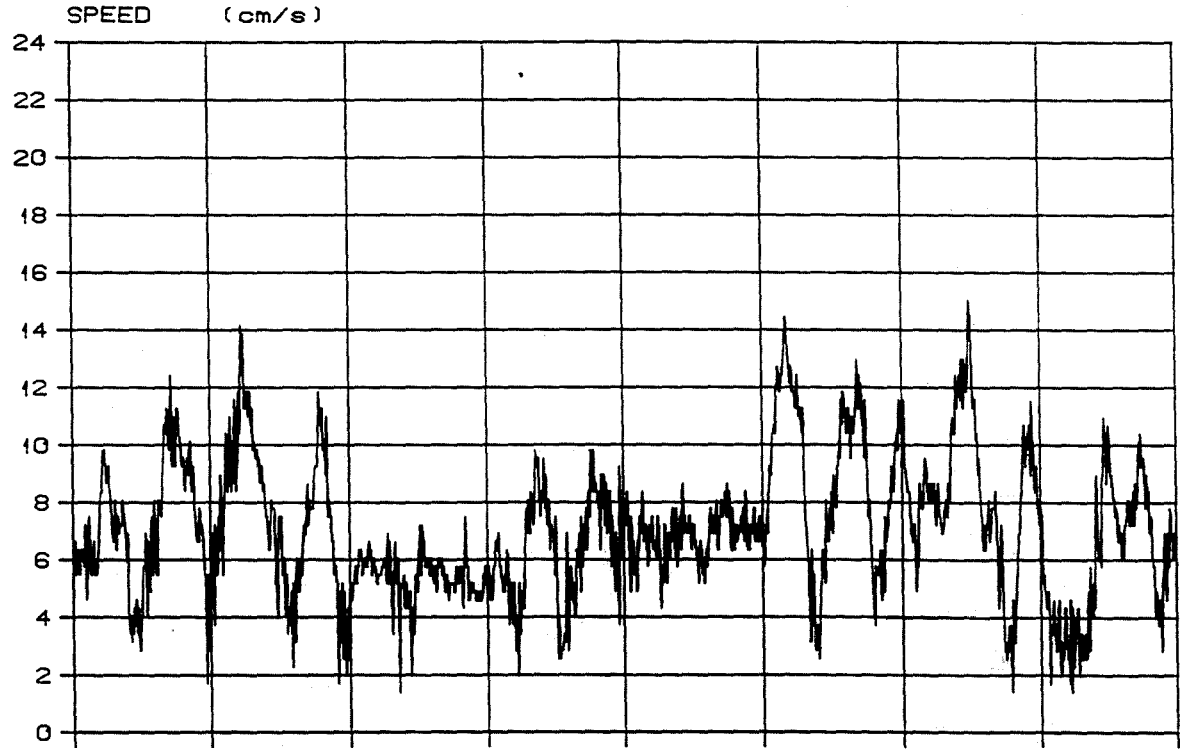
Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

H 1

Fig. 3-2-7

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 45.0 m Bottom depth : 285.0 m

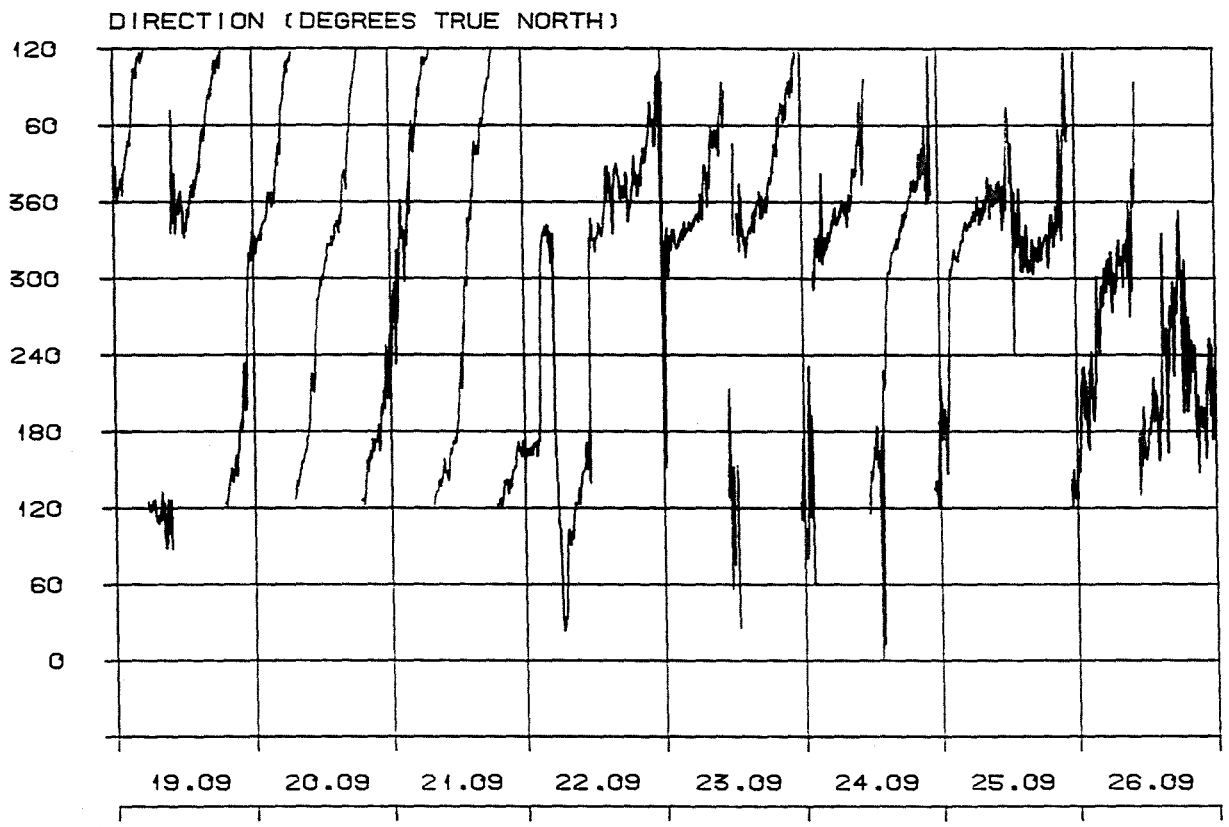
Time interval : 10.00 minutes.

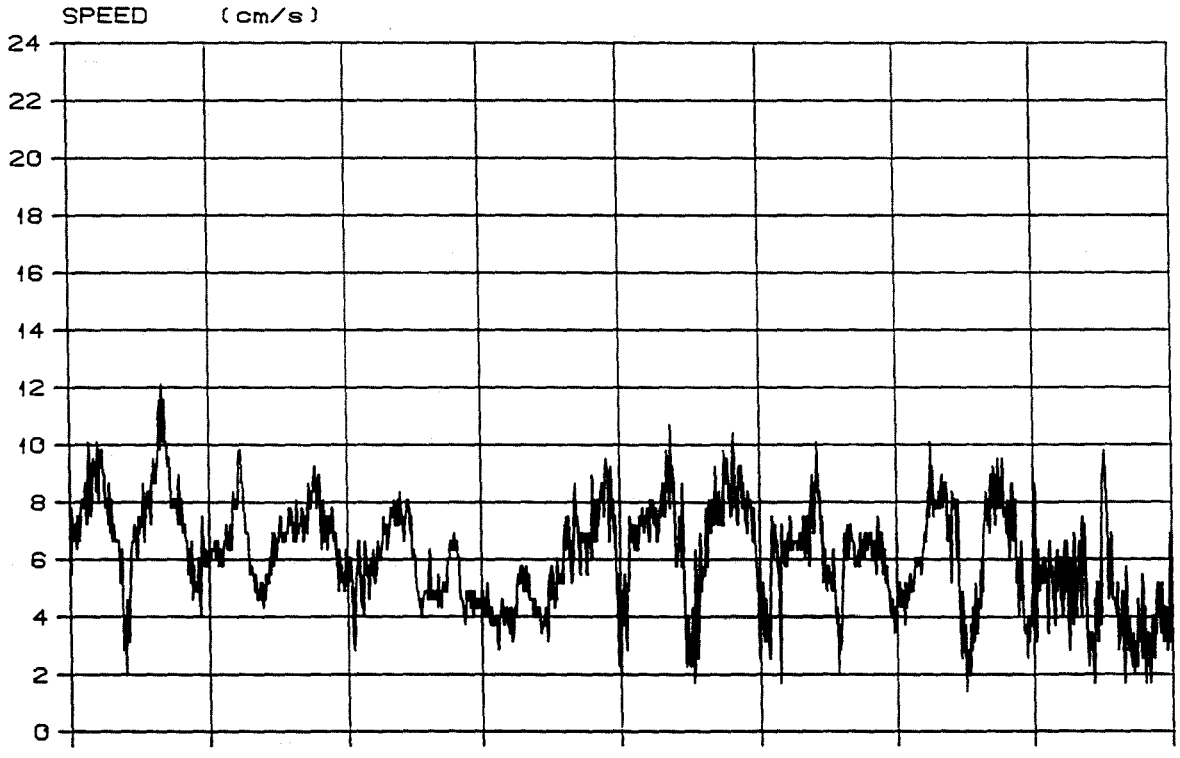
Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

H 1

Fig. 3-2-7

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 45.0 m Bottom depth : 285.0 m

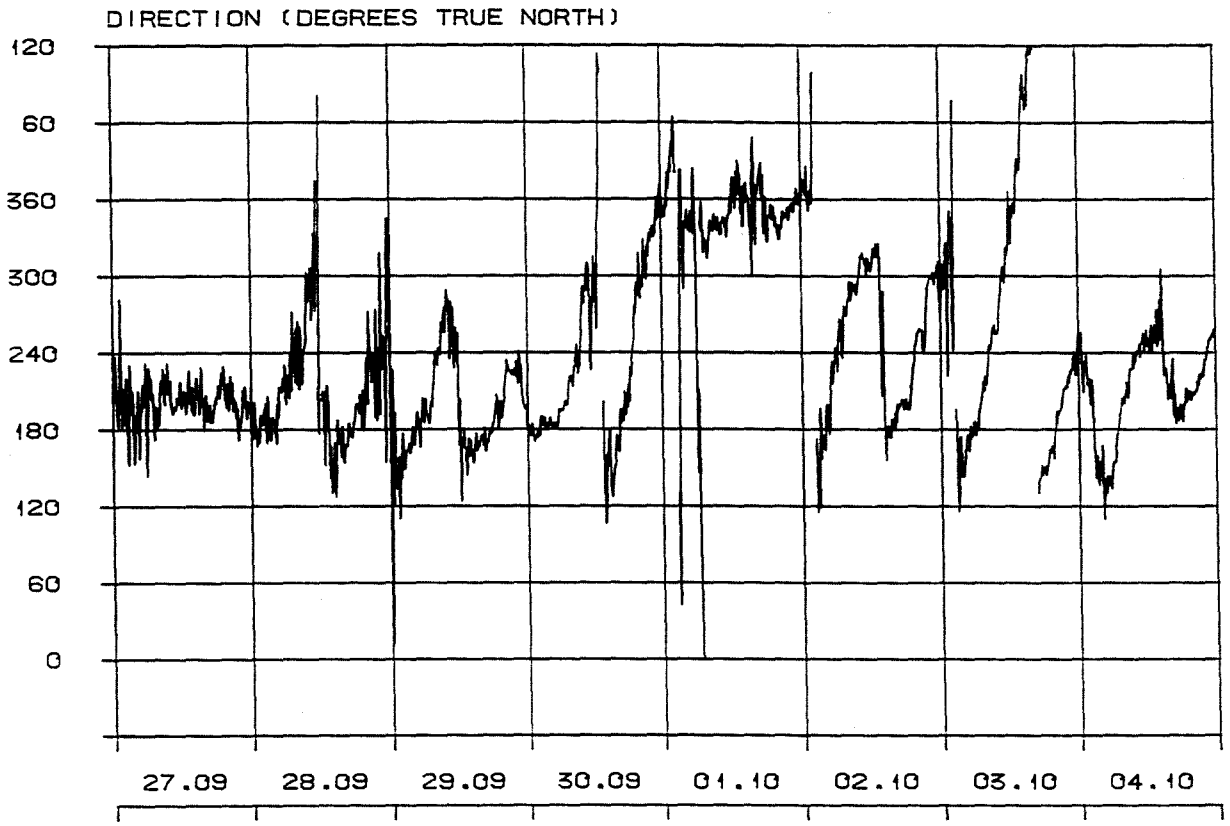
Time interval : 10.00 minutes.

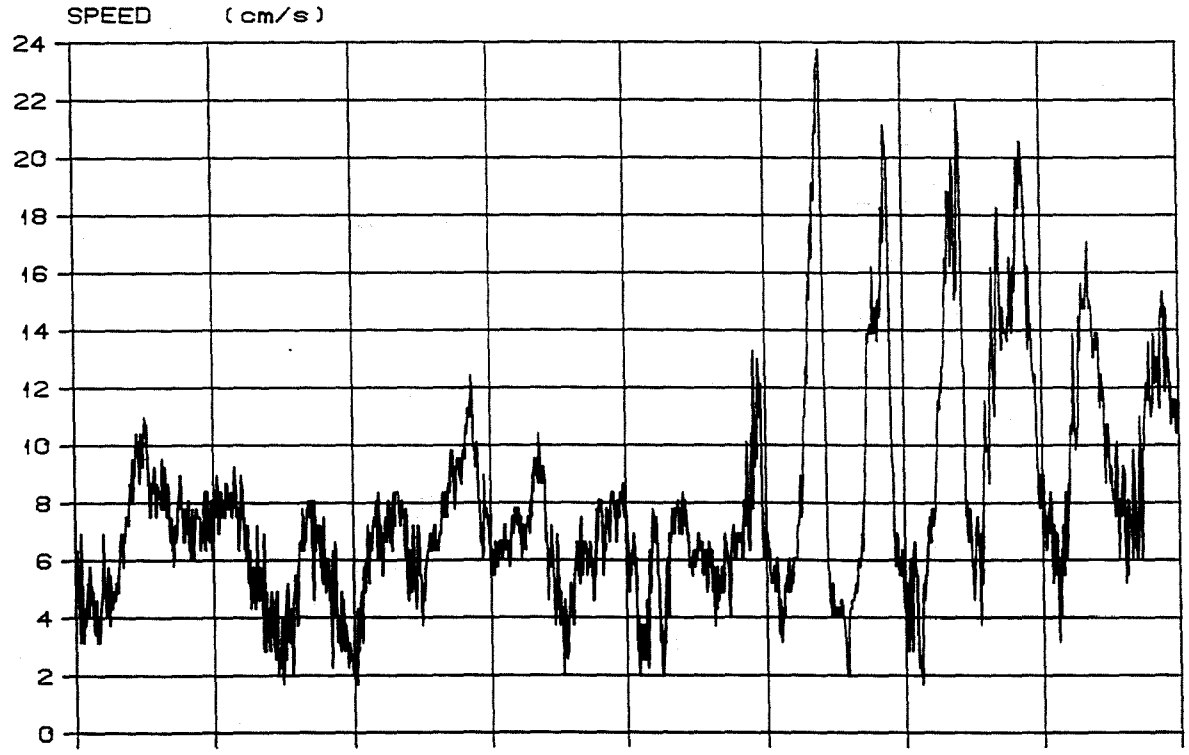
Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

H I

Fig. 3-2-7

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 45.0 m Bottom depth : 285.0 m

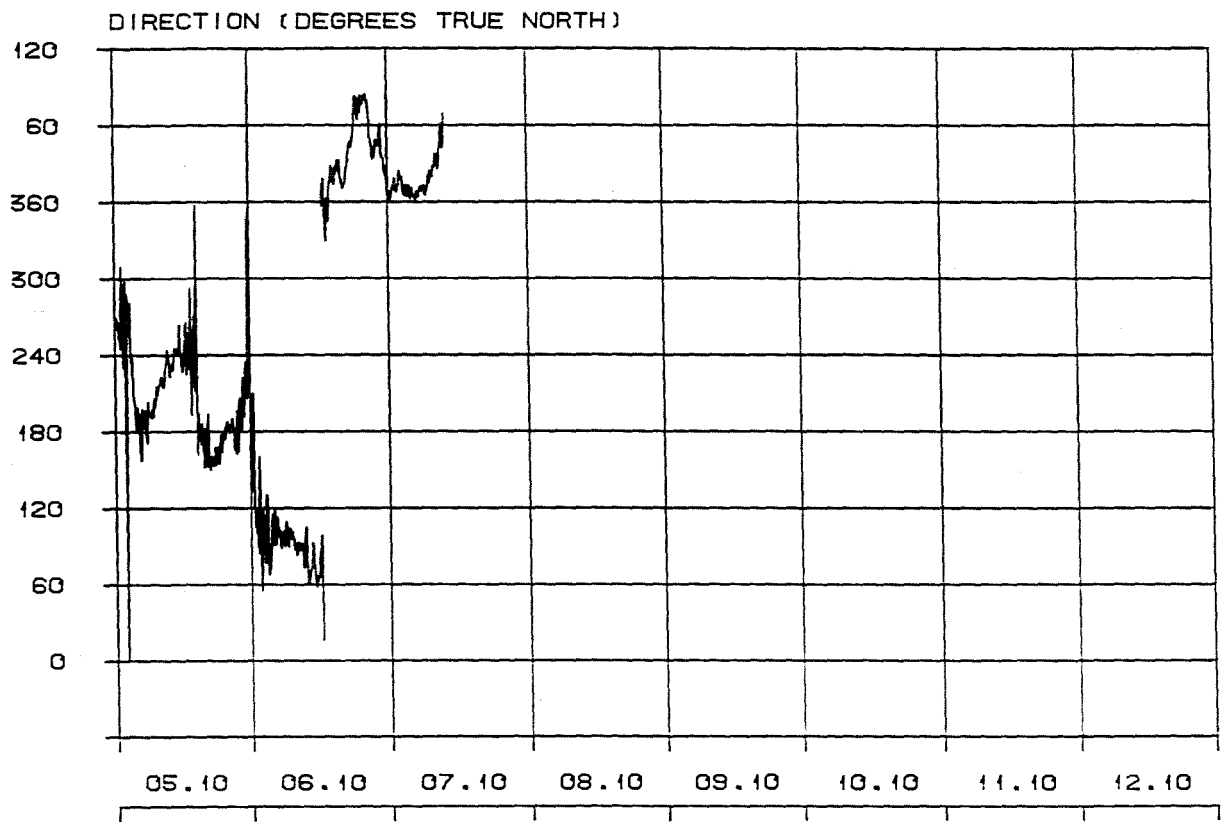
Time interval : 10.00 minutes.

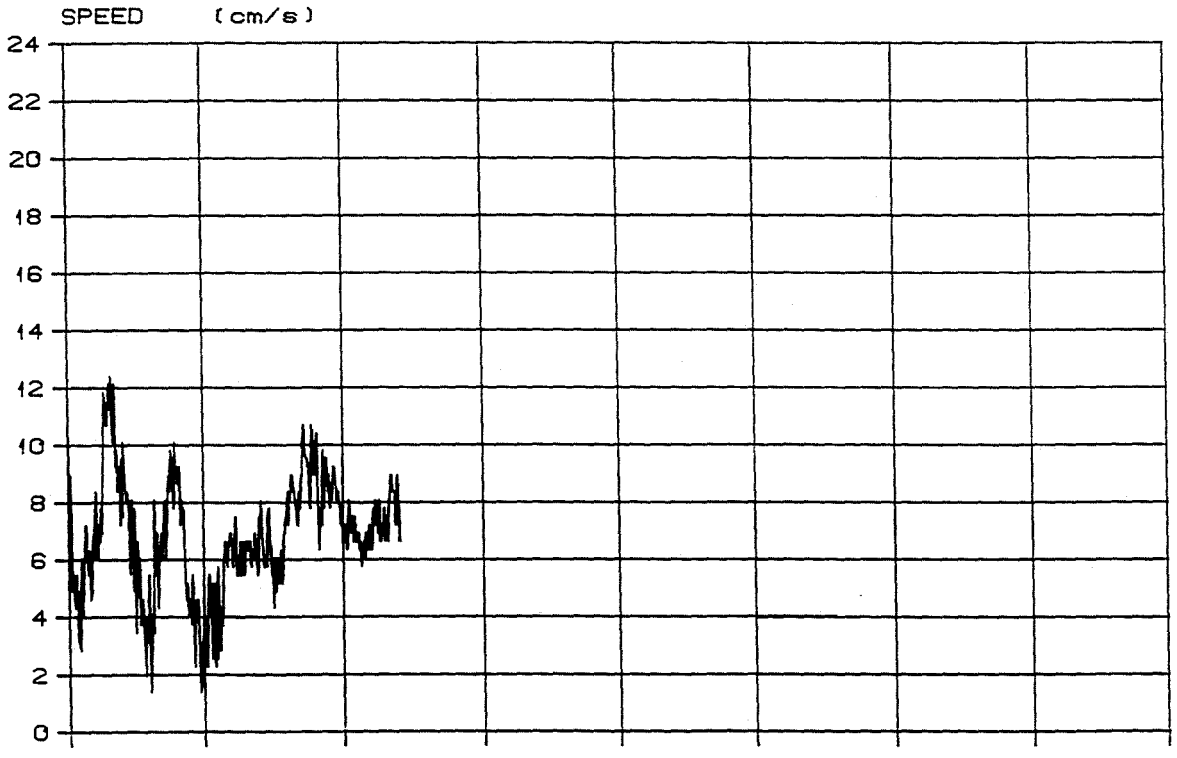
Obseervation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

H I

Fig. 3-2-7

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 45.0 m Bottom depth : 285.0 m

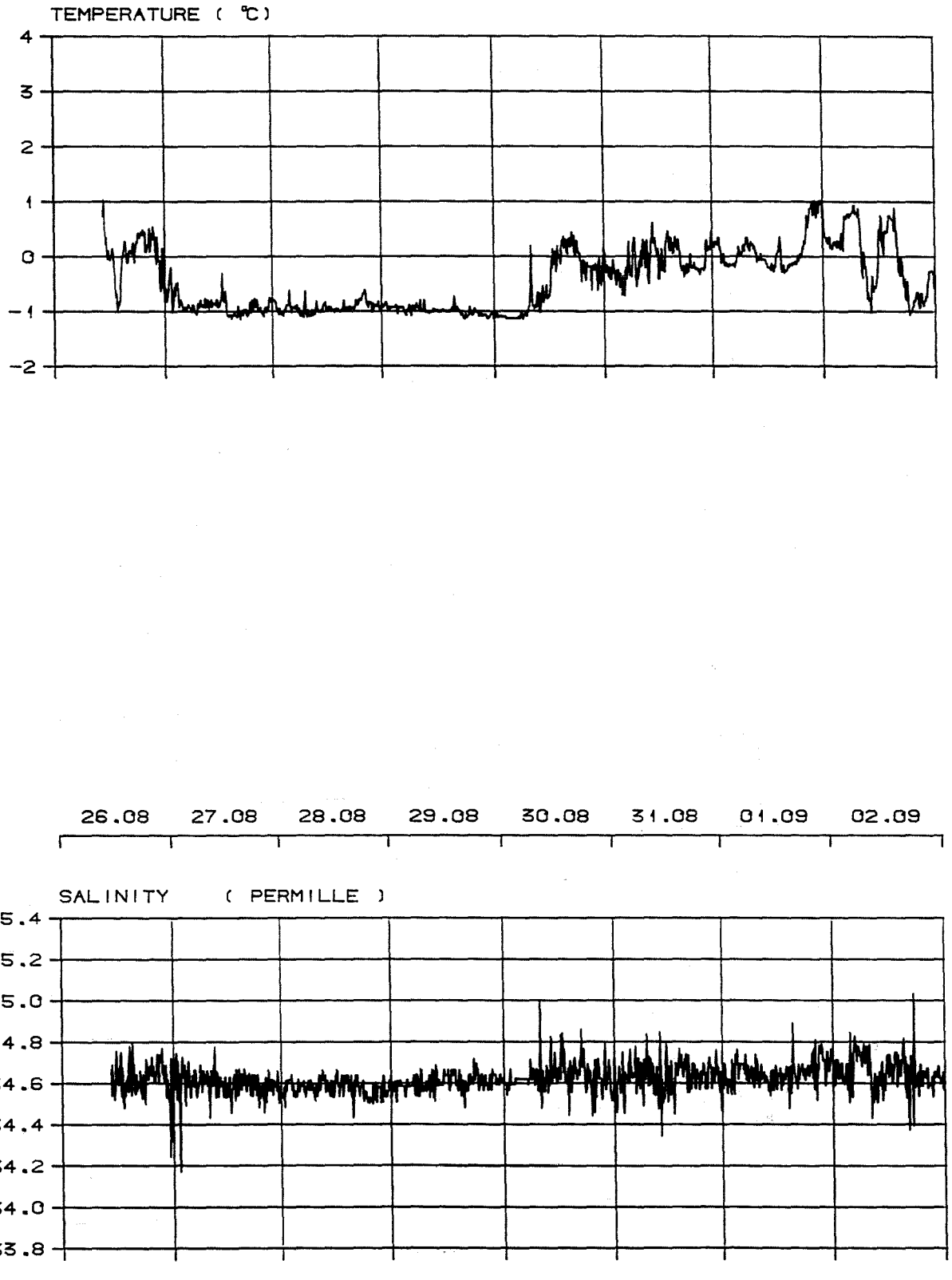
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

H 1

Fig. 3-2-7

Continues.....



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

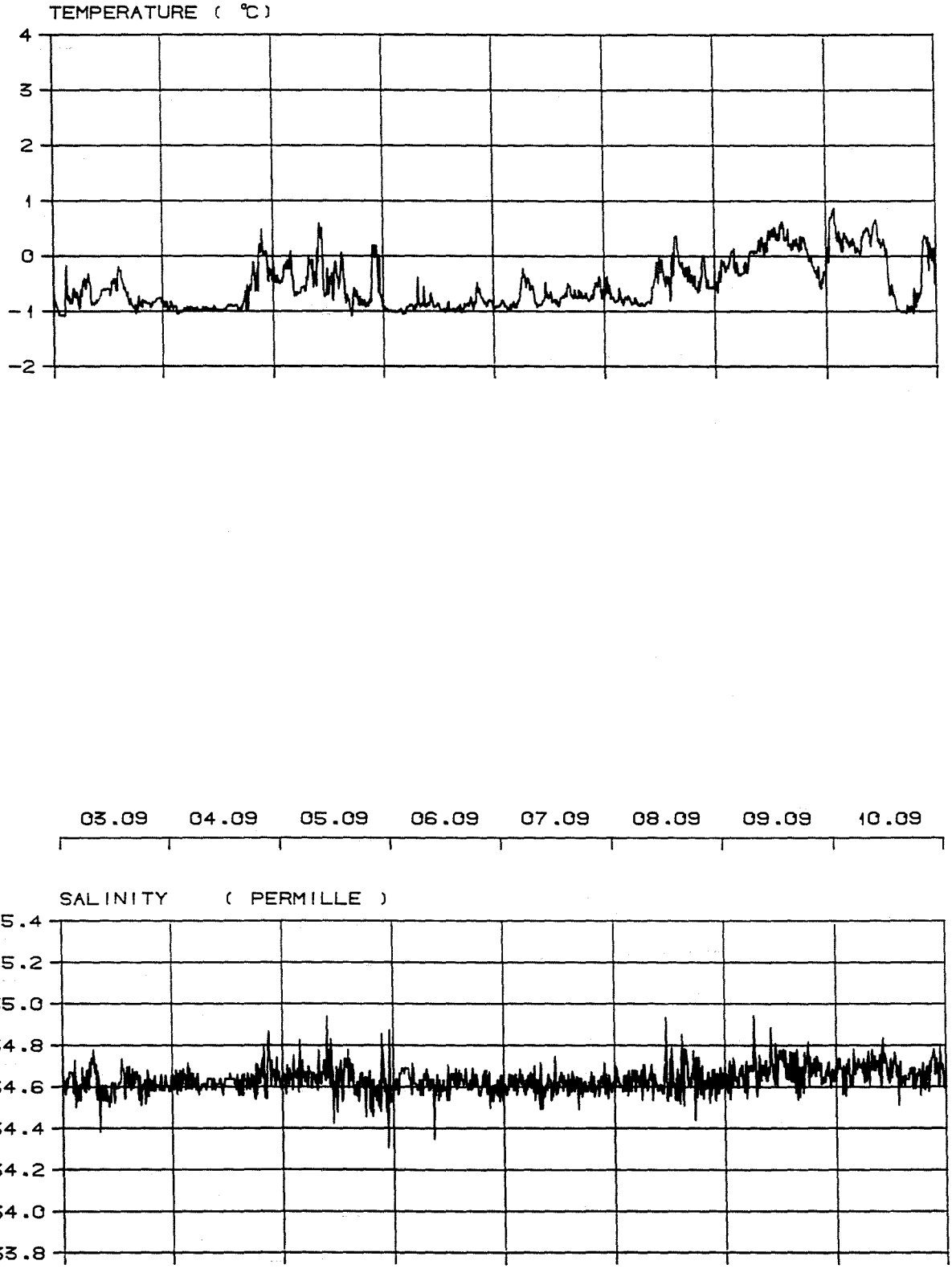
Instrument depth : 45.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

H 1

Fig. 3-2-8 Temperature and salinity.



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 45.0 m Bottom depth : 285.0 m

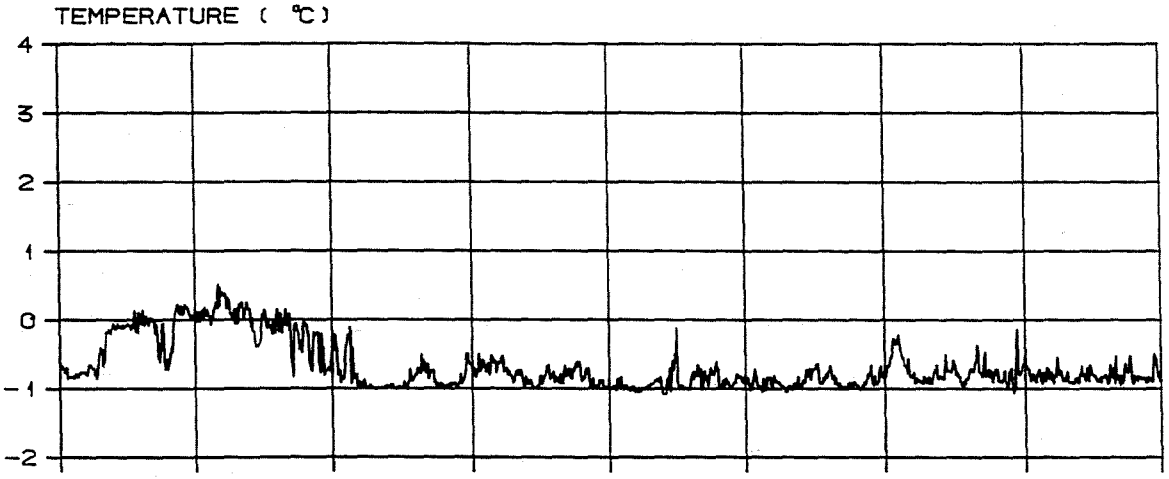
Time interval : 10.00 minutes.

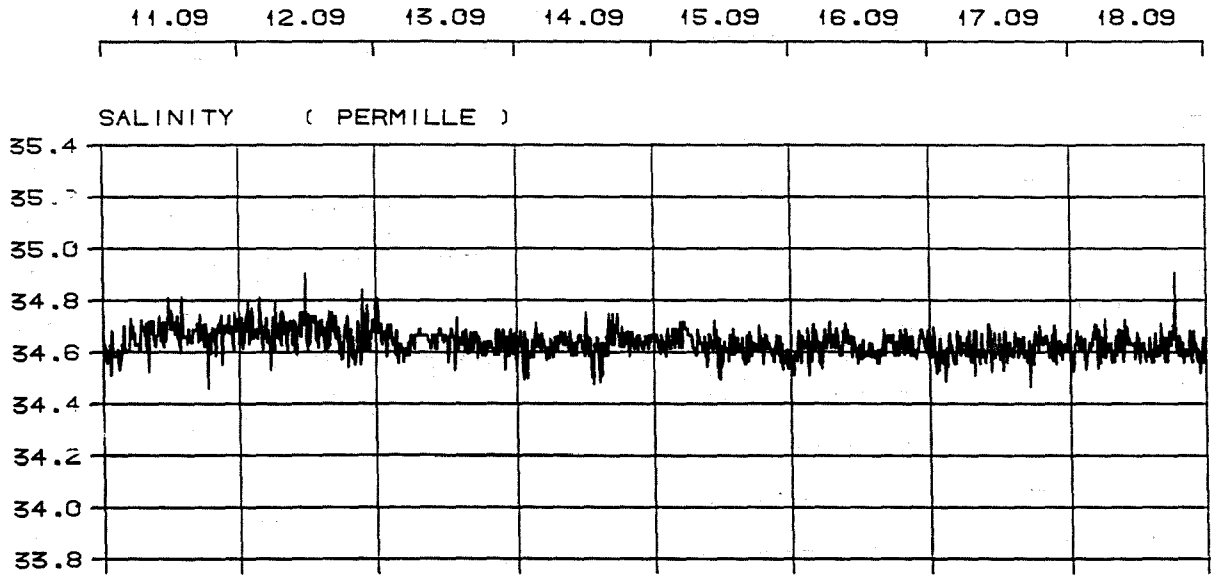
Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

H 1

Fig. 3-2-8

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 45.0 m Bottom depth : 285.0 m

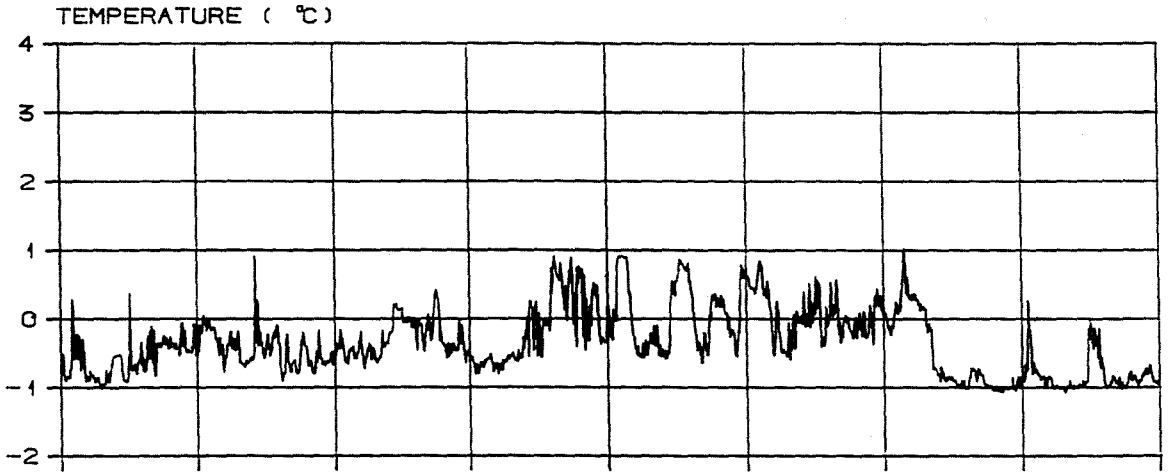
Time interval : 10.00 minutes.

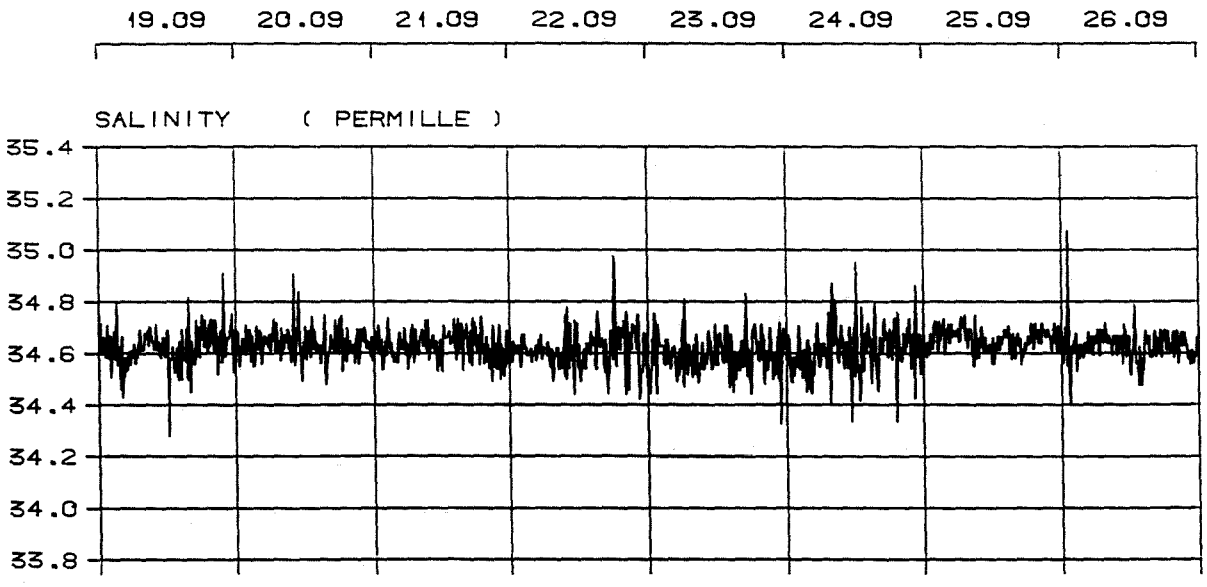
Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

H 1

Fig. 3-2-8

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 45.0 m Bottom depth : 285.0 m

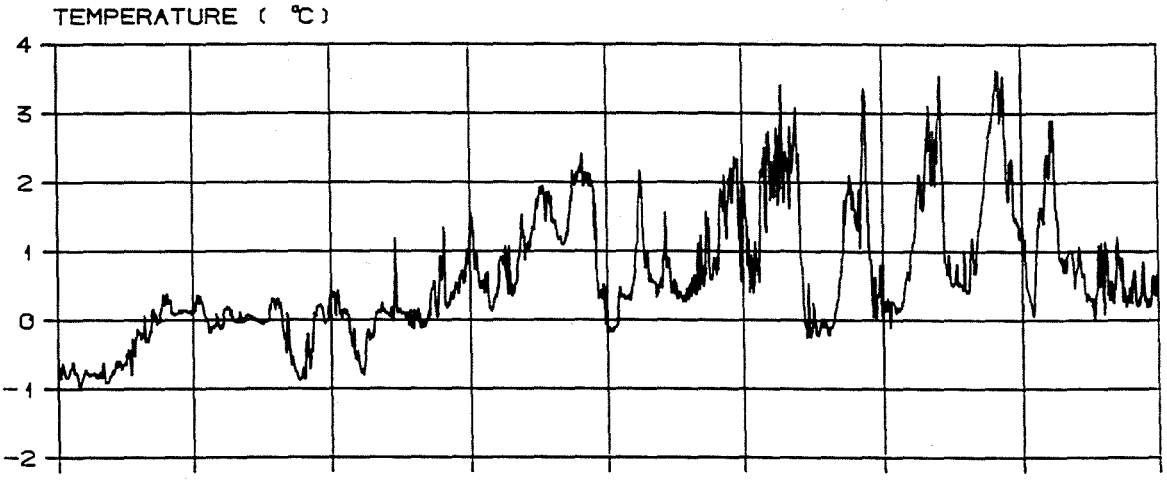
Time interval : 10.00 minutes.

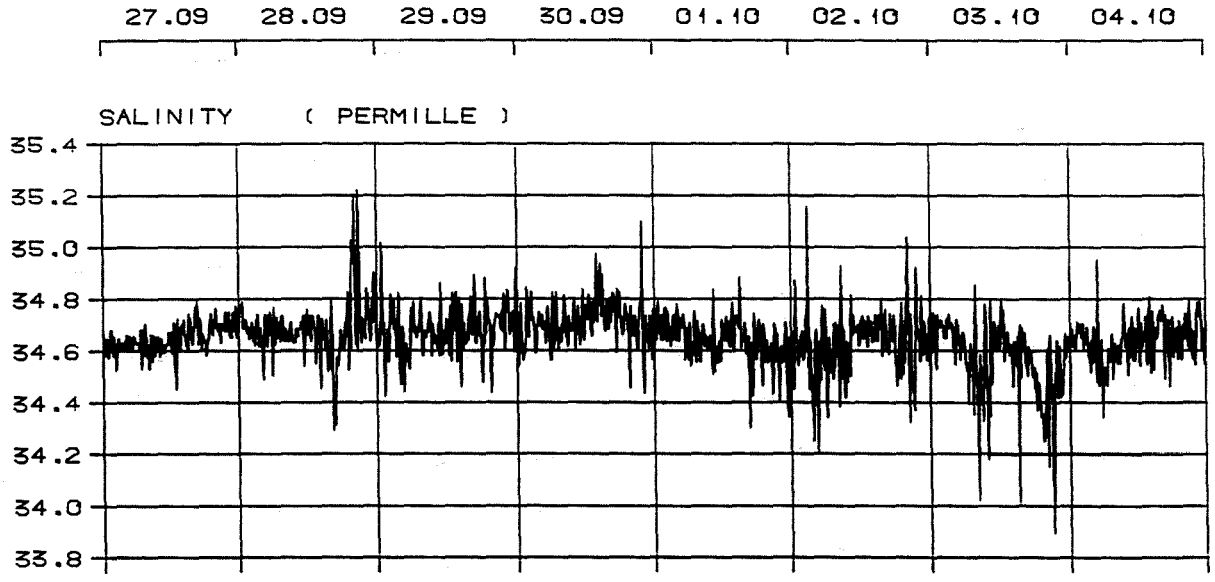
Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

H 1

Fig. 3-2-8

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 45.0 m Bottom depth : 285.0 m

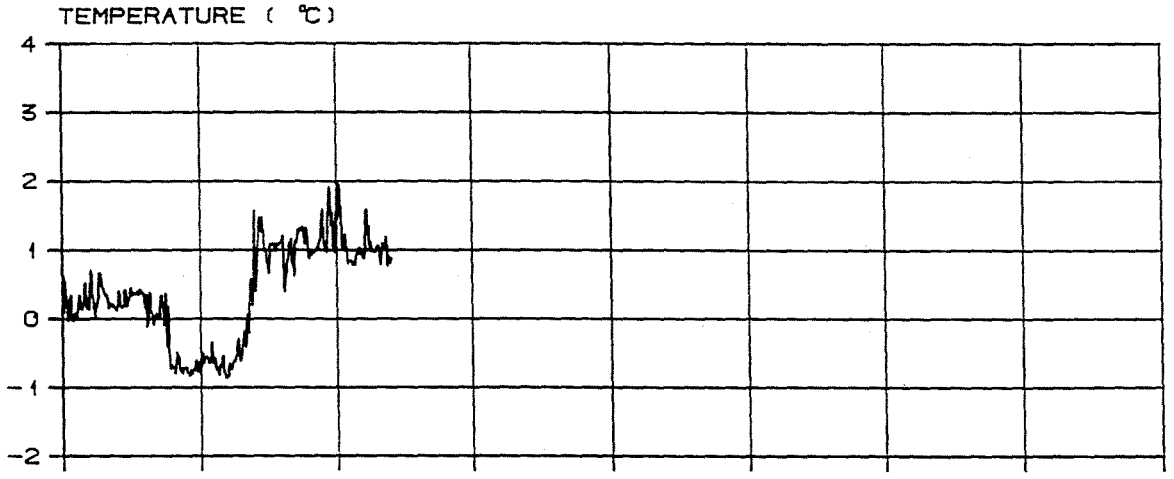
Time interval : 10.00 minutes.

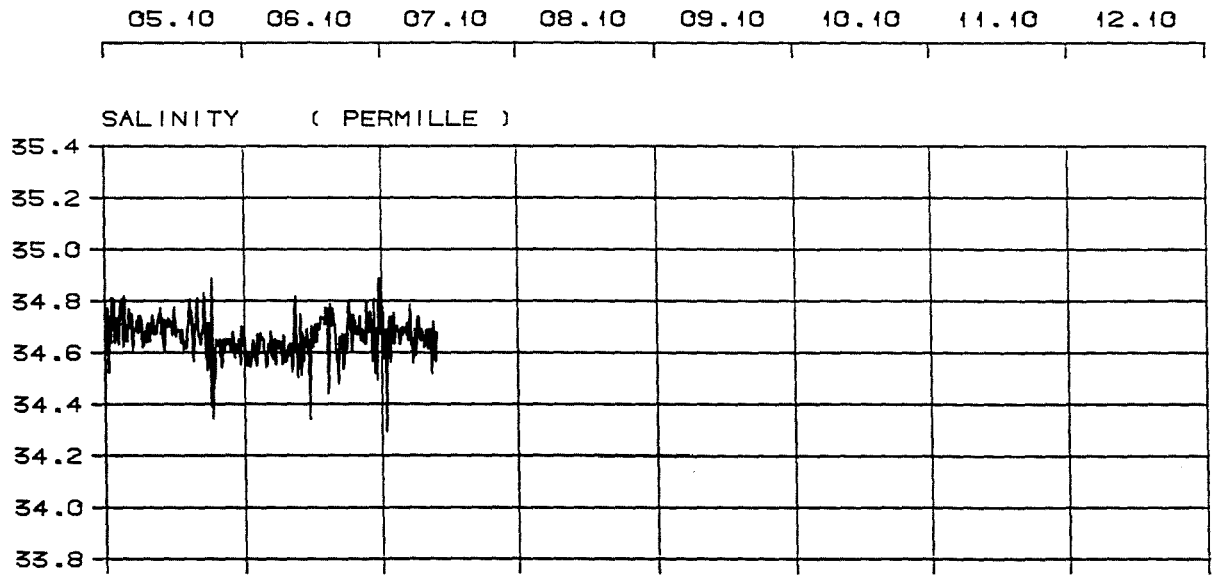
Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

H 1

Fig. 3-2-8

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 45.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

H 1

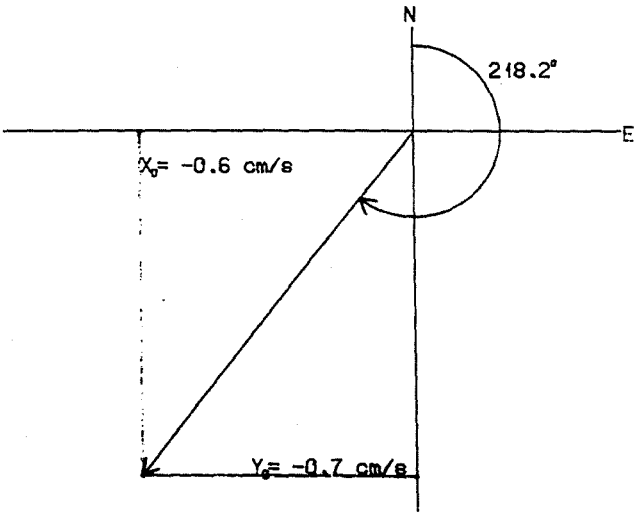
Fig. 3-2-8

Continues.....

HARMONIC ANALYSIS OF CURRENTS

CONSTITUENTS			DECOMPOSED CURRENT				TIDAL CURRENT ELLIPSE				
			E/W		N/S						
Symbol	Period houres	Frequense °/hour	X_j cm/s	g_{xj} °	Y_j cm/s	g_{yj} °	Major axis A_j cm/s	Minor axis B_j cm/s	θ_j °	g_j °	BETA. °
MM	661.31	0.5	1.6	35.5	1.4	30.9	2.1	-0.0	50.1	33.6	51.1
MSF	354.37	1.0	1.5	114.4	1.9	136.9	2.4	0.5	38.9	128.0	104.4
MU2	12.87	28.0	1.1	285.1	1.2	176.8	1.4	-1.0	140.8	326.5	70.9
M2	12.42	29.0	2.9	68.8	3.0	309.6	3.7	-2.2	317.6	281.4	3.9
S2	12.00	30.0	1.4	119.0	1.3	7.7	1.6	-1.1	310.8	329.4	29.5

MEAN CURRENT



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 45.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

H 1

Fig. 3-2-9 Harmonic analysis of currents.

A discription of the model and its definitions :

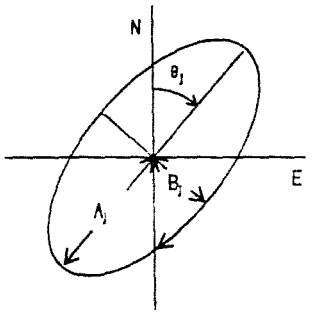
Current-vector decomposed in E/W (real) - and N/S (imaginary) - direction :

$$Z(t)=X_0+\sum_{j=1}^{n}(X_j\cos(\sigma_j t+(V_0+u)_j-g_{xj})+i(Y_0+\sum_{j=1}^{n}Y_j\cos(\sigma_j t+(V_0+u)_j-g_{yj}))$$

g_{xj} , g_{yj} : Greenwich-phase for E/W- and N/S-components of each constituent.

With ellipseparameters :

$$Z(t)=\sum_{j=1}^{n}\exp(i(90^0-\theta_j))(A_j\cos(\sigma_j t+(V_0+u)_j-g_j)+iB_j\sin(\sigma_j t+(V_0+u)_j-g_j))$$



g_j : Greenwich phase of the current-vector for each constituent.

Rotationdirection : anticlockwise when $B_j > 0$, clockwise when $B_j < 0$

BETA : The angle between t=0 and major halv axis in the ellipse.

Common for both modles :

σ_j : Frequence in degrees/hour.

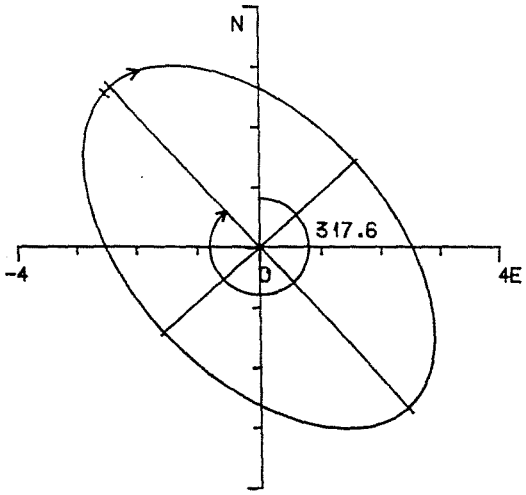
$(V_0+u)_j$: Astronomic argument relative to Greenwich-meridian.

During the calculation of Z(t) will V_0+u be put into the formulas at the time t=0.

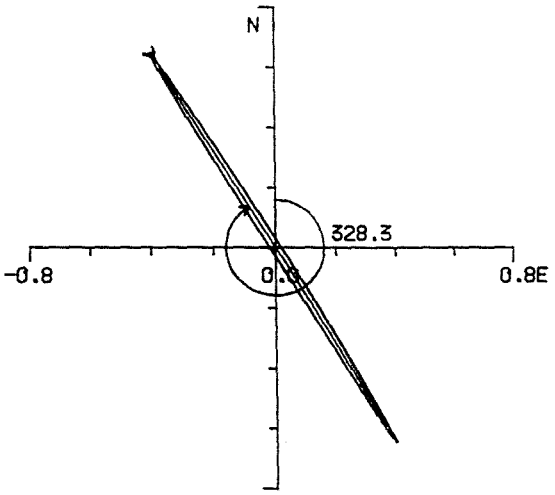
The time t is in houres; the same timezone as the analysed data.

t=0 in the midle of the measurement series : 1989 16.09 H. 1000 , marked with a line on the ellipse.

M2-ellipse



K1-ellipse



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 45.0 m Bottom depth : 285.0 m

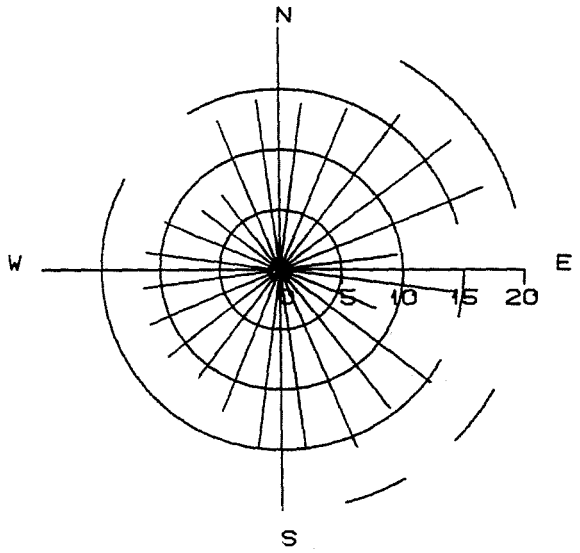
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 07.10 H. 0940

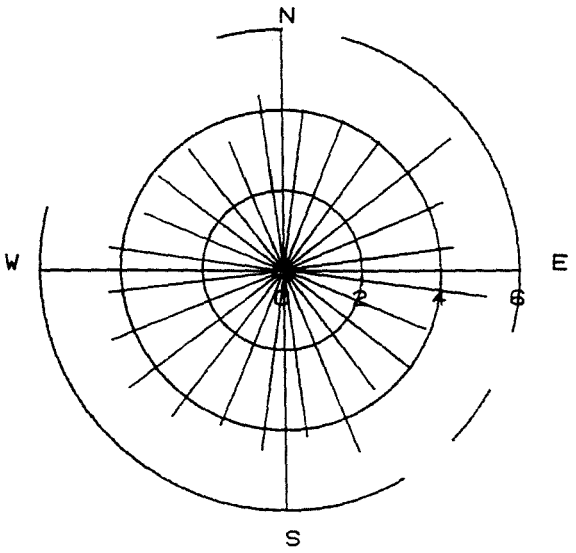
H 1

Fig. 3-2-10 M2 and K1 ellipse.

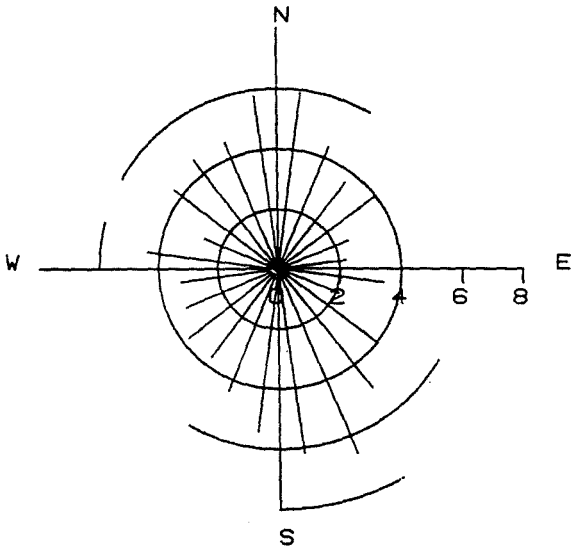
CURRENT VELOCITY DISTRIBUTION



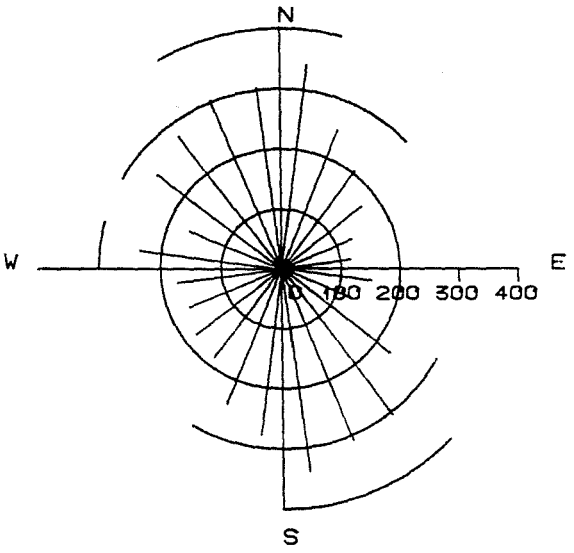
Maksimum velocity (cm/s)



Mean velocity (cm/s)



Relative flux in %



Number measured

Number of observations : 5436

The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 150.0 m Bottom depth : 285.0 m

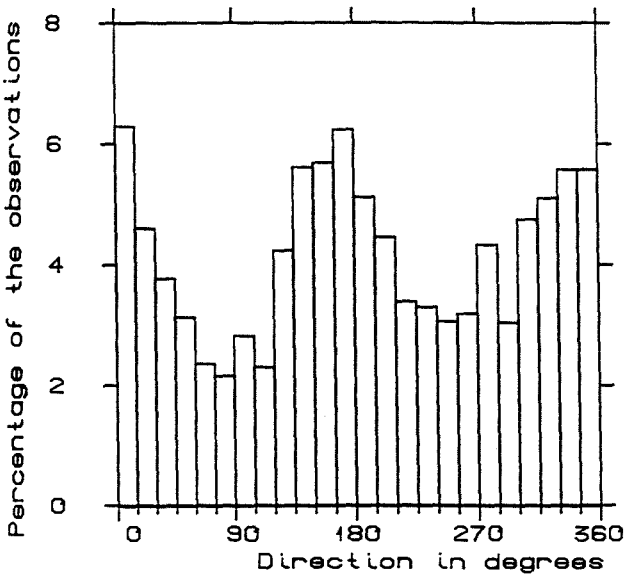
Time interval : 10.00 minutes.

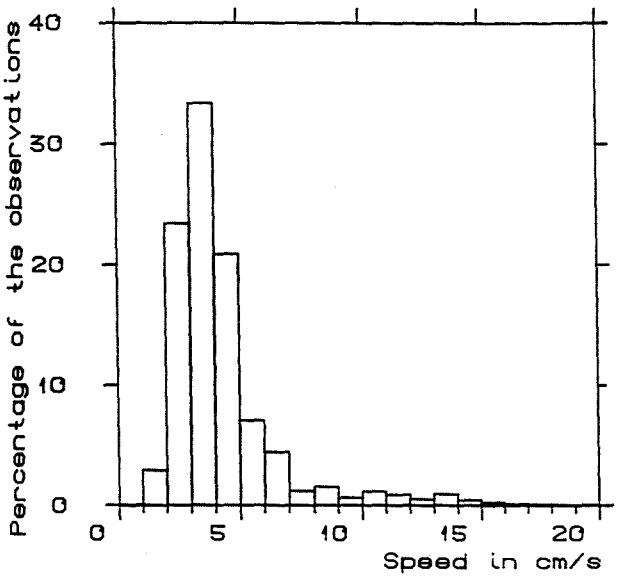
Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

H 1

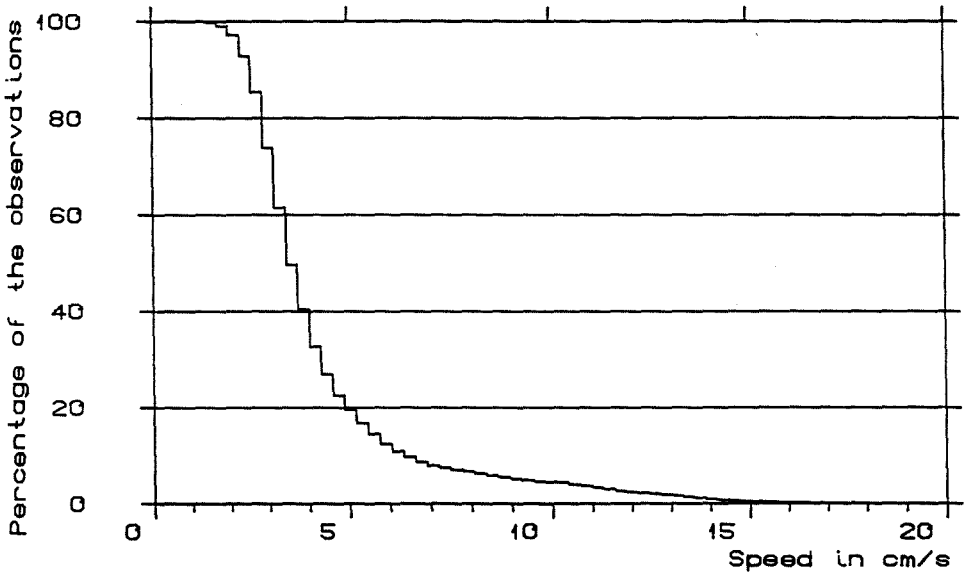
Fig. 3-3-1 Current velocity distribution.

HISTOGRAM





CURRENT SPEED DISTRIBUTION



Number of observations : 5436

The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 150.0 m Bottom depth : 285.0 m

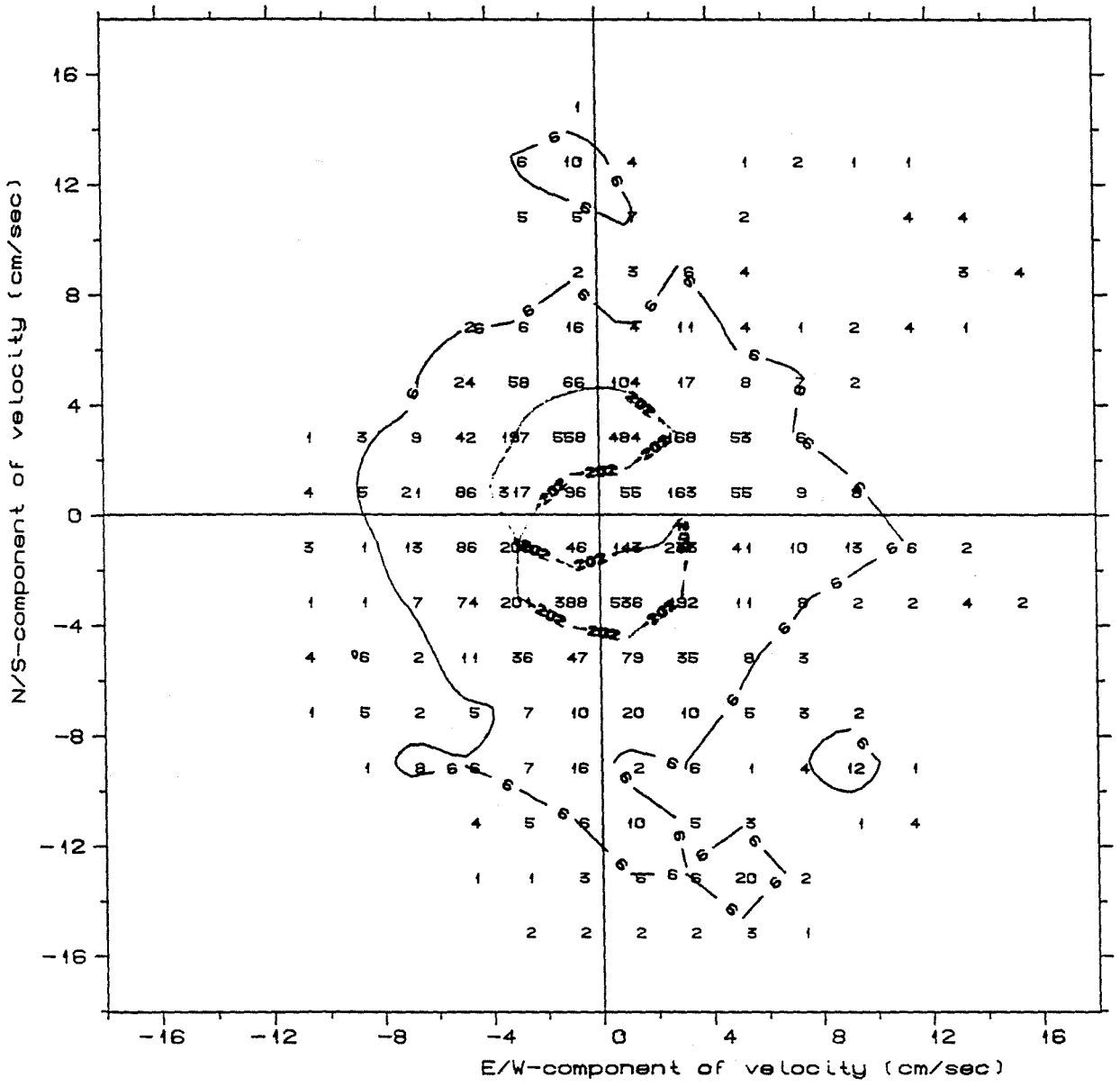
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

H I

Fig. 3-3-2 Histogram of speed and direction. Current speed distribution.

VELOCITY DISTRIBUTION DIAGRAM



Number of observations : 5436

Isoline for 50% and 96%

Number of observations : 5436

The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 150.0 m Bottom depth : 285.0 m

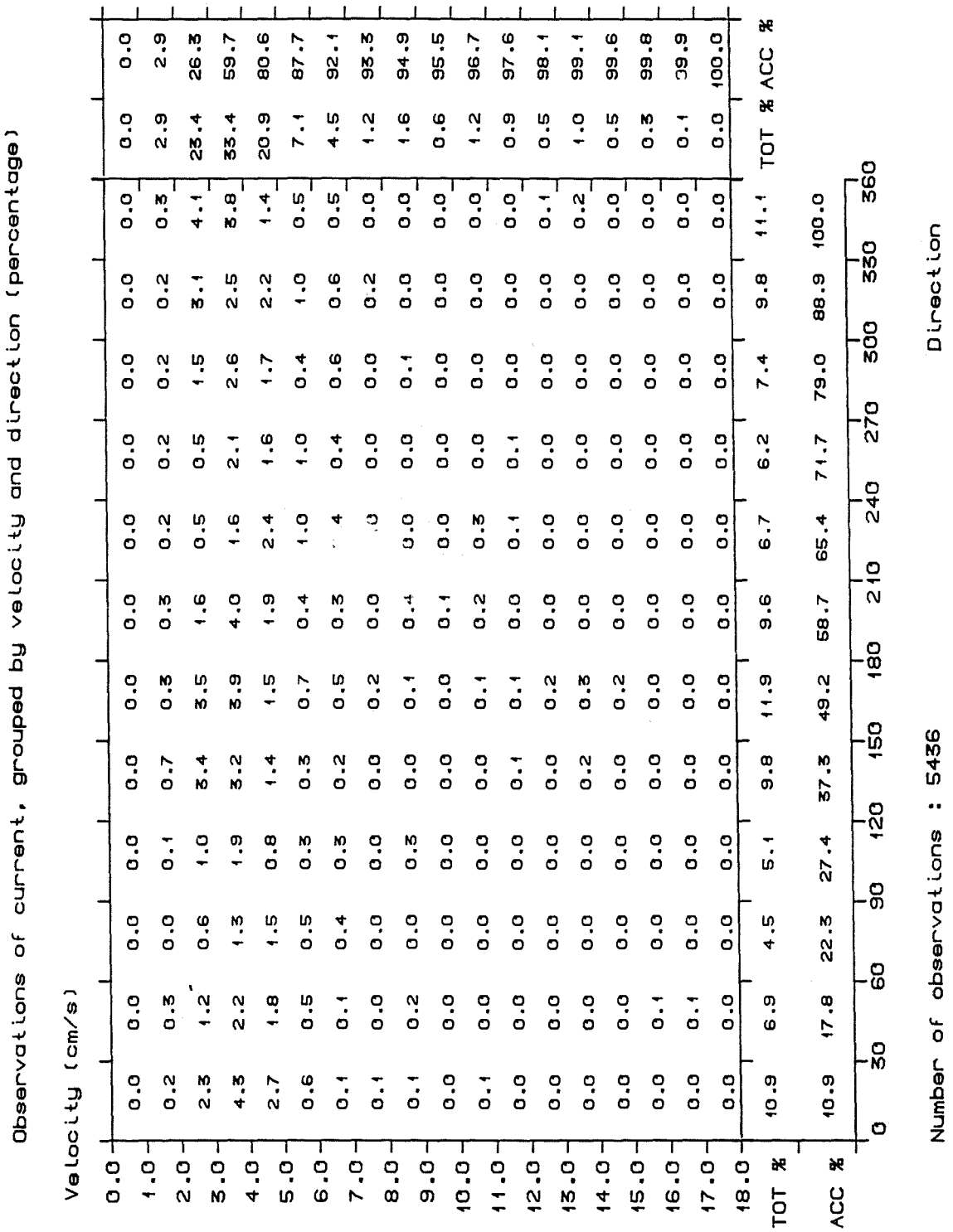
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

H 1

Fig. 3-3-3 Velocity distribution diagram.

DIRECTION DISTRIBUTION OF CURRENT VELOCITY



Number of observations : 5436

The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

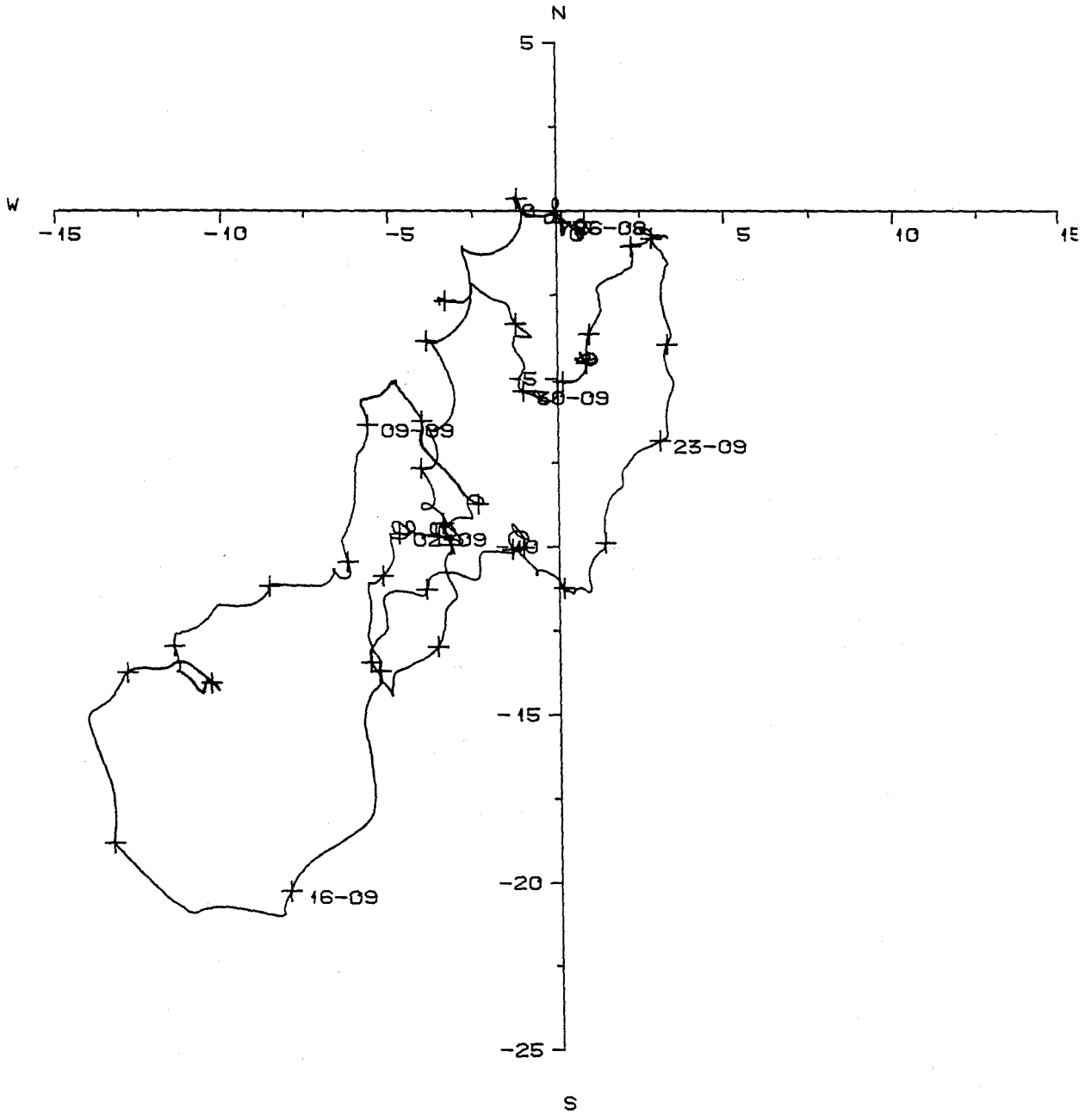
Instrument depth : 150.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

Fig. 3-3-4 Velocity distribution table.

PROGRESSIVE VECTOR DIAGRAM



Units in km

Number of obeervations : 5436

The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

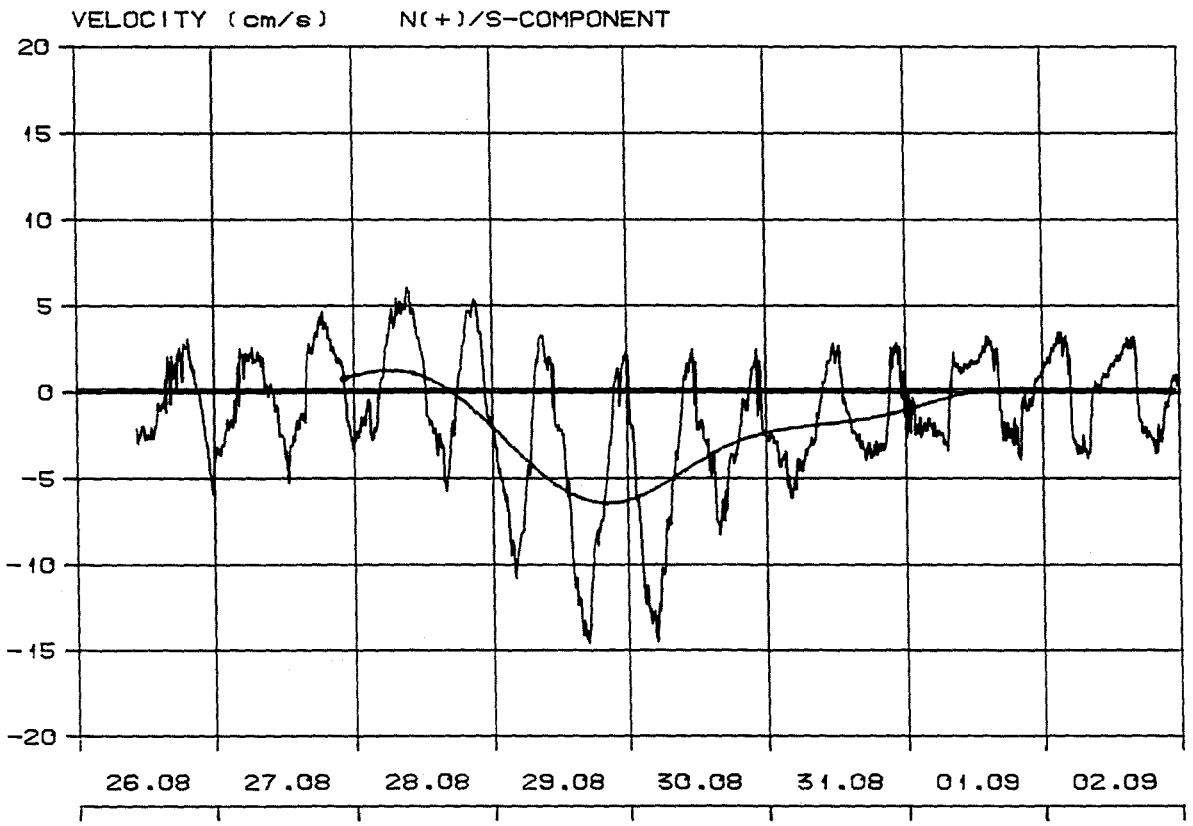
Instrument depth : 150.0 m Bottom depth : 285.0 m

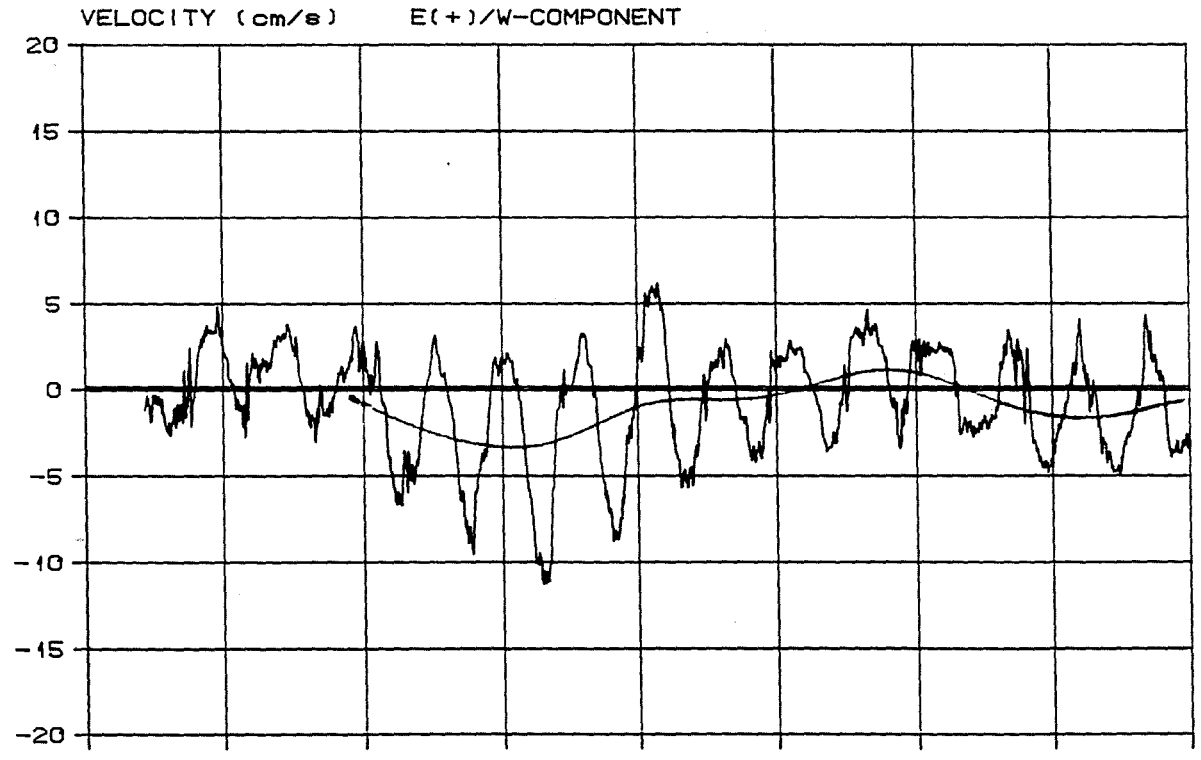
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

H I

Fig. 3-3-5 Progressive vector diagram.





The Barents Sea

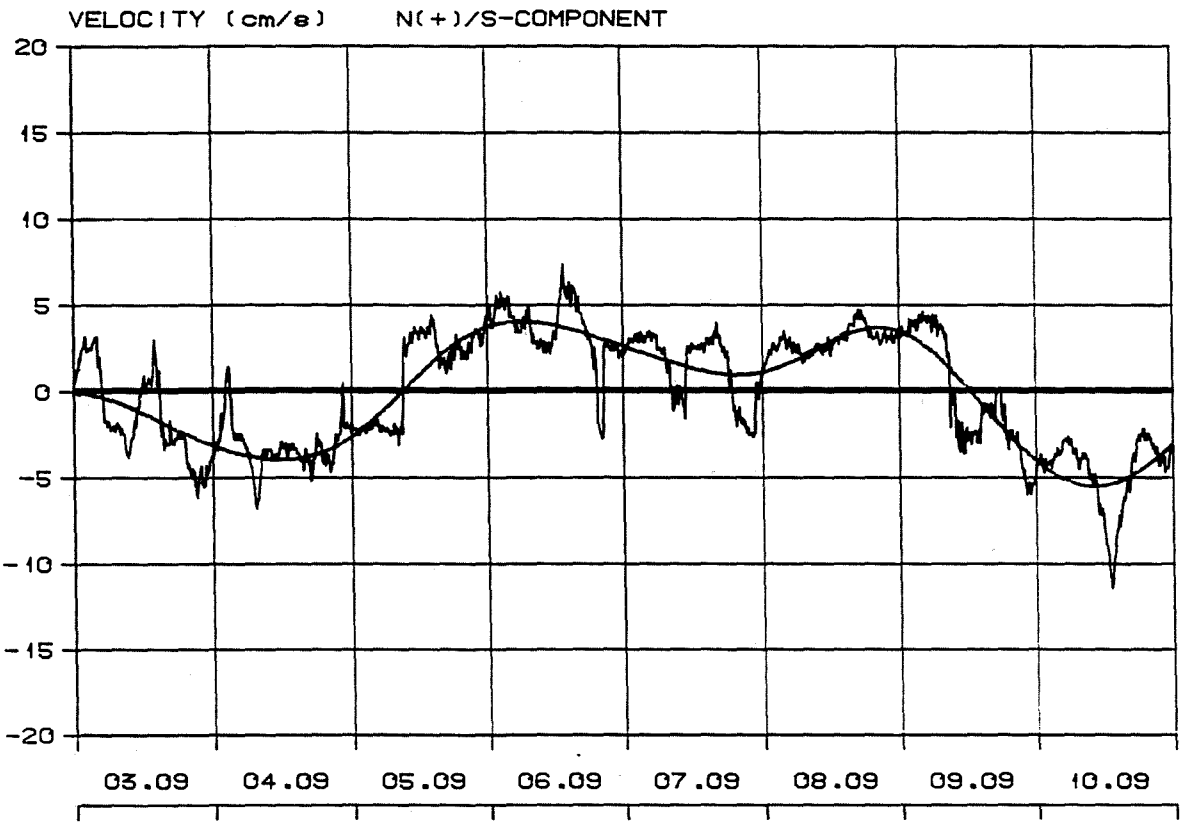
Position : N 74° 29.70' E 43° 0.60'

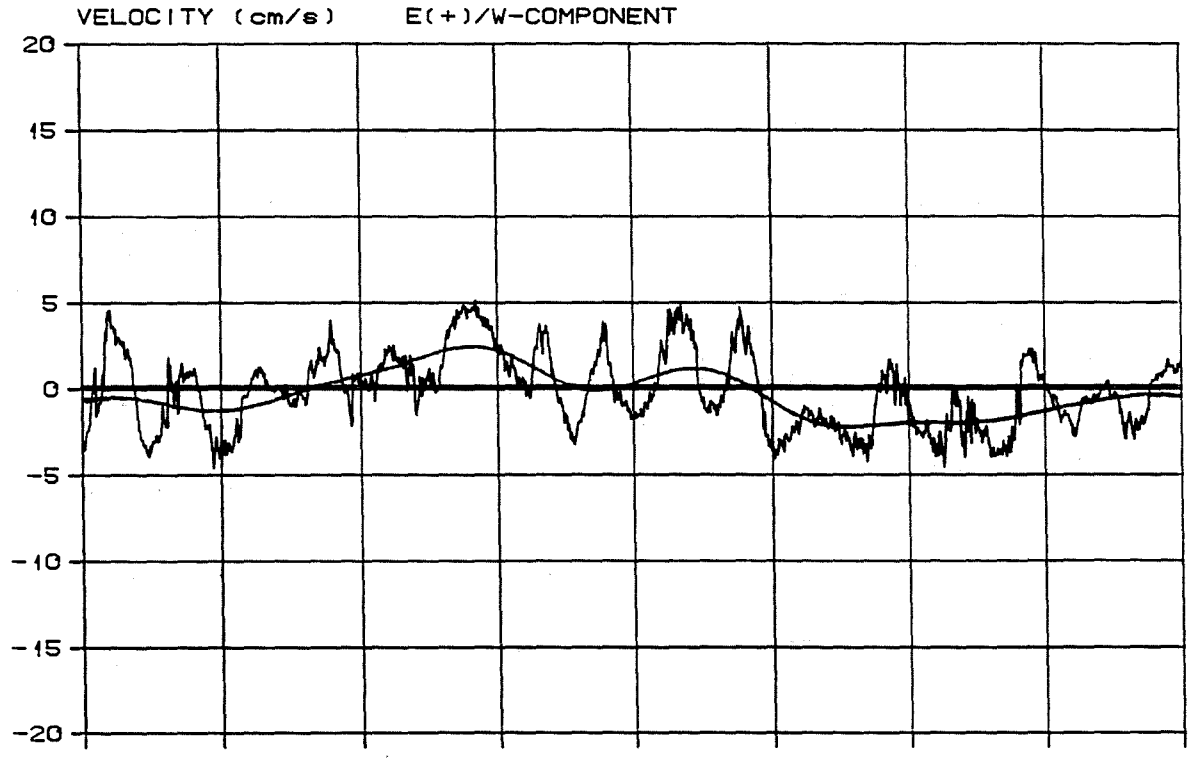
Instrument depth : 150.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

Fig. 3-3-6 N/S and E/W components of current.





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 150.0 m Bottom depth : 285.0 m

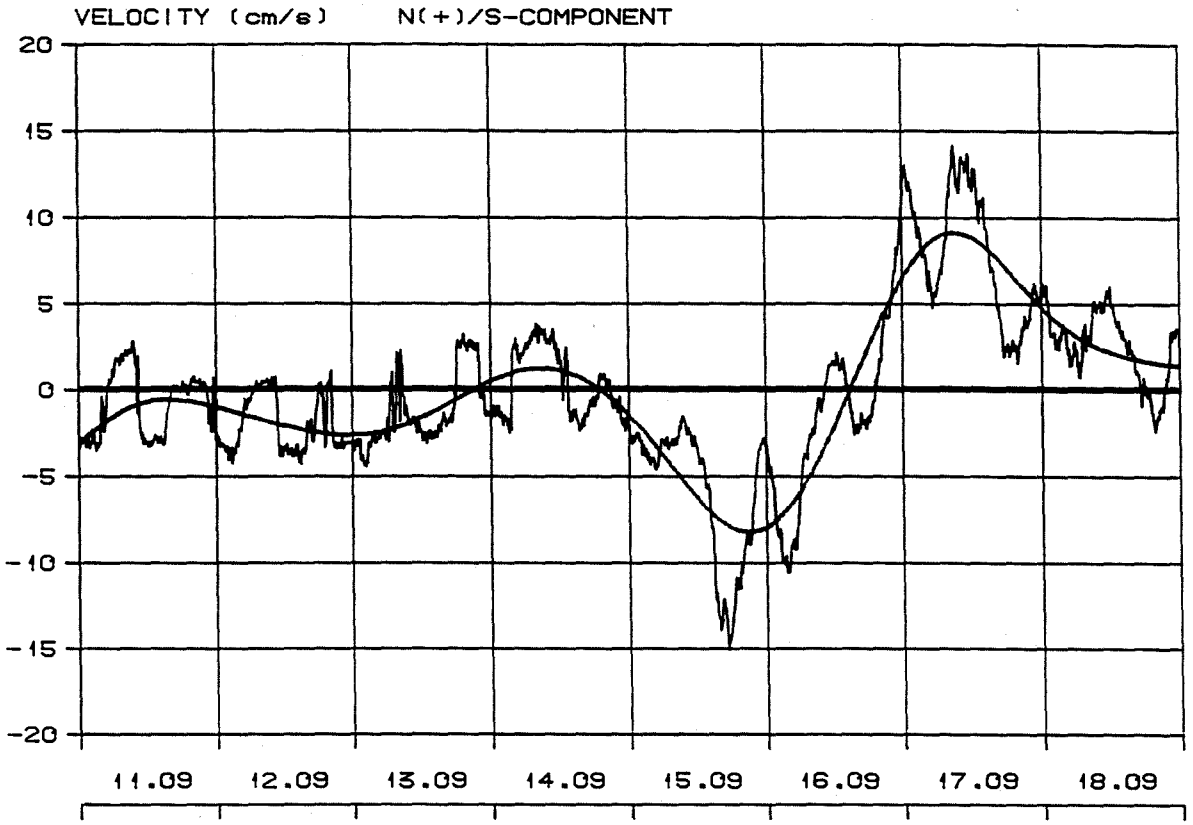
Time interval : 10.00 minutes.

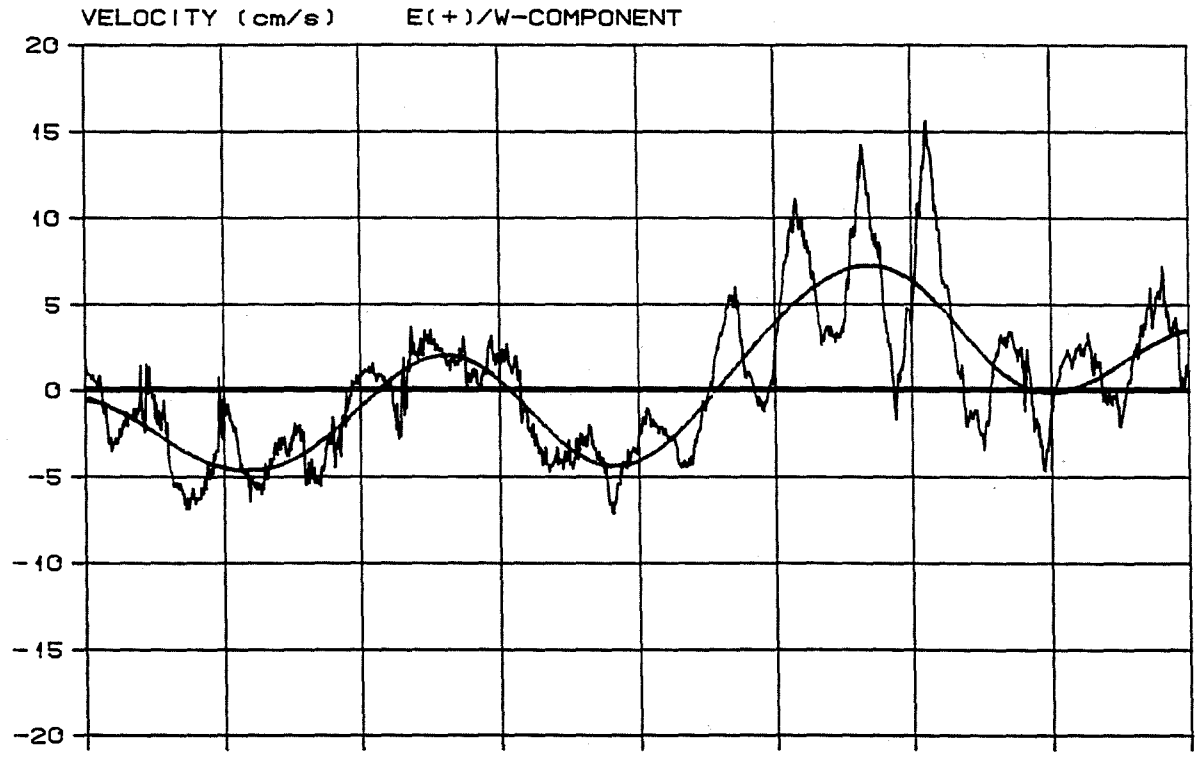
Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

H 1

Fig. 3-3-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 150.0 m Bottom depth : 285.0 m

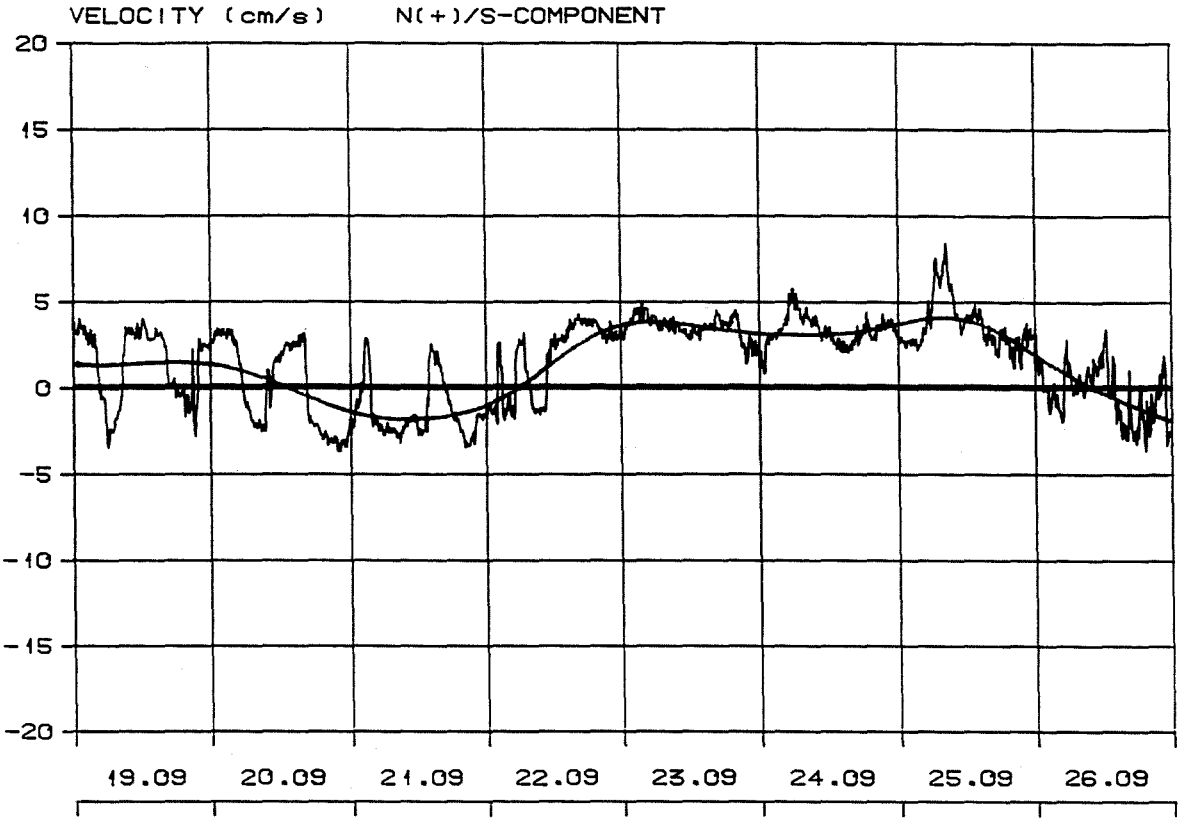
Time interval : 10.00 minutes.

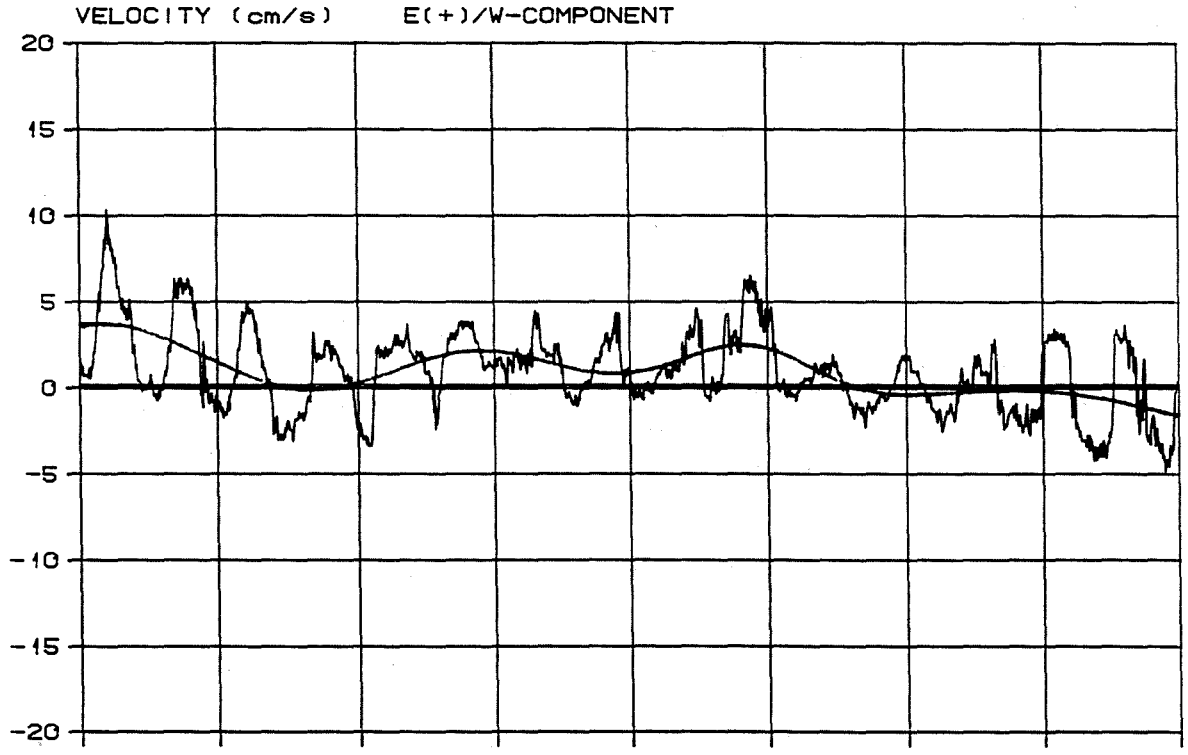
Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

H 1

Fig. 3-3-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 150.0 m Bottom depth : 285.0 m

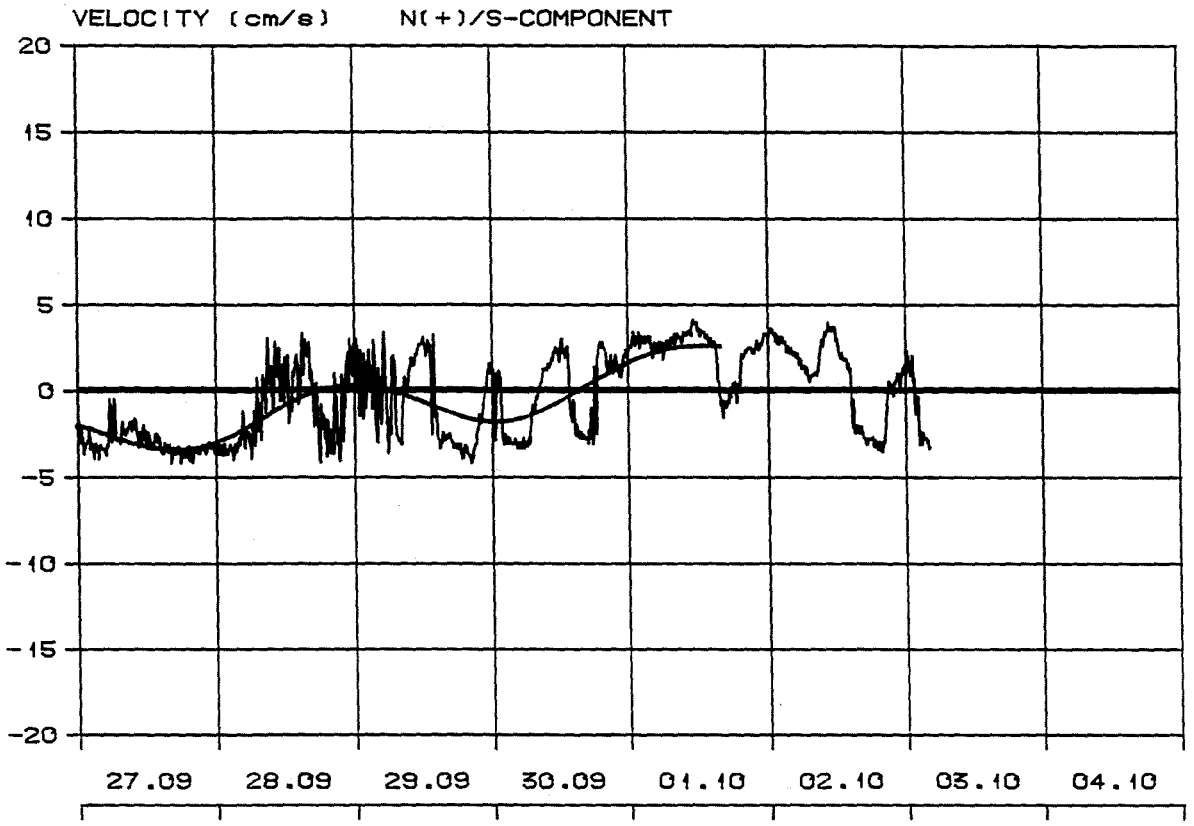
Time interval : 10.00 minutes.

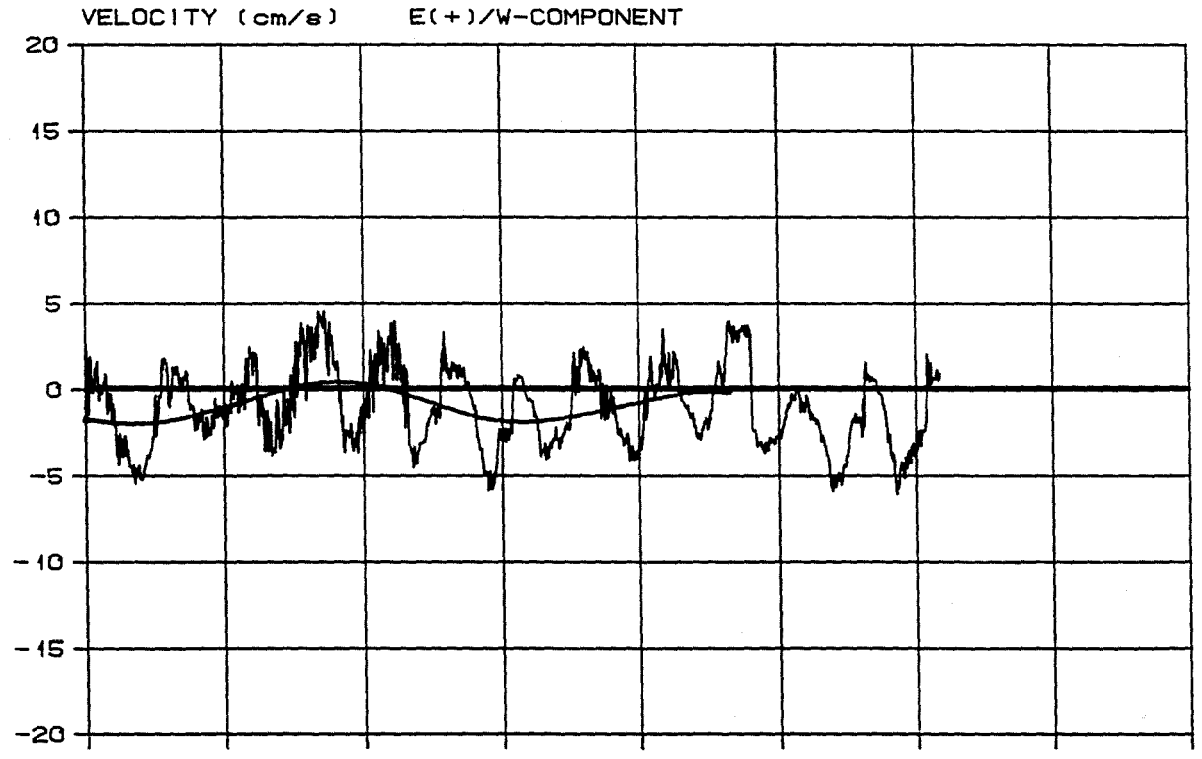
Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

H 1

Fig. 3-3-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

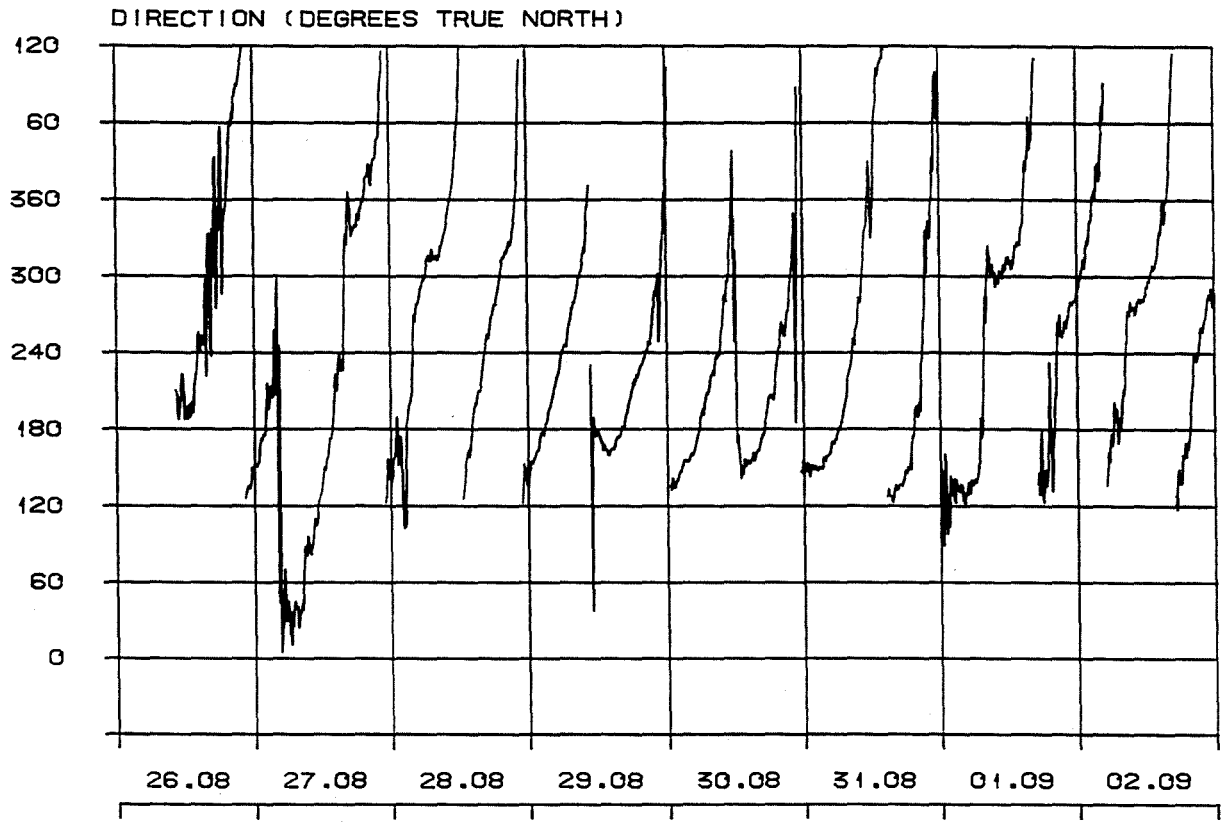
Instrument depth : 150.0 m Bottom depth : 285.0 m

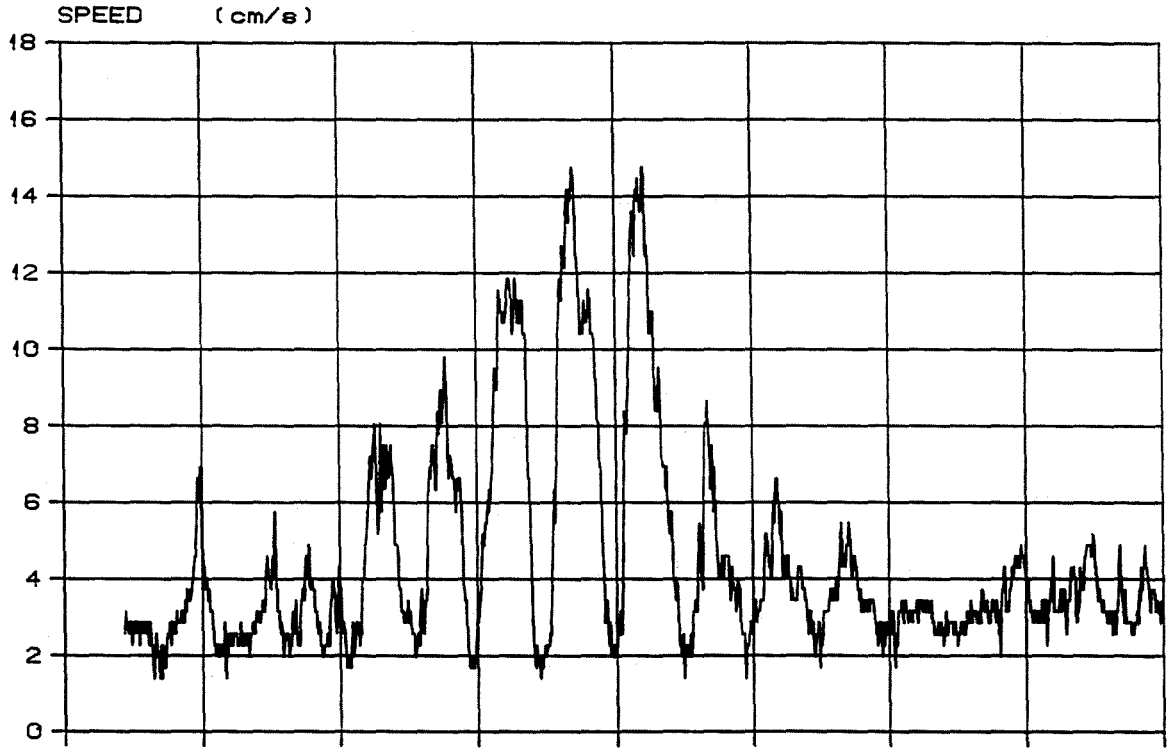
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

Fig. 3-3-6

Continues.....





The Barents Sea

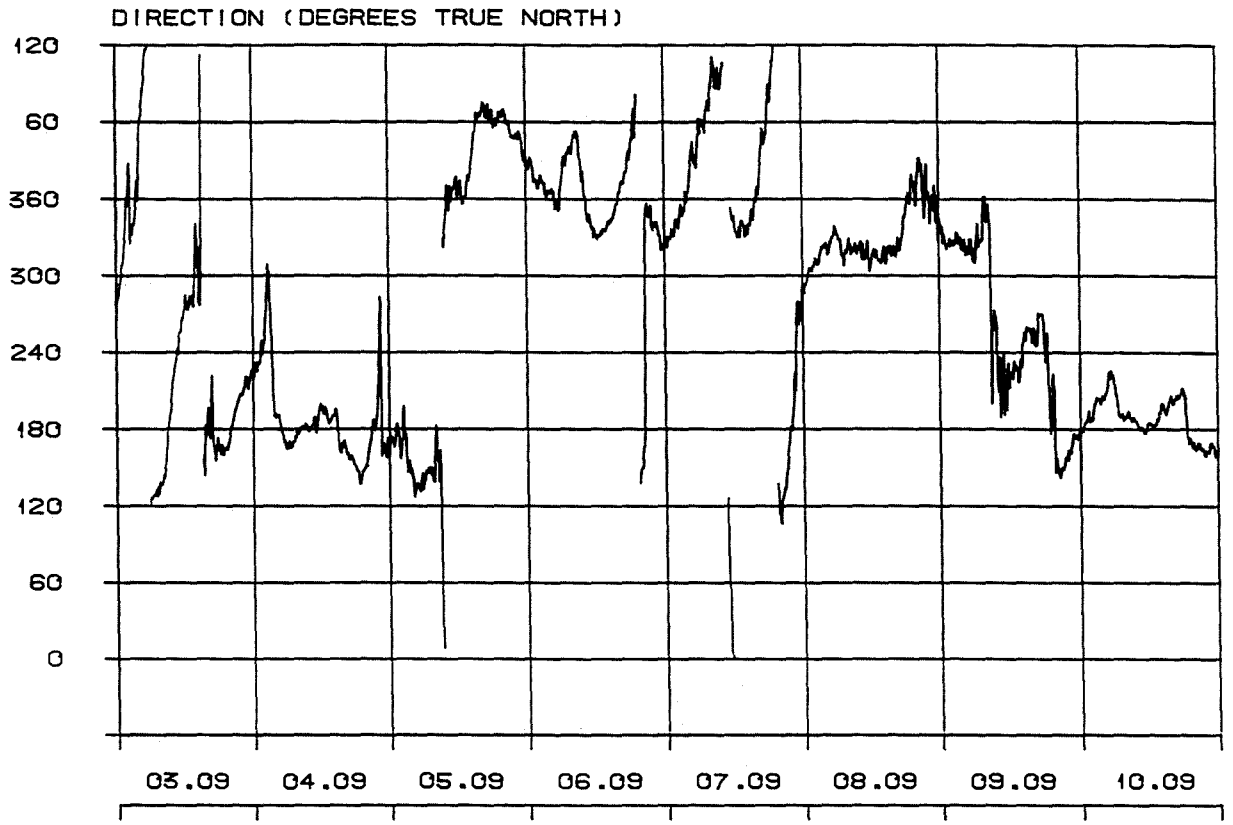
Position : N 74° 29.70' E 43° 0.60'

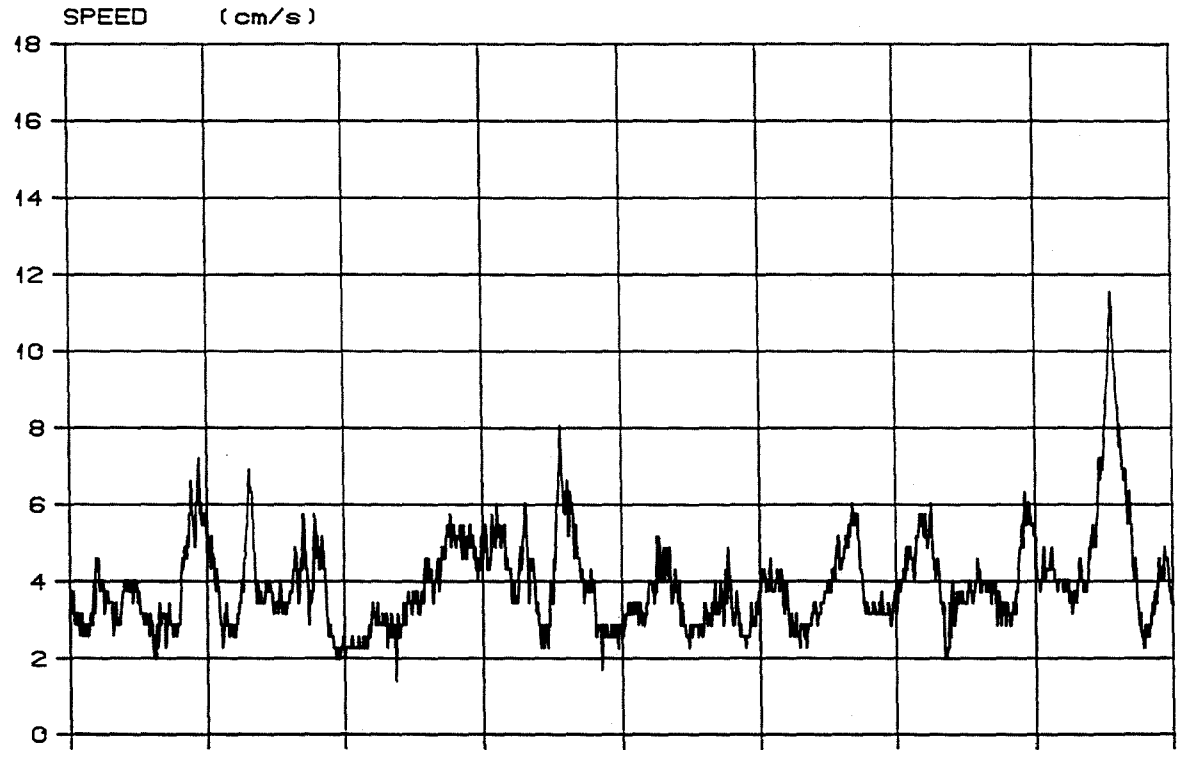
Instrument depth : 150.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

Fig. 3-3-7 Speed and direction of current.





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 150.0 m Bottom depth : 285.0 m

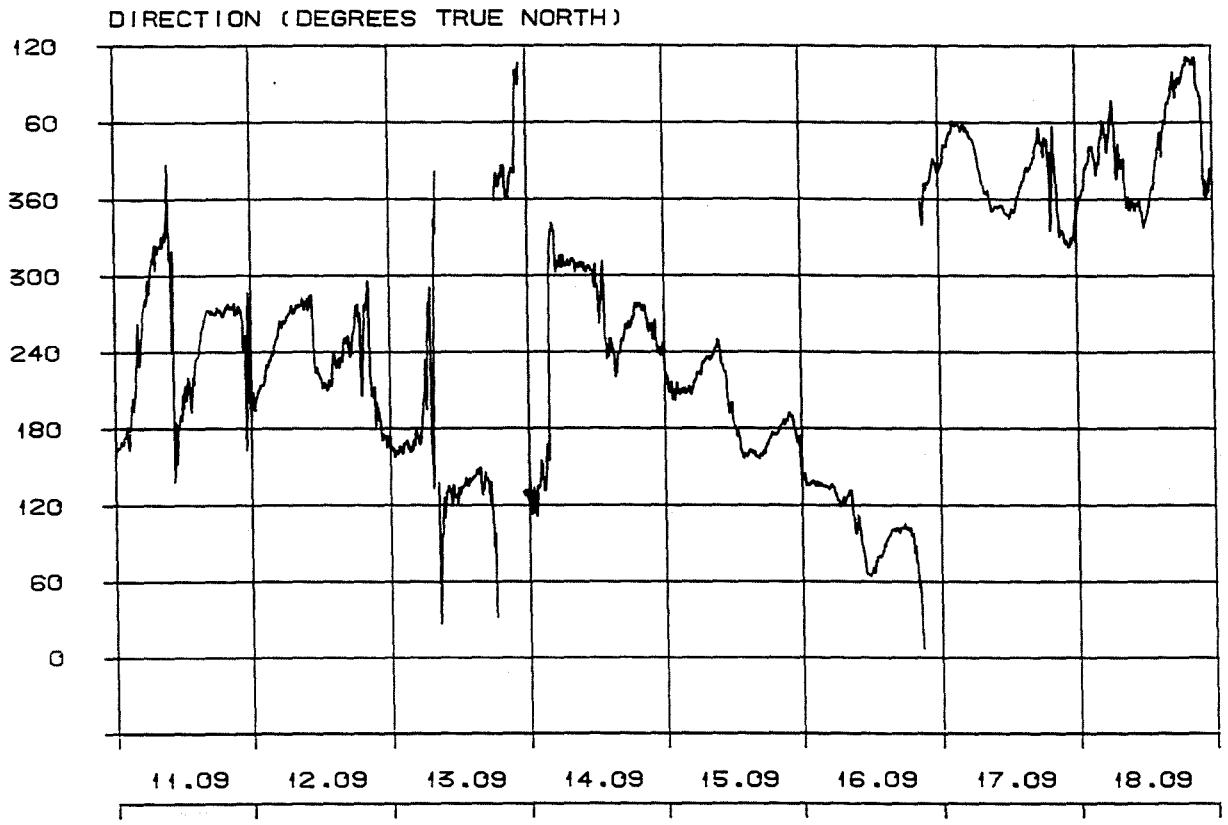
Time interval : 10.00 minutes.

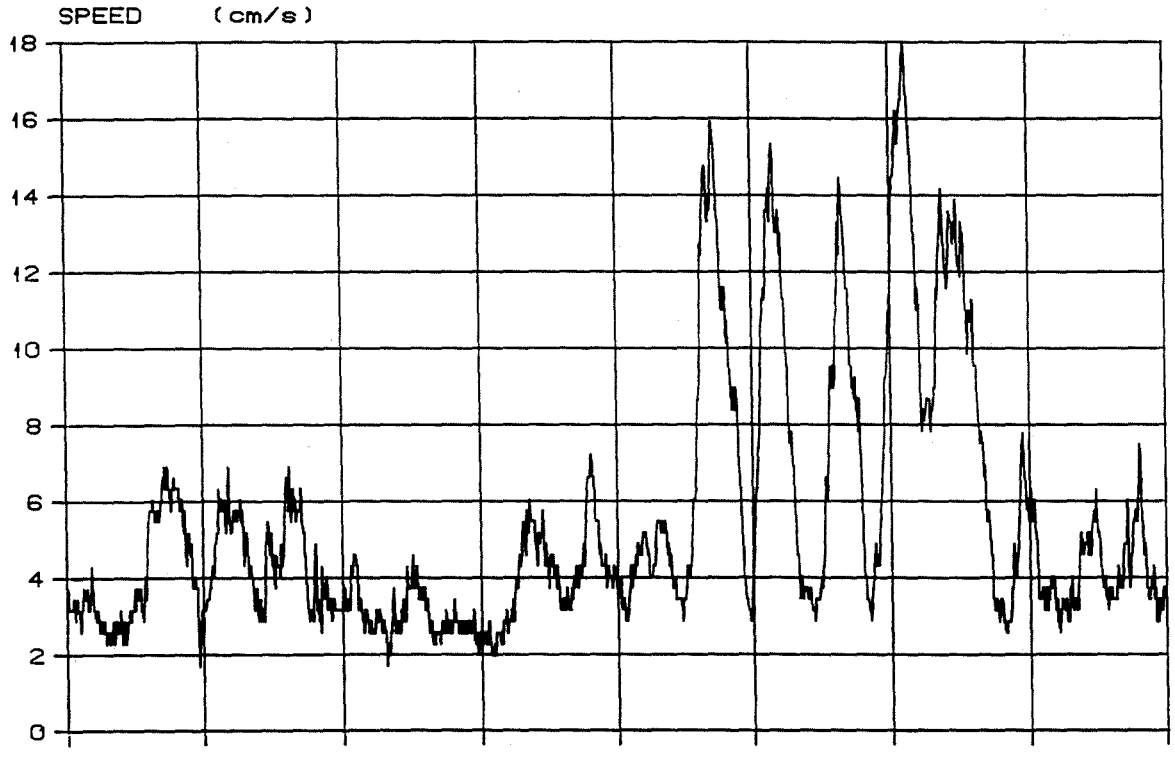
Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

H 1

Fig. 3-3-7

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 150.0 m Bottom depth : 285.0 m

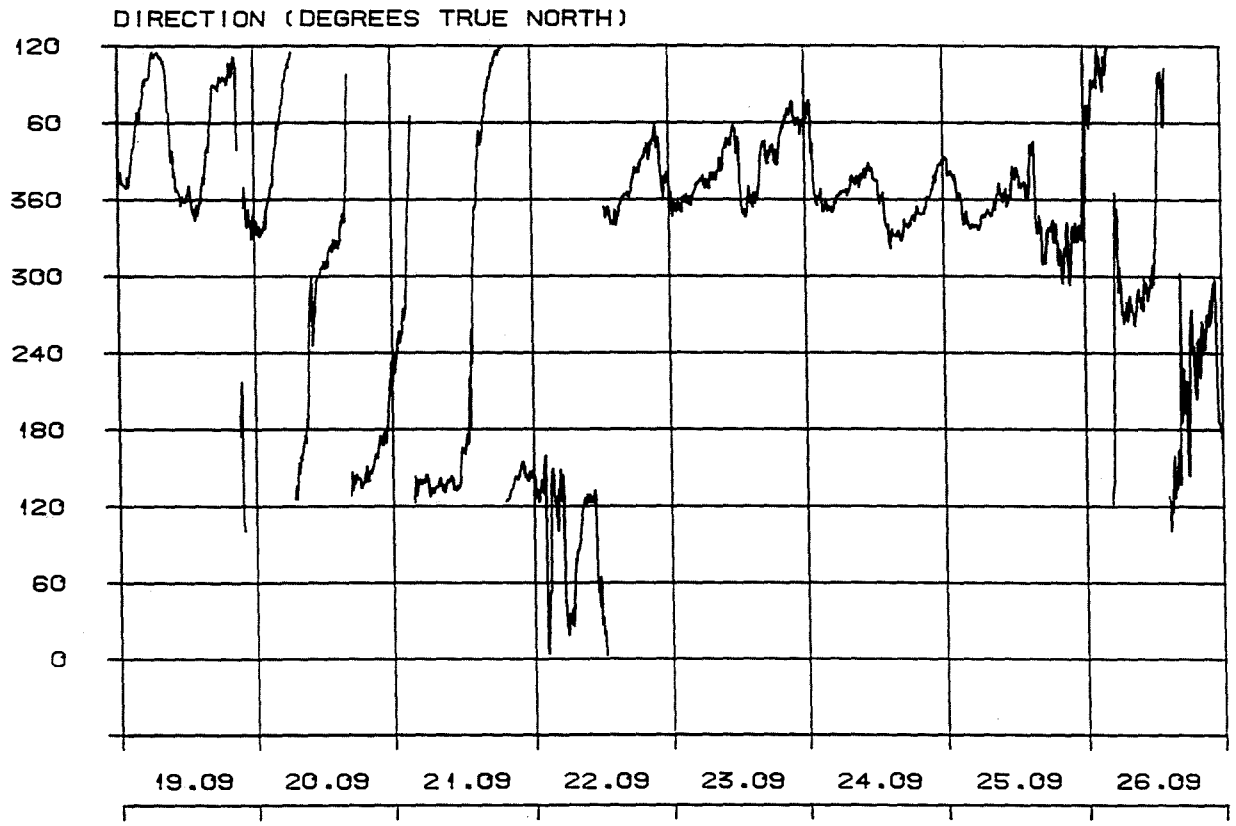
Time interval : 10.00 minutes.

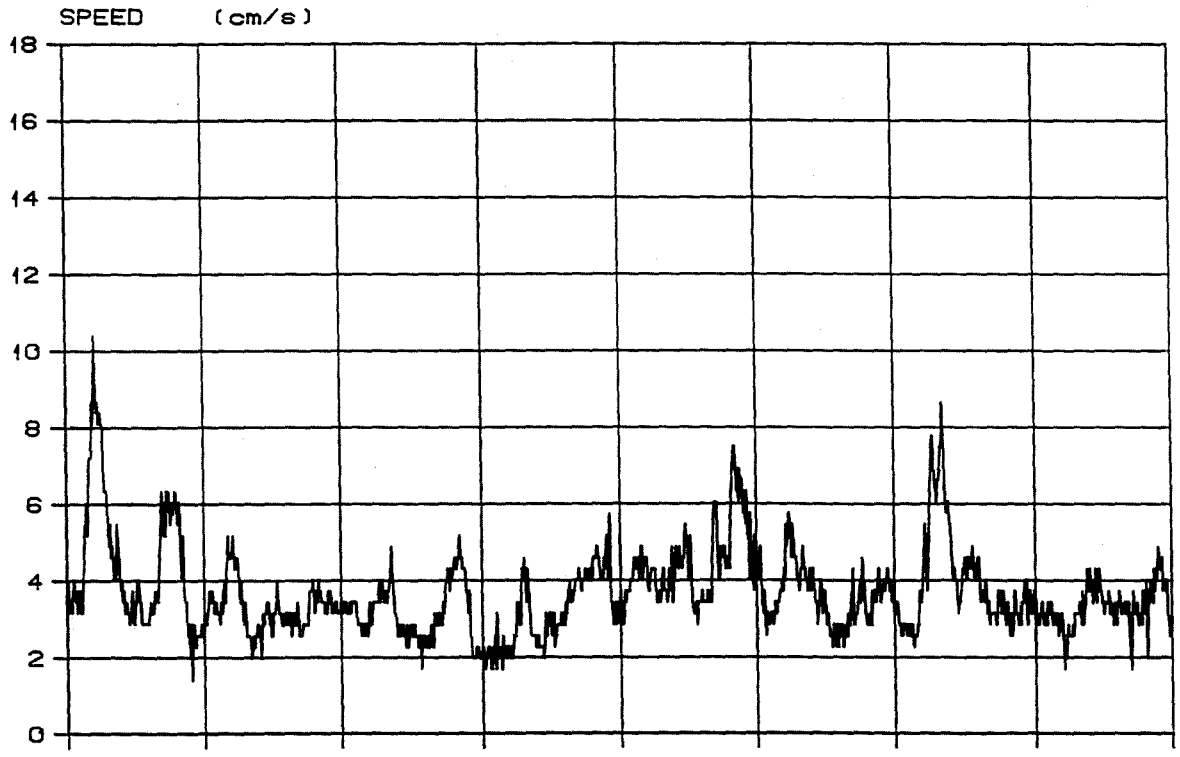
Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

H 1

Fig. 3-3-7

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 150.0 m Bottom depth : 285.0 m

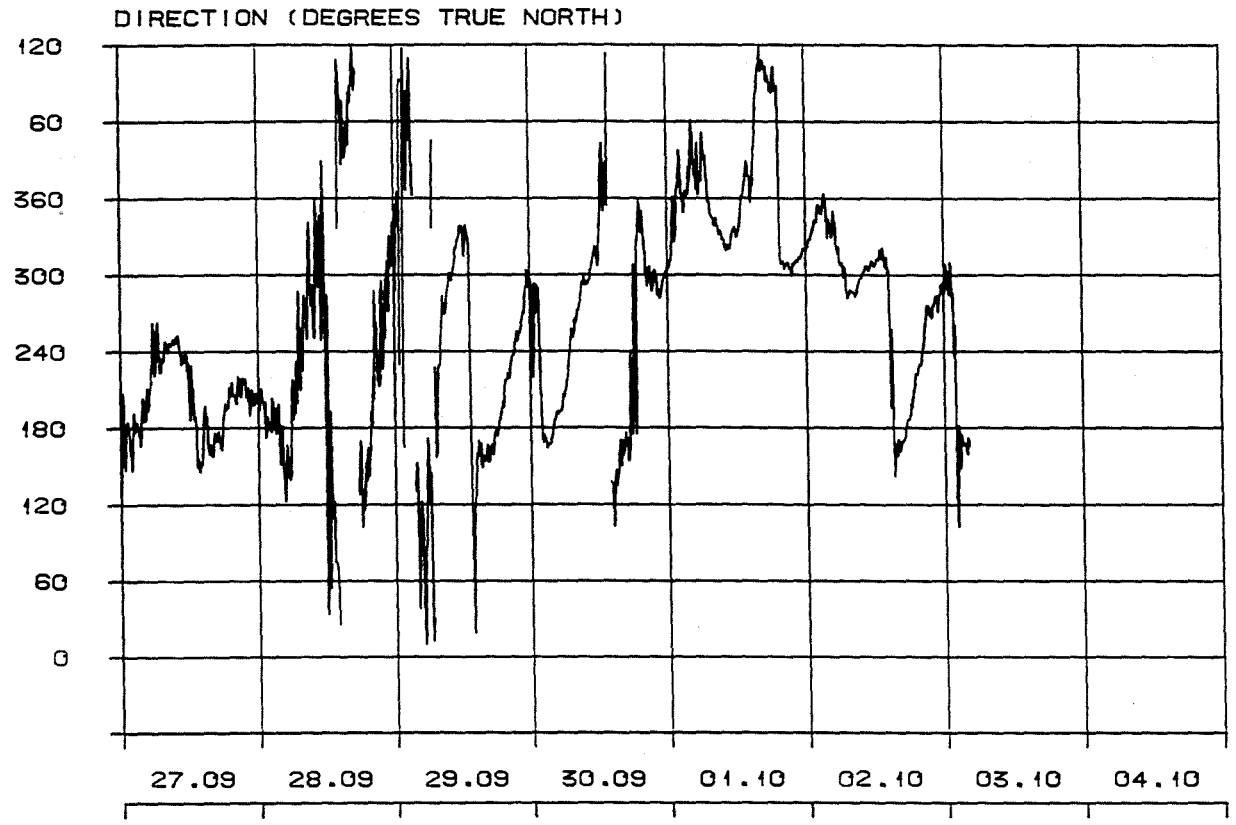
Time interval : 10.00 minutes.

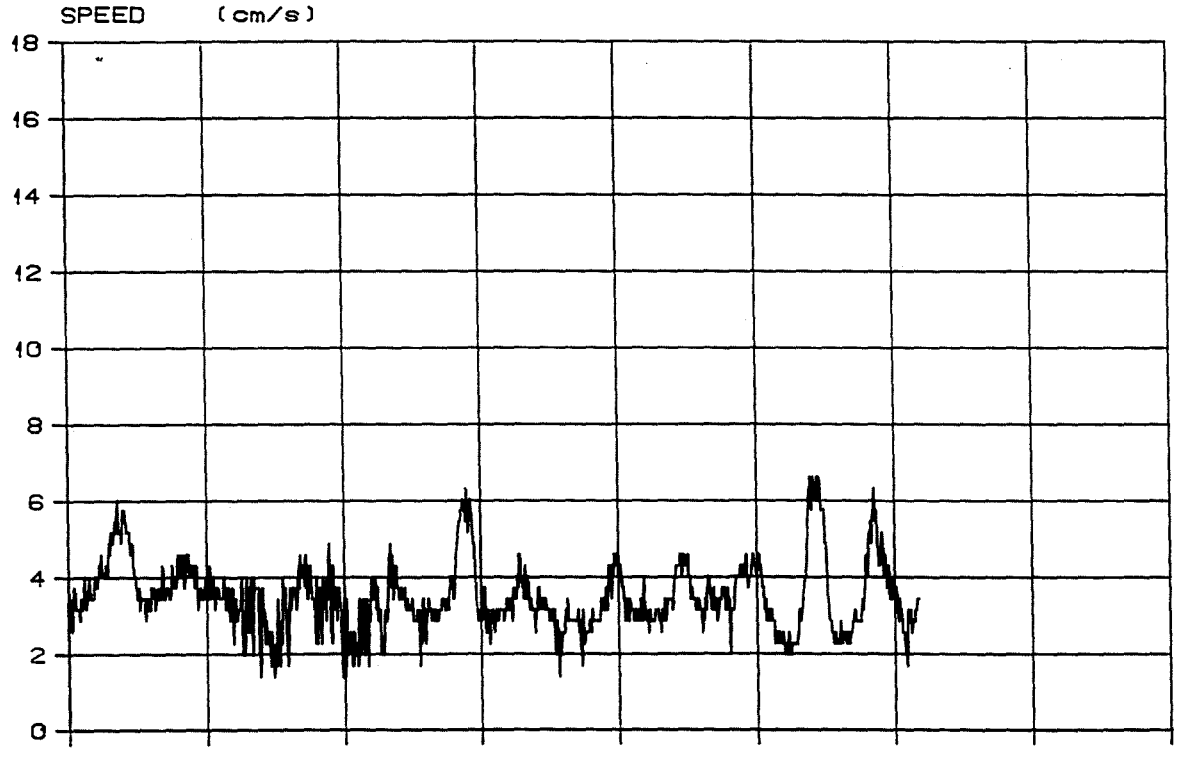
Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

H 1

Fig. 3-3-7

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 150.0 m Bottom depth : 285.0 m

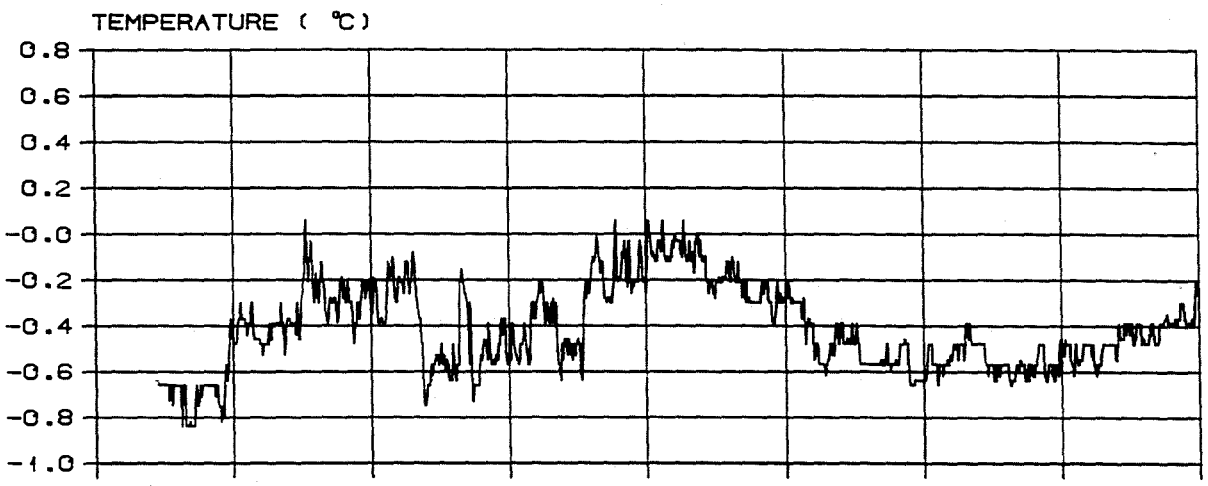
Time interval : 10.00 minutes.

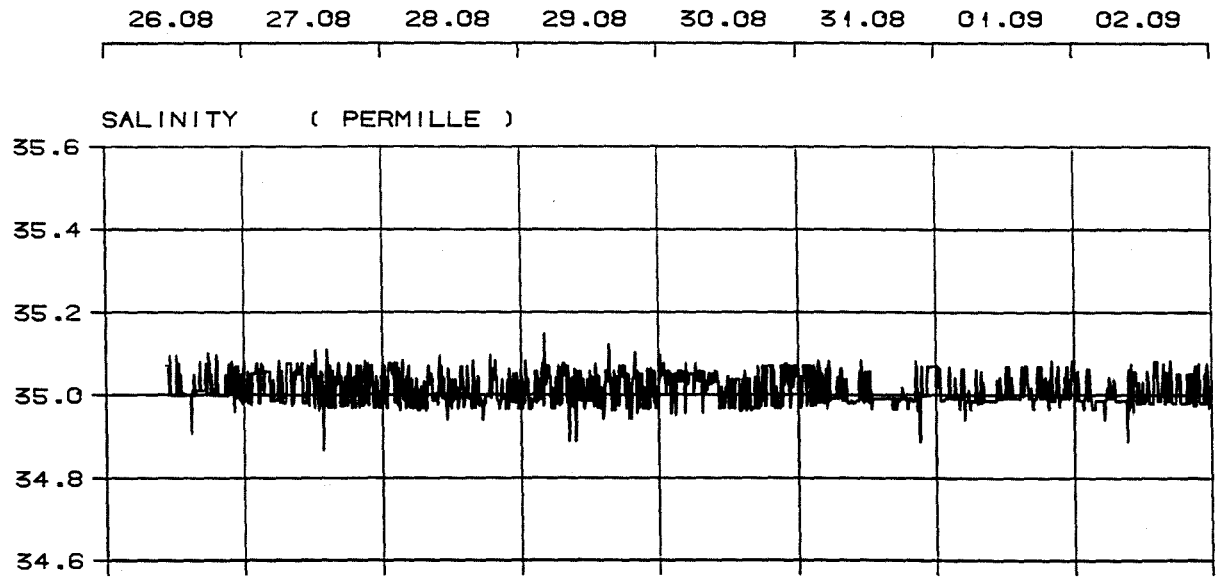
Obeervation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

H I

Fig. 3-3-7

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

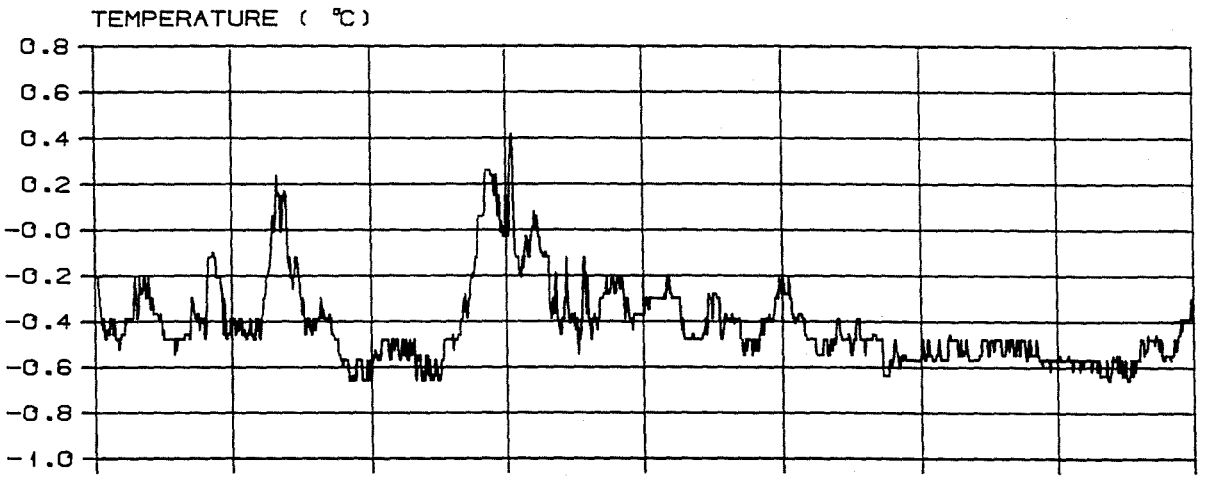
Instrument depth : 150.0 m Bottom depth : 285.0 m

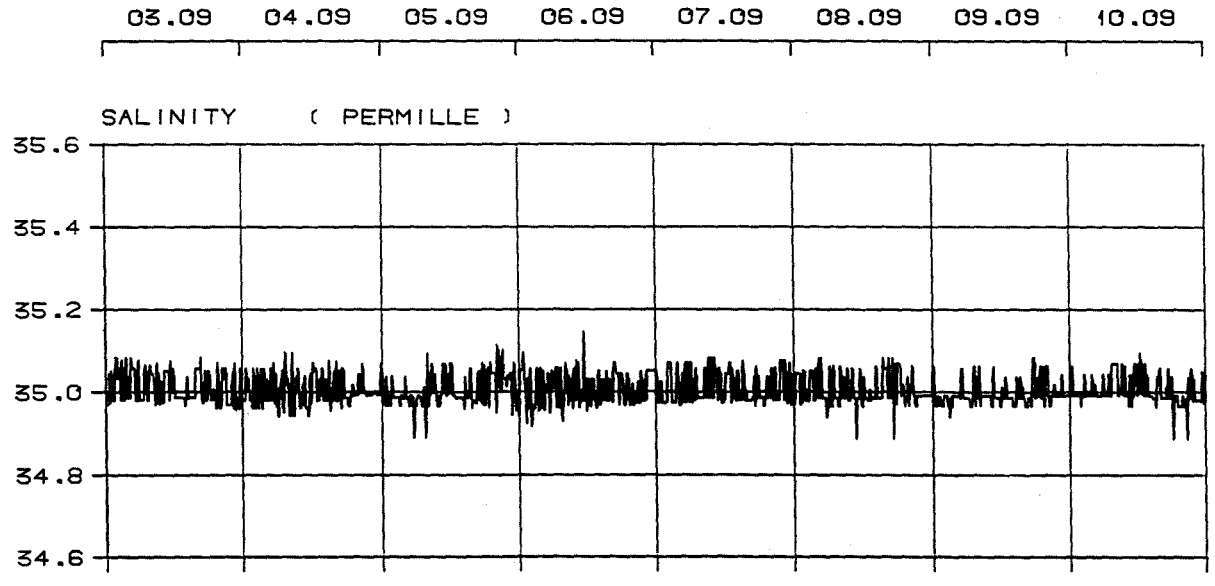
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

H I

Fig. 3-3-8 Temperature and salinity.





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 150.0 m Bottom depth : 285.0 m

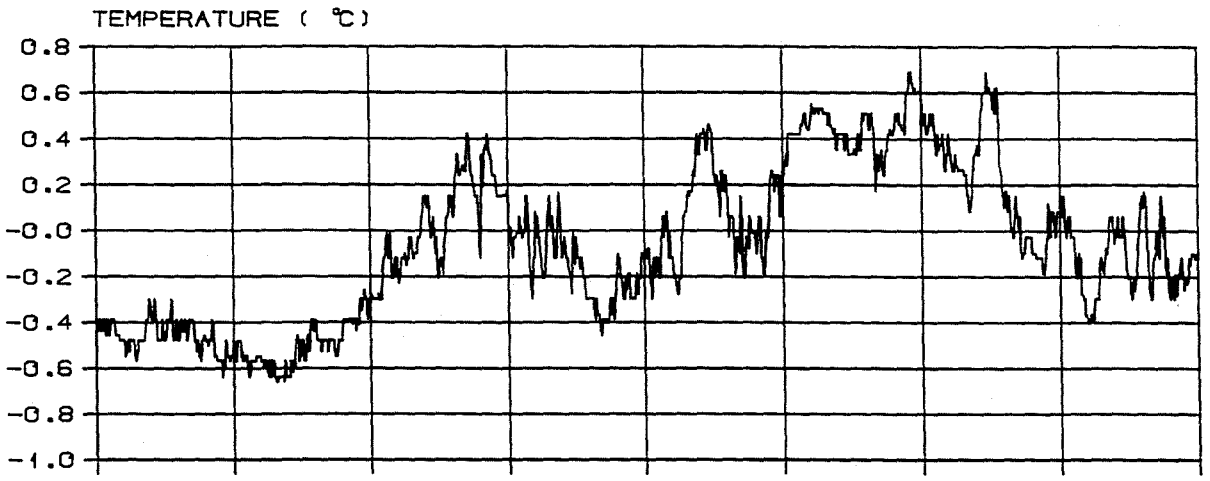
Time interval : 10.00 minutes.

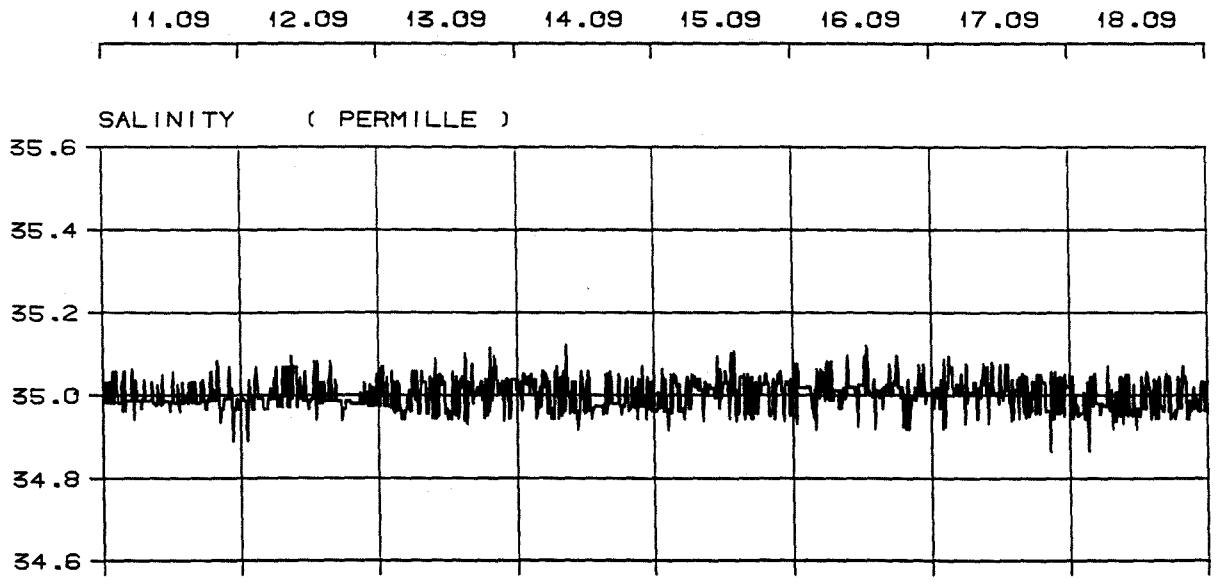
Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

H 1

Fig. 3-3-8

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 150.0 m Bottom depth : 285.0 m

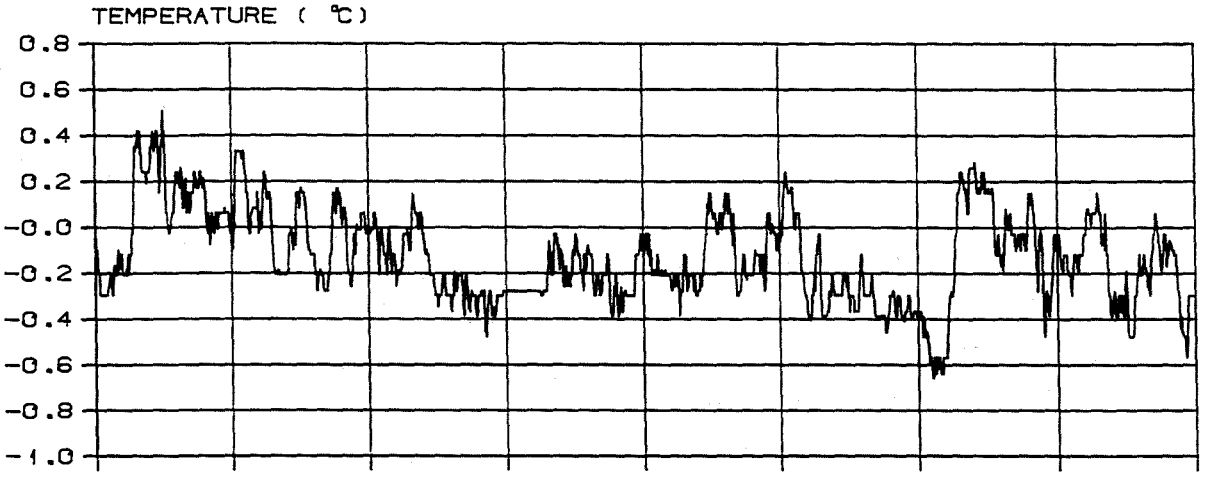
Time interval : 10.00 minutes.

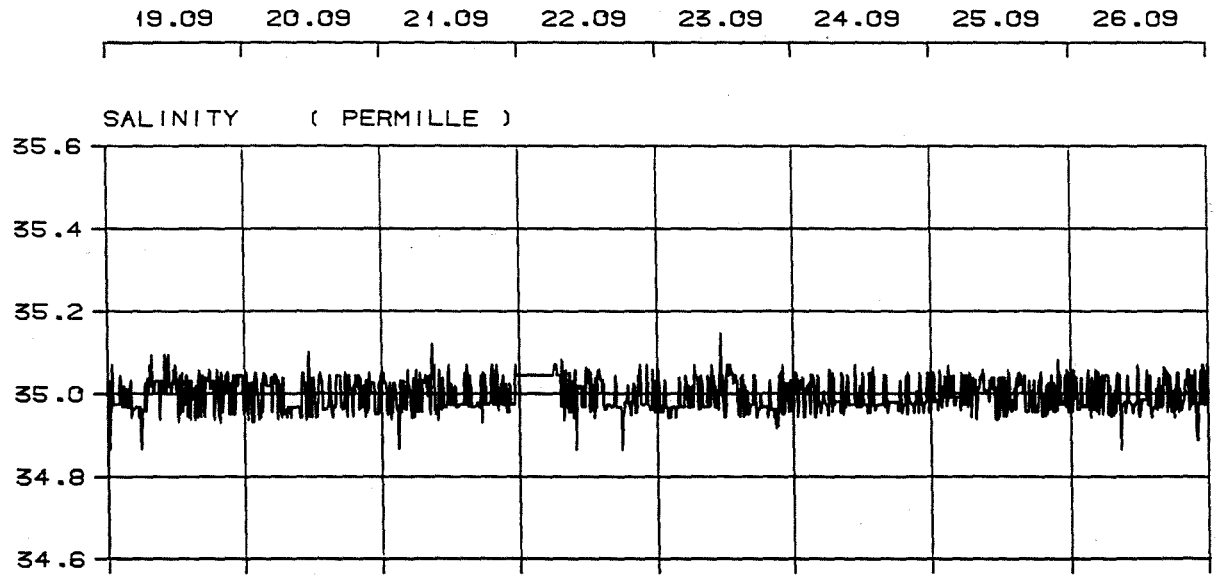
Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

H I

Fig. 3-3-8

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 150.0 m Bottom depth : 285.0 m

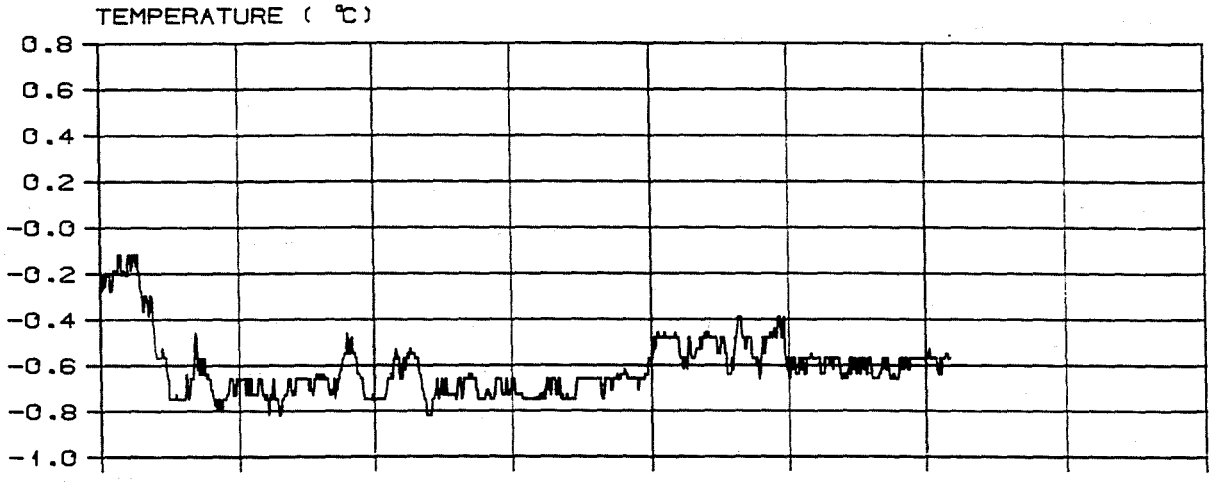
Time interval : 10.00 minutes.

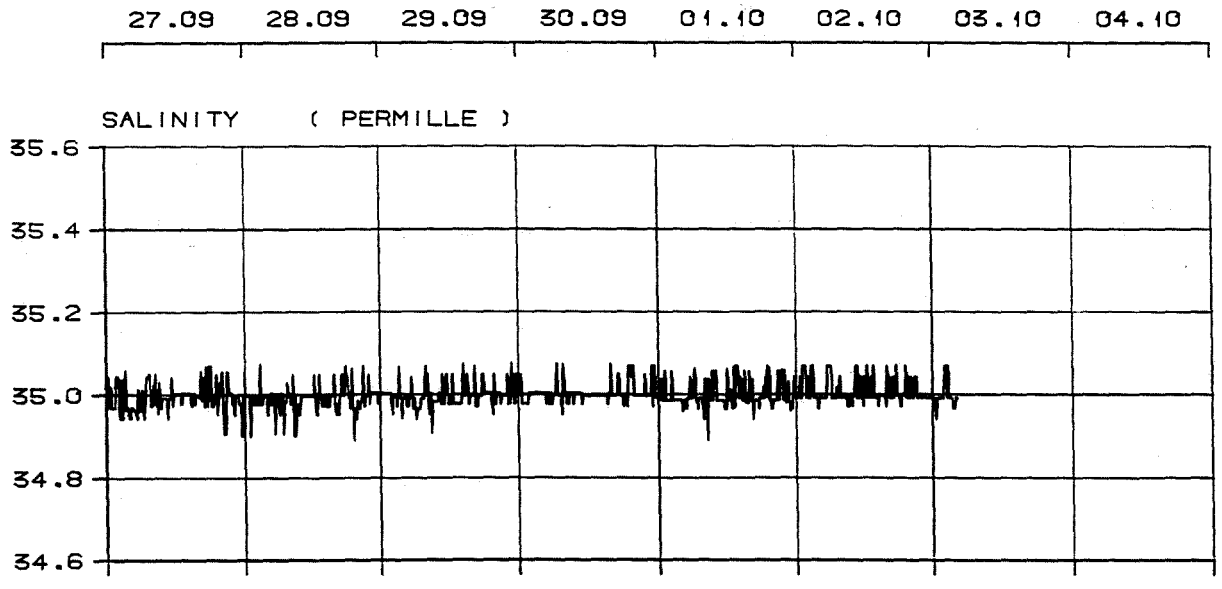
Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

H 1

Fig. 3-3-8

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 150.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

H 1

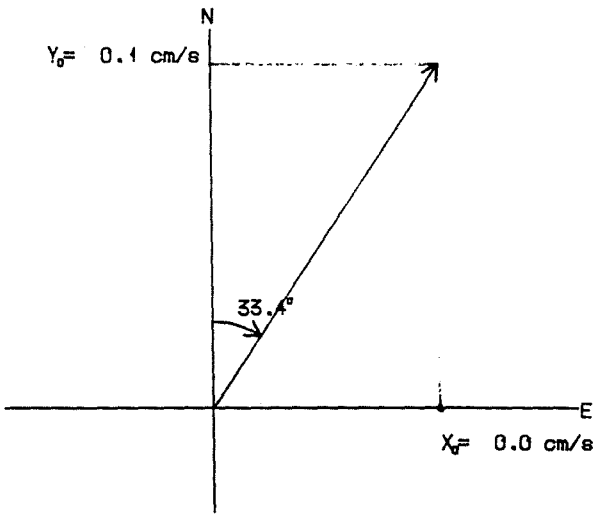
Fig. 3-3-8

Continues.....

HARMONIC ANALYSIS OF CURRENTS

CONSTITUENTS			DECOMPOSED CURRENT				TIDAL CURRENT ELLIPSE				
			E/W		N/S						
Symbol	Period houres	Frequense °/hour	X_j cm/s	g_{xj} °	Y_j cm/s	g_{yj} °	Major axis A_j cm/s	Minor axis B_j cm/s	θ_j °	g_j °	BETA. °
MM	661.31	0.5	1.3	28.2	0.6	53.4	1.4	0.2	67.5	32.0	77.2
MSF	354.37	1.0	1.3	101.8	1.7	139.5	2.1	0.7	214.6	306.9	155.1
M2	12.42	29.0	2.2	86.9	1.9	316.8	2.7	-1.2	126.9	105.7	46.4

MEAN CURRENT



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 150.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

H 1

Fig. 3-3-9 Harmonic analysis of currents.

A discription of the model and its definitions :

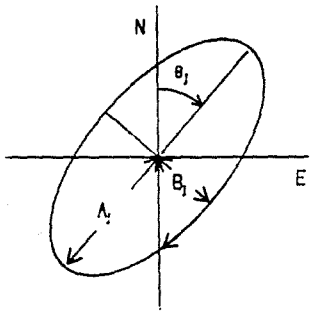
Current-vector decomposed in E/W (real) - and N/S (imaginary) - direction :

$$Z(t)=X_0+\sum_{j=1}^{n}(X_j\cos(\sigma_j t+(V_0+u)_j-g_{xj})+i(Y_0+\sum_{j=1}^{n}Y_j\cos(\sigma_j t+(V_0+u)_j-g_{yj}))$$

g_{xj} , g_{yj} : Greenwich-phase for E/W- and N/S-components of each constituent.

With ellipseparameters :

$$Z(t)=\sum_{j=1}^{n}\exp(i(90^\circ-\theta_j))(A_j\cos(\sigma_j t+(V_0+u)_j-g_j)+iB_j\sin(\sigma_j t+(V_0+u)_j-g_j))$$



g_j : Greenwich phase of the current-vector for each constituent.

Rotationdirection : anticlockwise when $B_j > 0$, clockwise when $B_j < 0$

BETA : The angle between t=0 and major halv axis in the ellipse.

Common for both modles :

σ_j : Frequence in degrees/hour.

$(V_0+u)_j$: Astronomic argument relative to Greenwich-meridian.

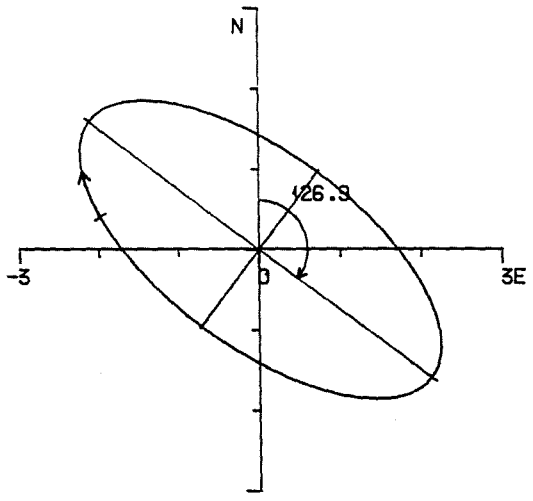
During the calculation of Z(t) will V_0+u be put into the formulas at the time t=0.

The time t is in houres; the same timezone as the analysed data.

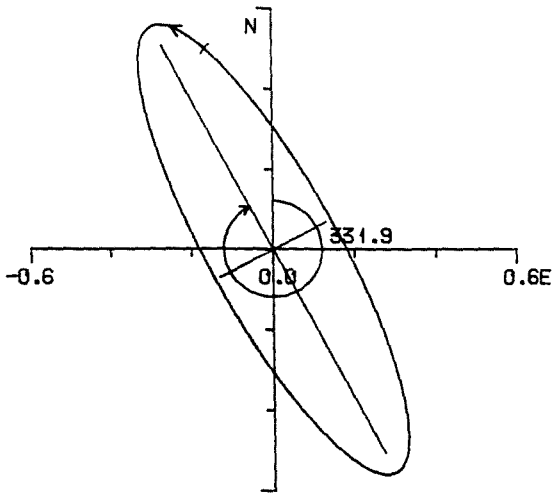
t=0 in the midle of the measurement series : 1989 14.09 H. 0700 ,

marked with a line on the ellipse.

M2-ellipse



K1-ellipse



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

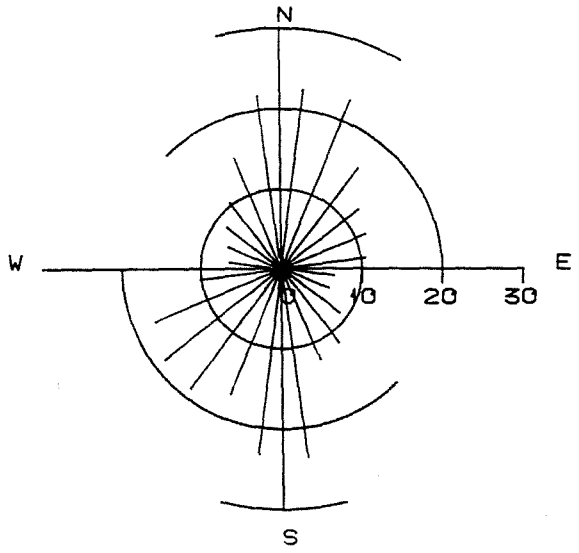
Instrument depth : 150.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

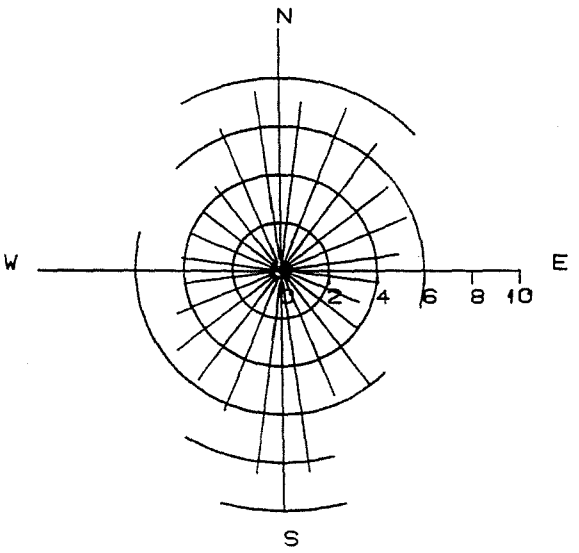
Observation period: 1989 26.08 H. 1020 - 1989 03.10 H. 0410

Fig. 3-3-10 M2 and K1 ellipse.

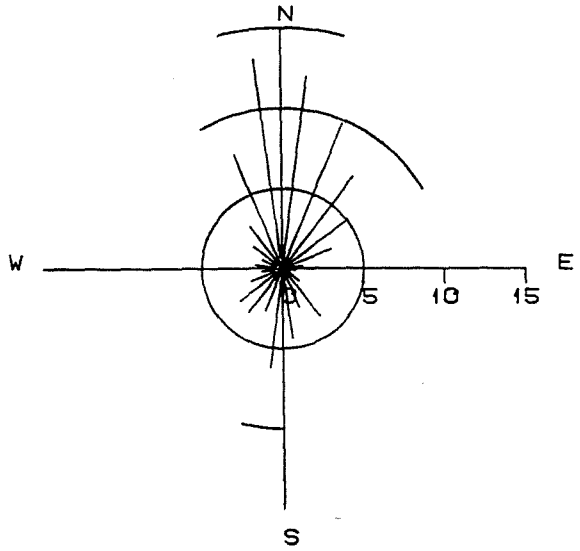
CURRENT VELOCITY DISTRIBUTION



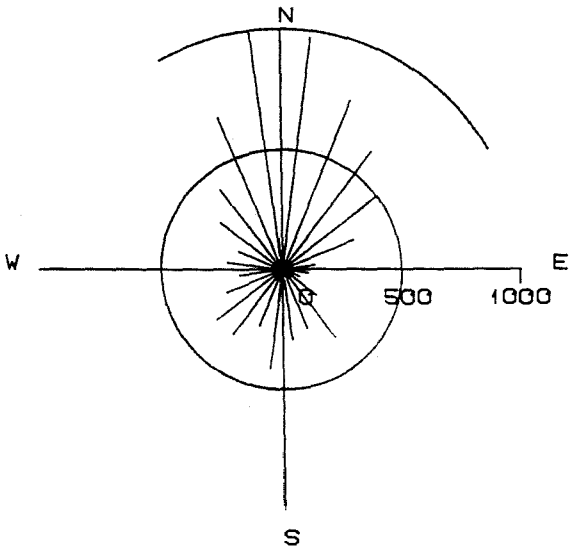
Maksimum velocity (cm/s)



Mean velocity (cm/s)



Relative flux in %



Number measured

Number of observations : 9182

The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

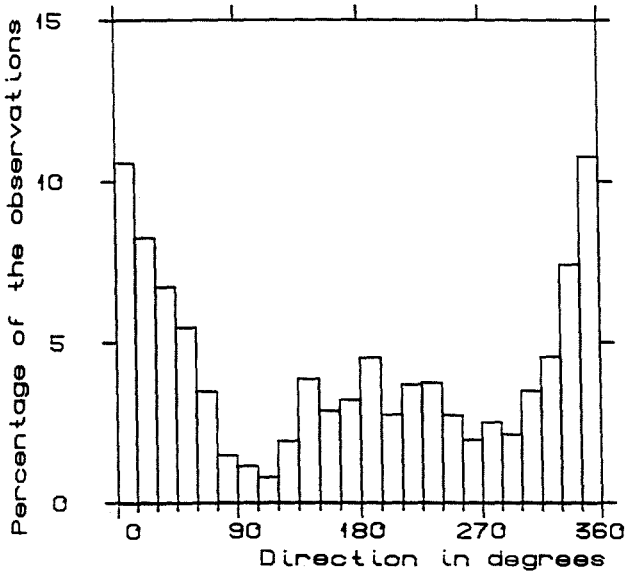
Time interval : 10.00 minutes.

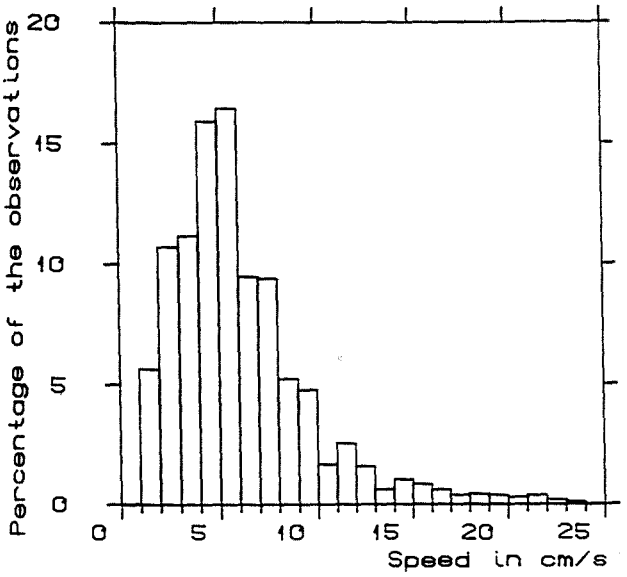
Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

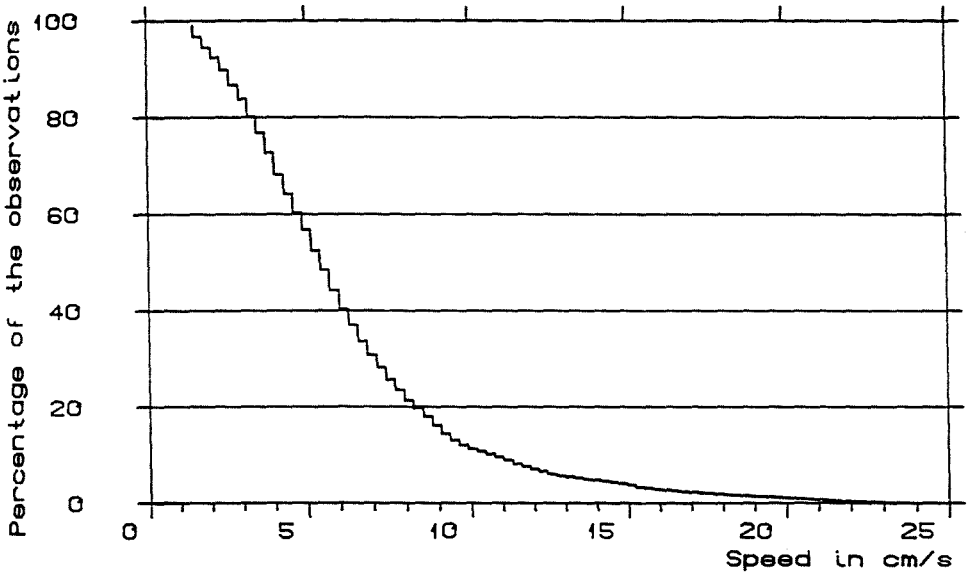
Fig. 3-4-1 Current velocity distribution.

HISTOGRAM





CURRENT SPEED DISTRIBUTION



Number of observations : 9182

The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

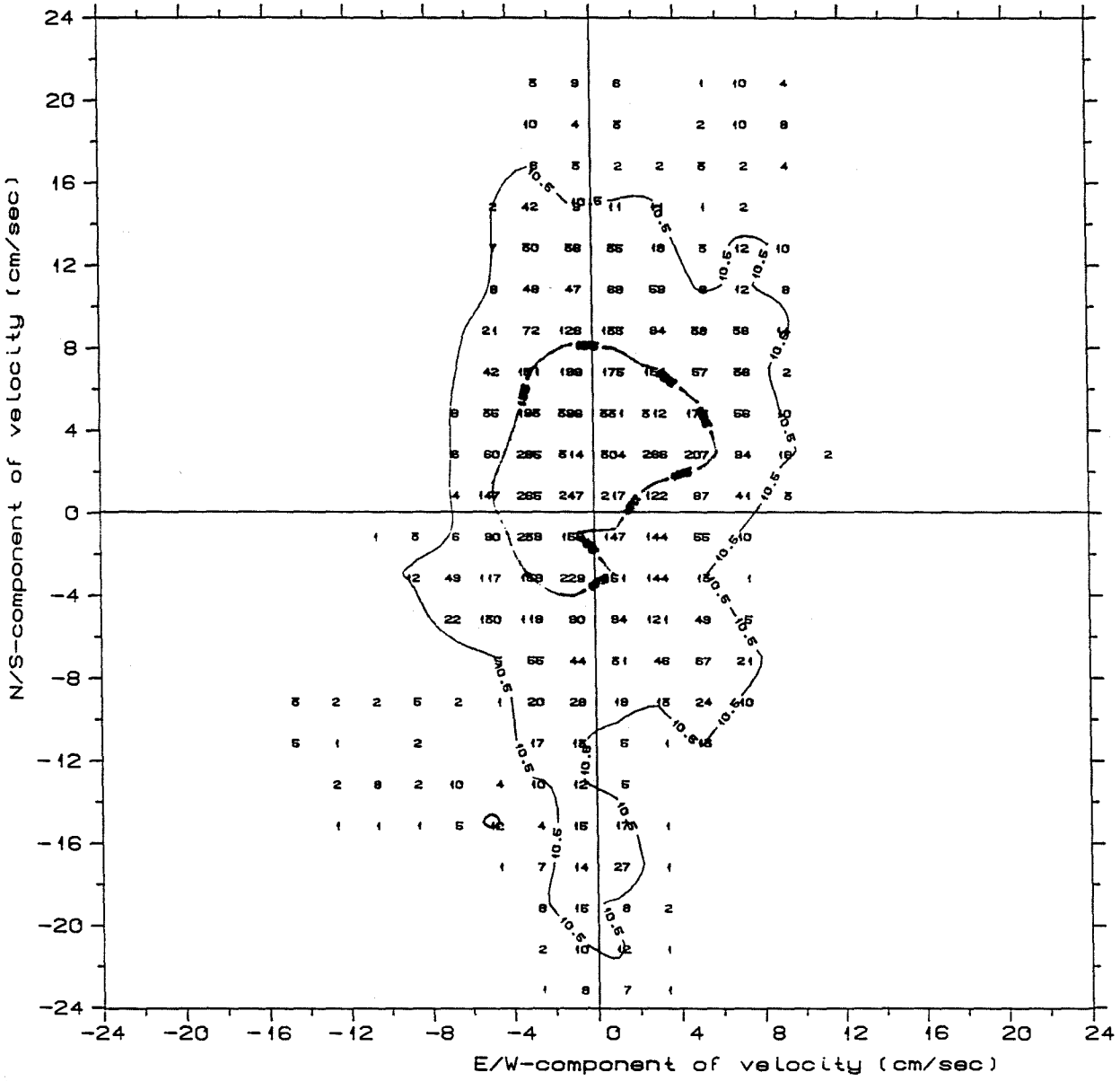
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-2 Histogram of speed and direction. Current speed distribution.

VELOCITY DISTRIBUTION DIAGRAM



Number of observations : 9182

Isoline for 50% and 96%

Number of observations : 9182

The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

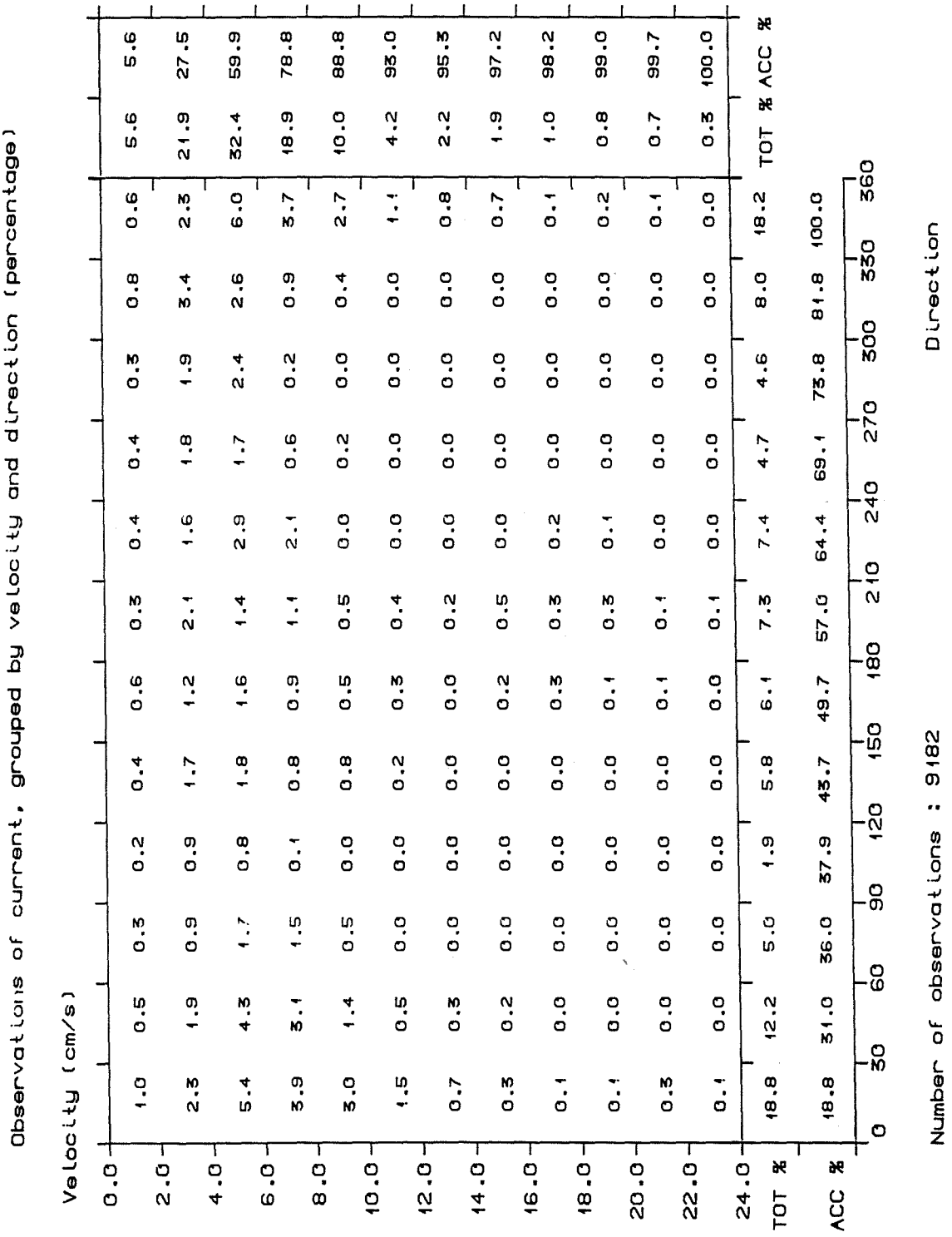
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-3 Velocity distribution diagram.

DIRECTION DISTRIBUTION OF CURRENT VELOCITY



Number of observations : 9182

The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

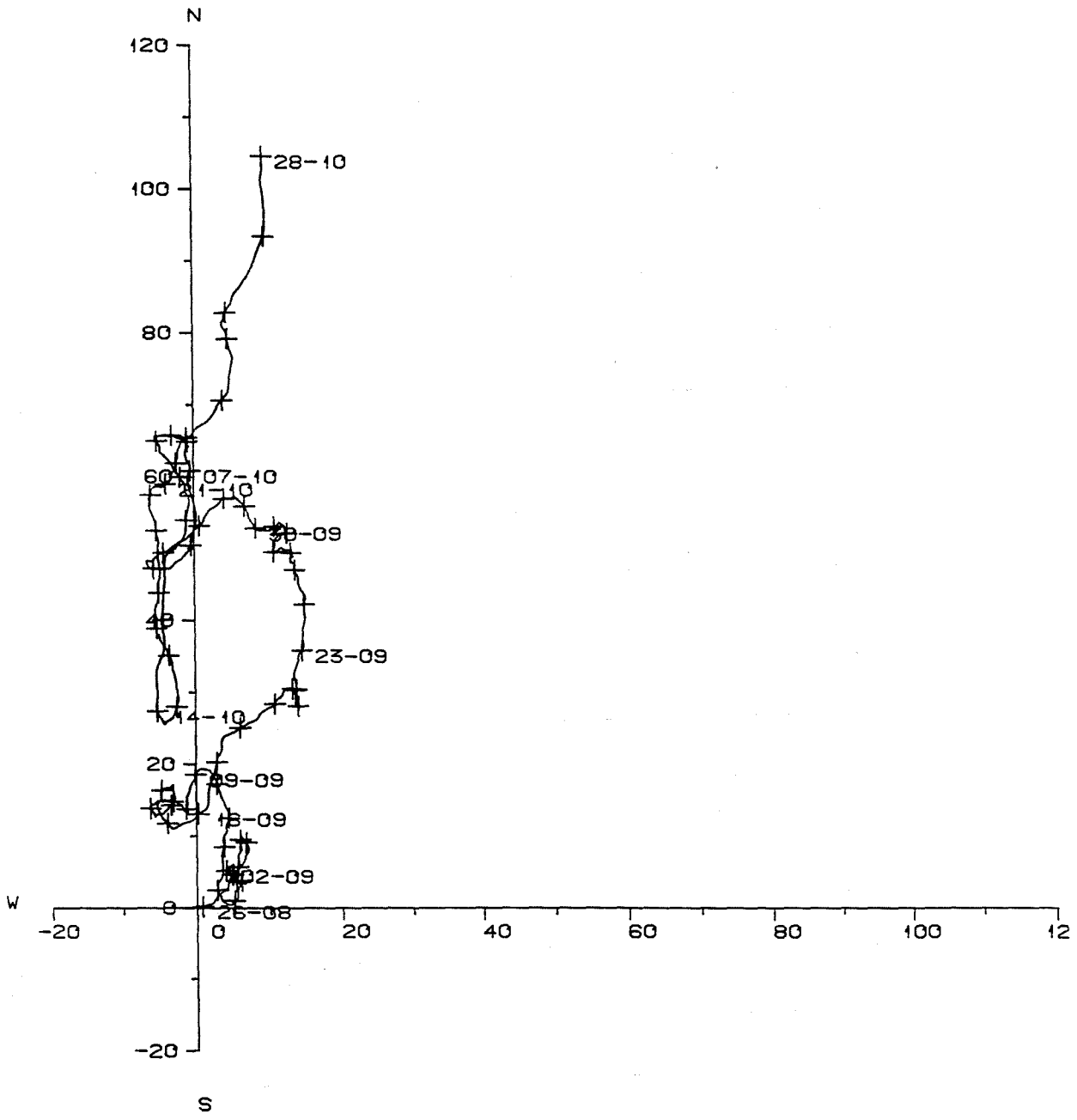
Instrument depth : 275.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

Fig. 3-4-4 Velocity distribution table.

PROGRESSIVE VECTOR DIAGRAM



Units in km

Number of observations : 9182

The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

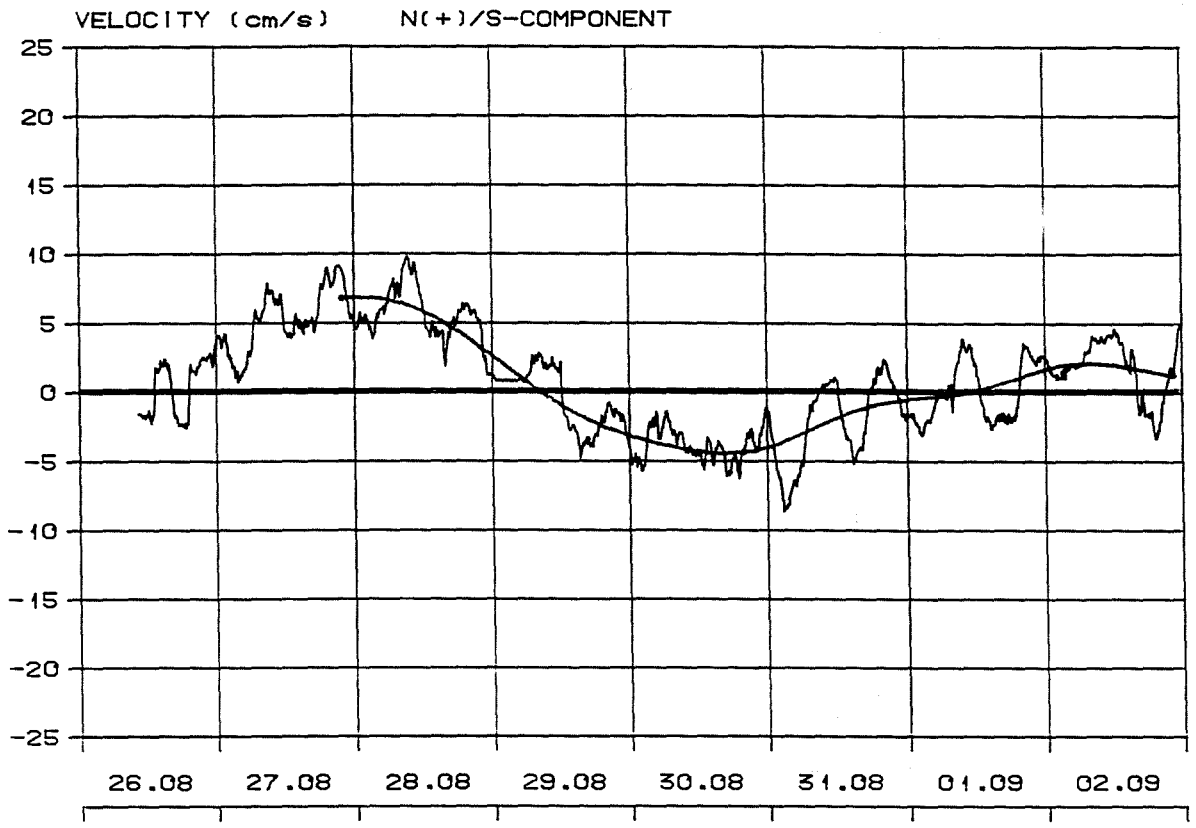
Instrument depth : 275.0 m Bottom depth : 285.0 m

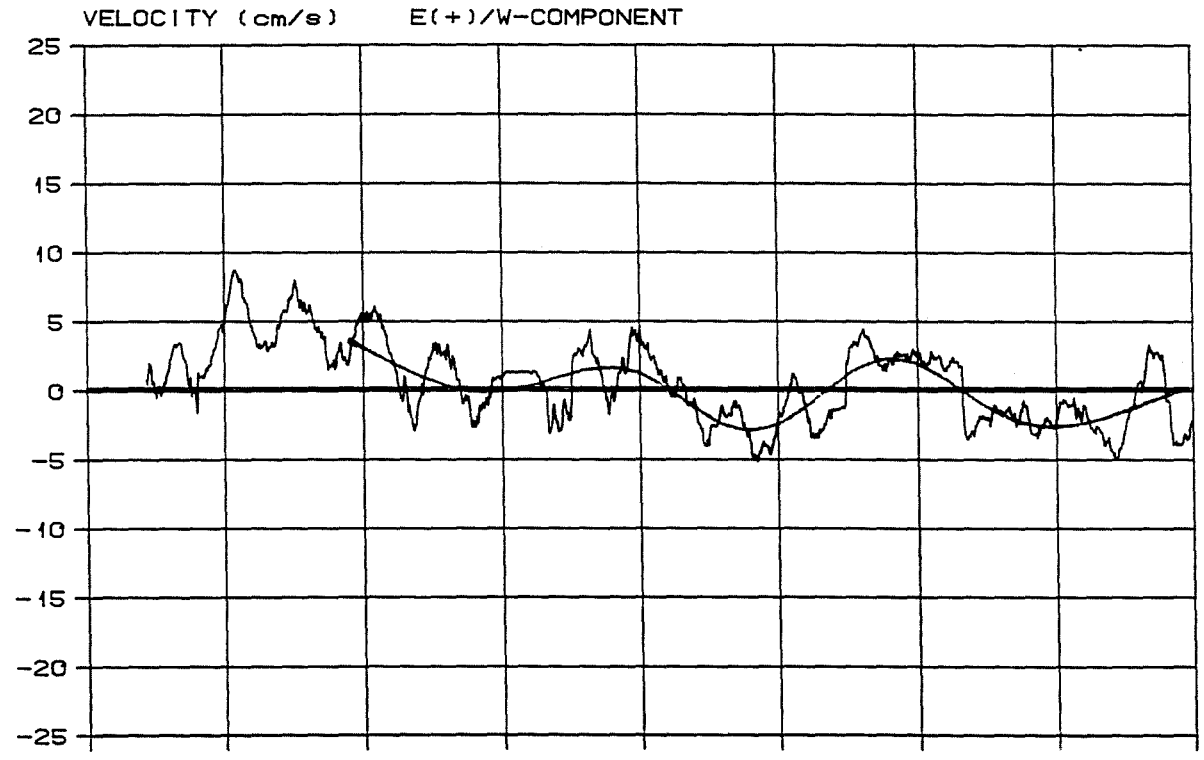
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-5 Progressive vector diagram.





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

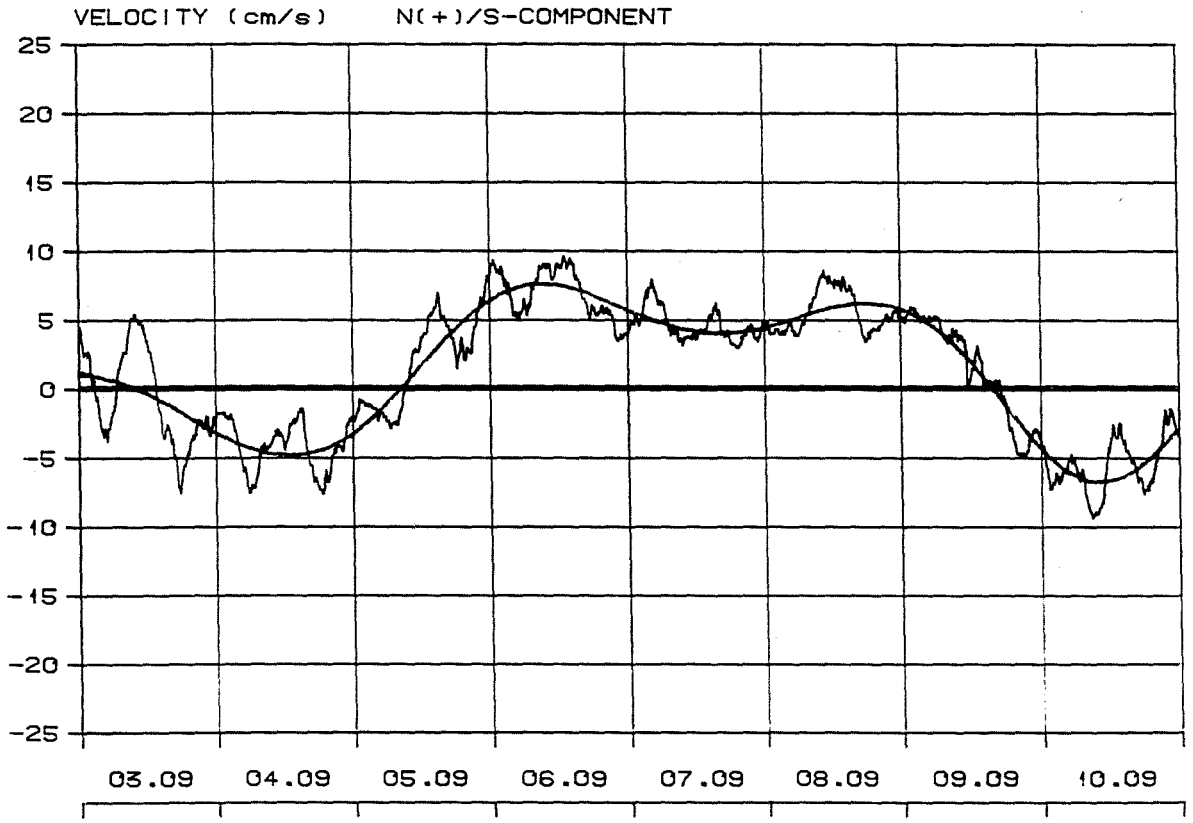
Instrument depth : 275.0 m Bottom depth : 285.0 m

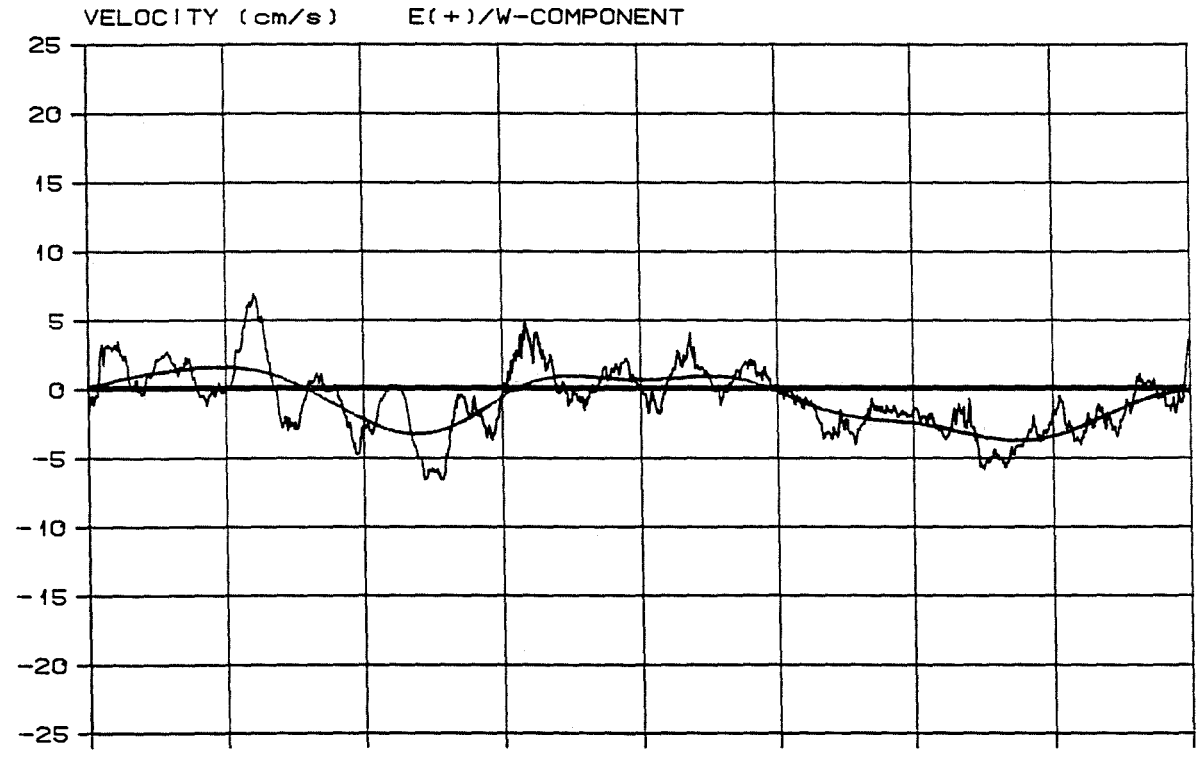
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-6 N/S and E/W components of current.





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

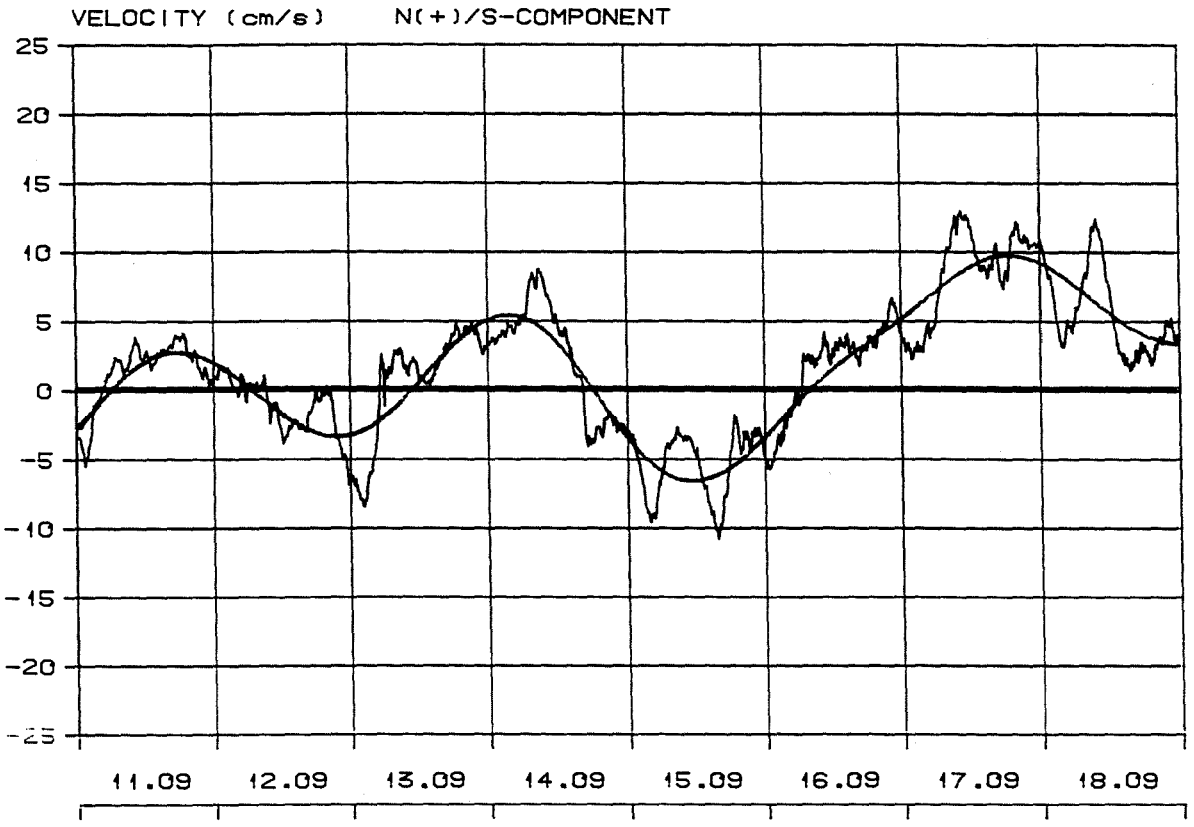
Time interval : 10.00 minutes.

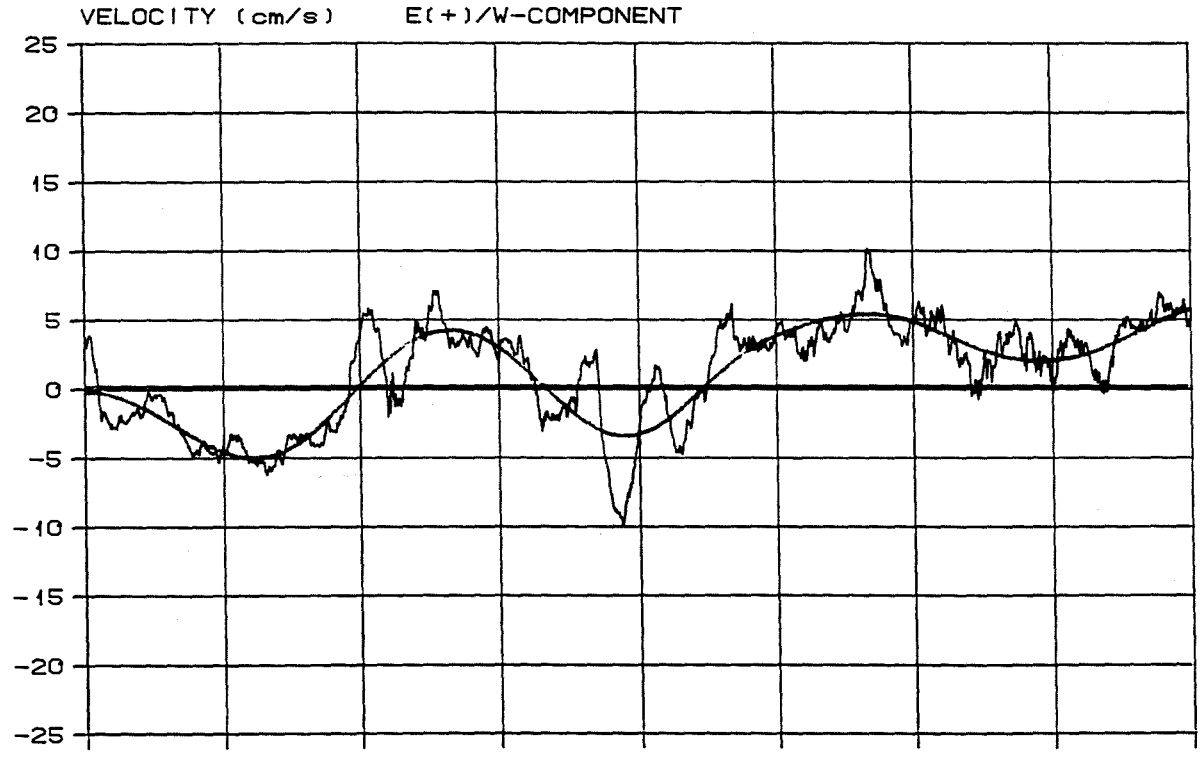
Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

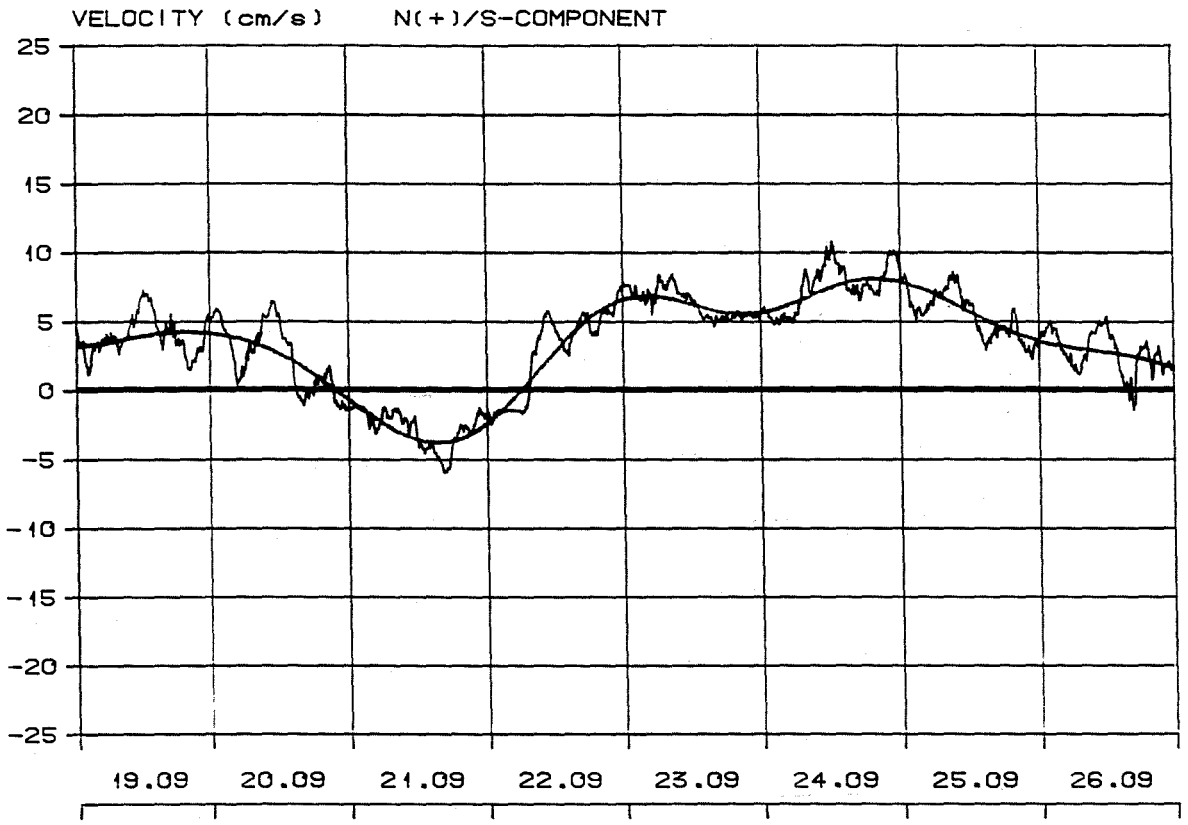
Time interval : 10.00 minutes.

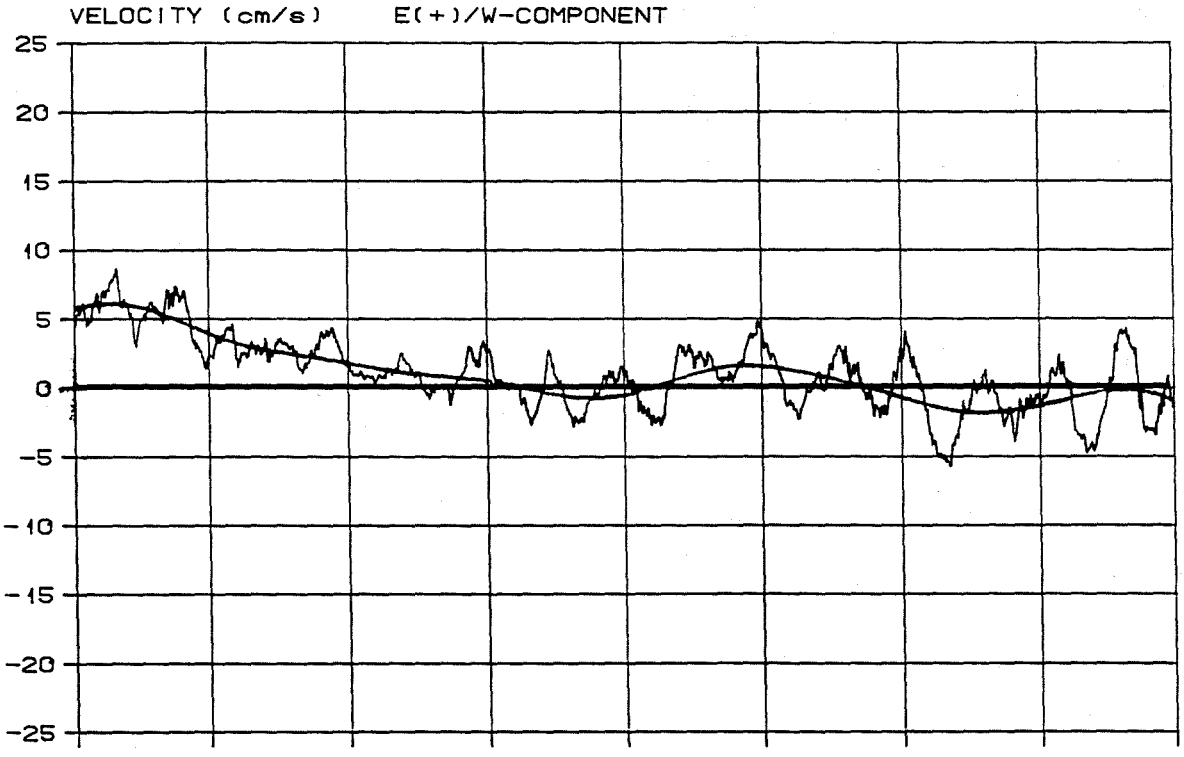
Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

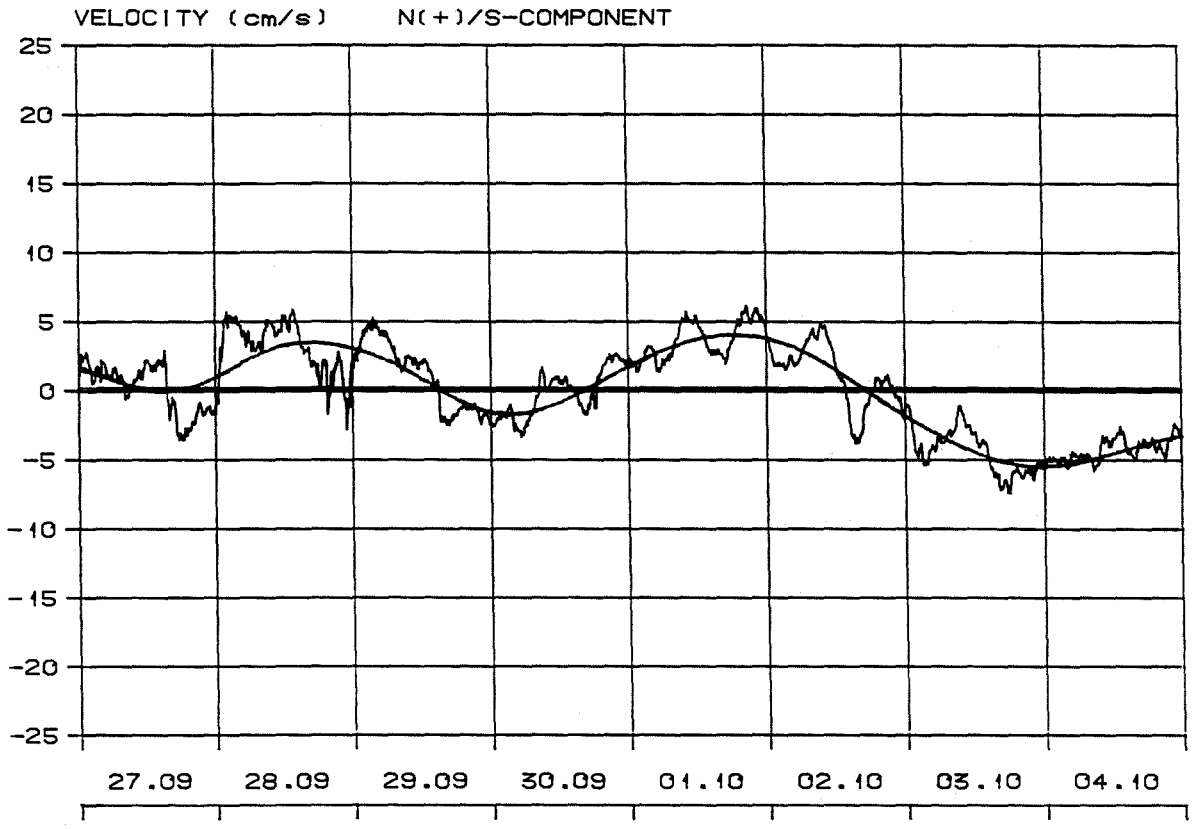
Time interval : 10.00 minutes.

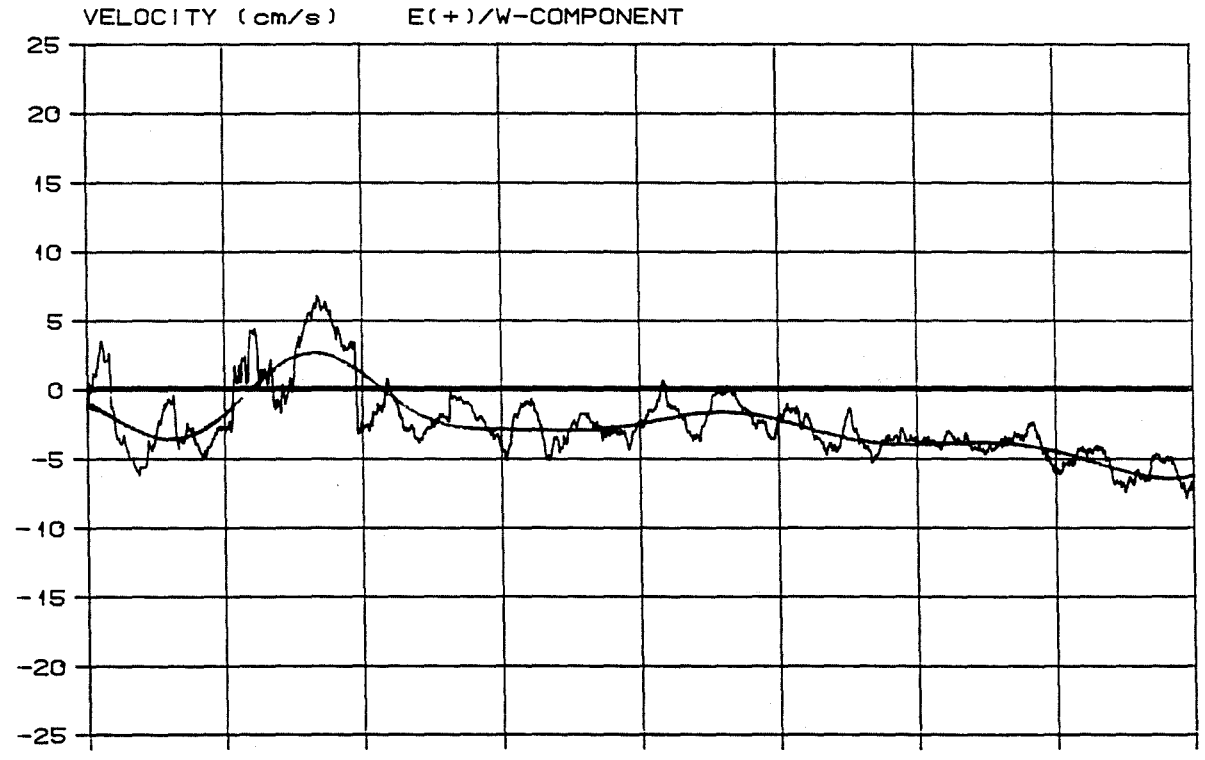
Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

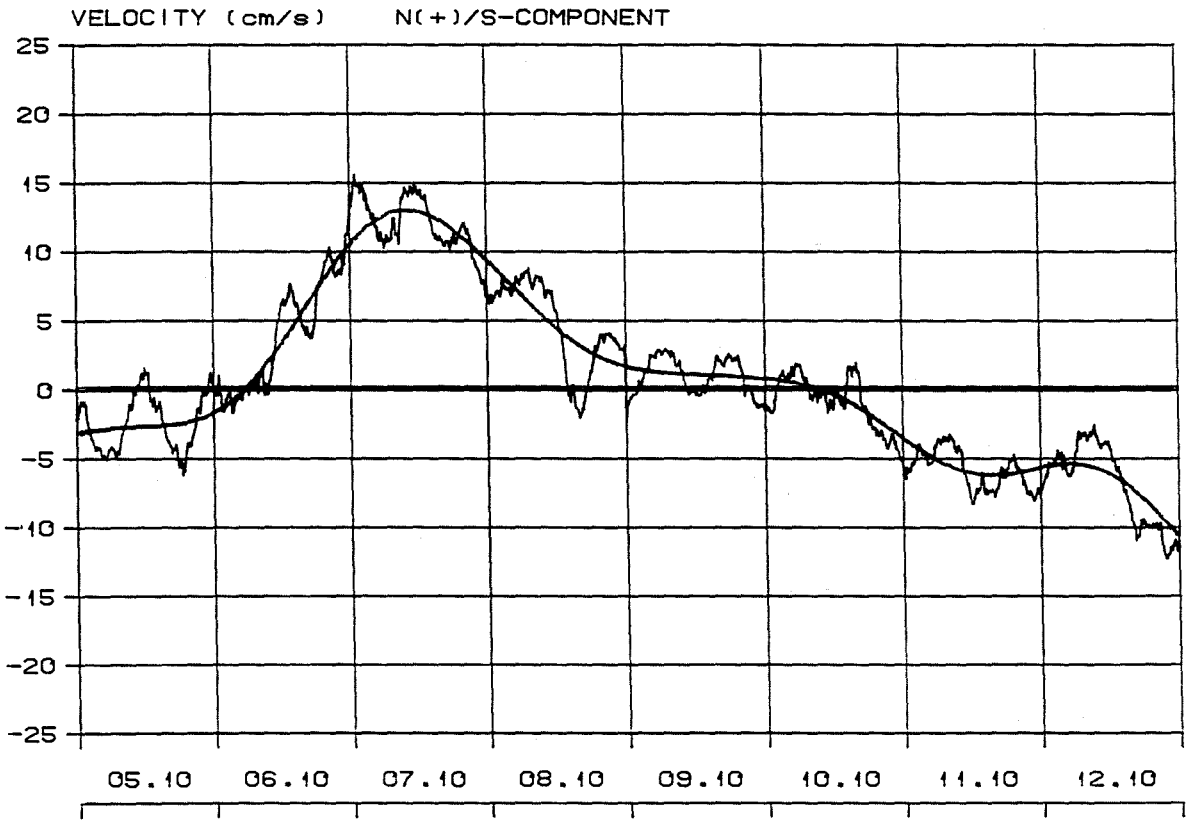
Time interval : 10.00 minutes.

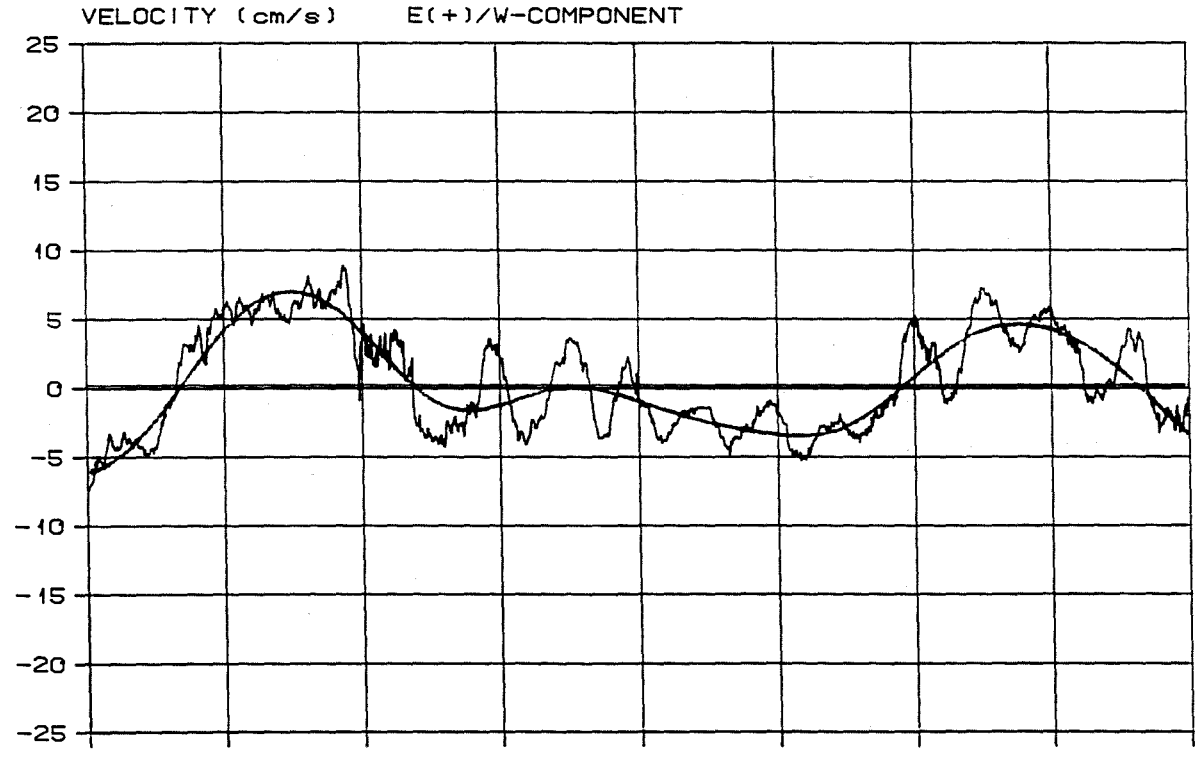
Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

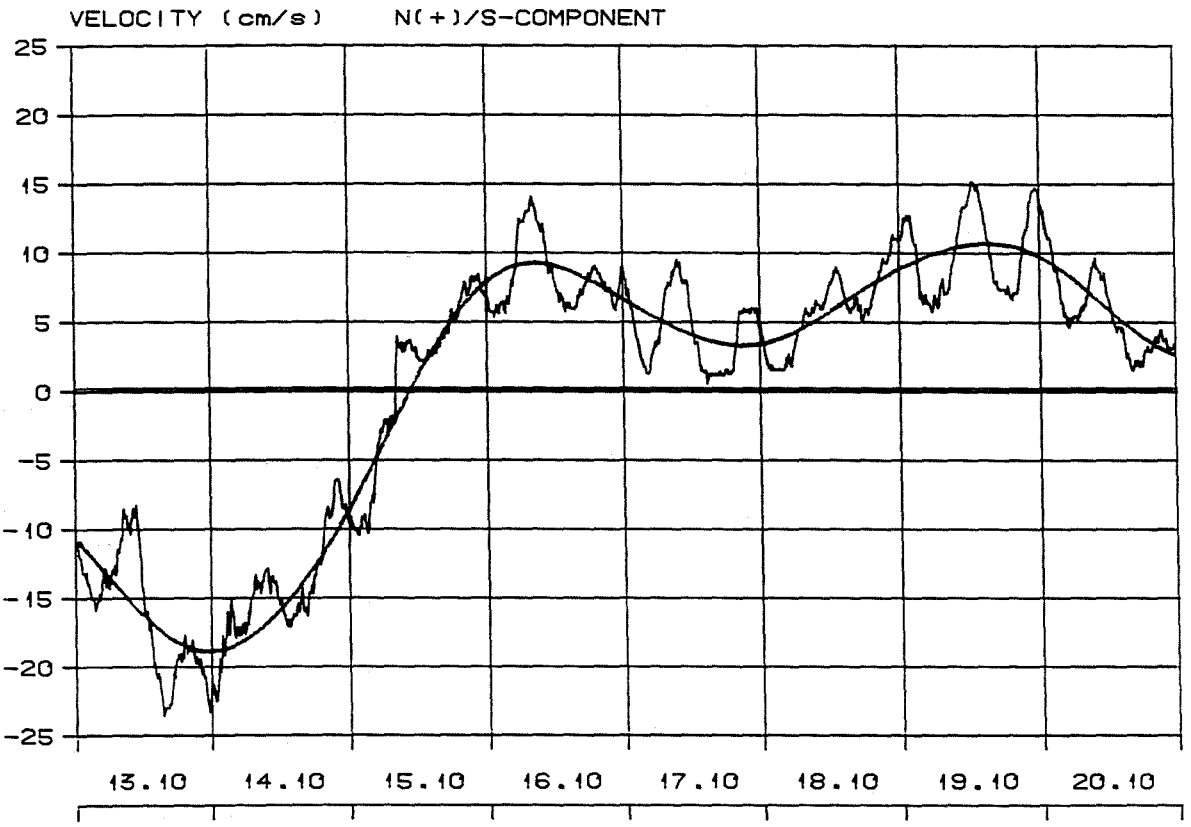
Time interval : 10.00 minutes.

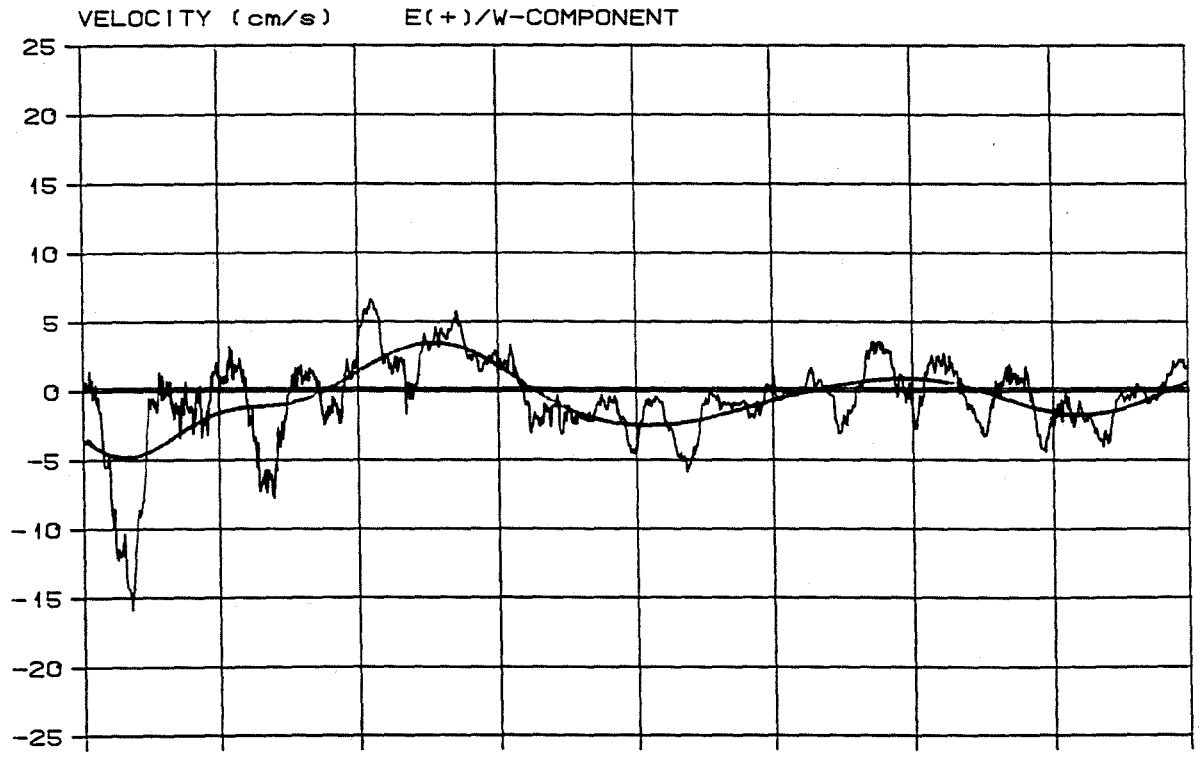
Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

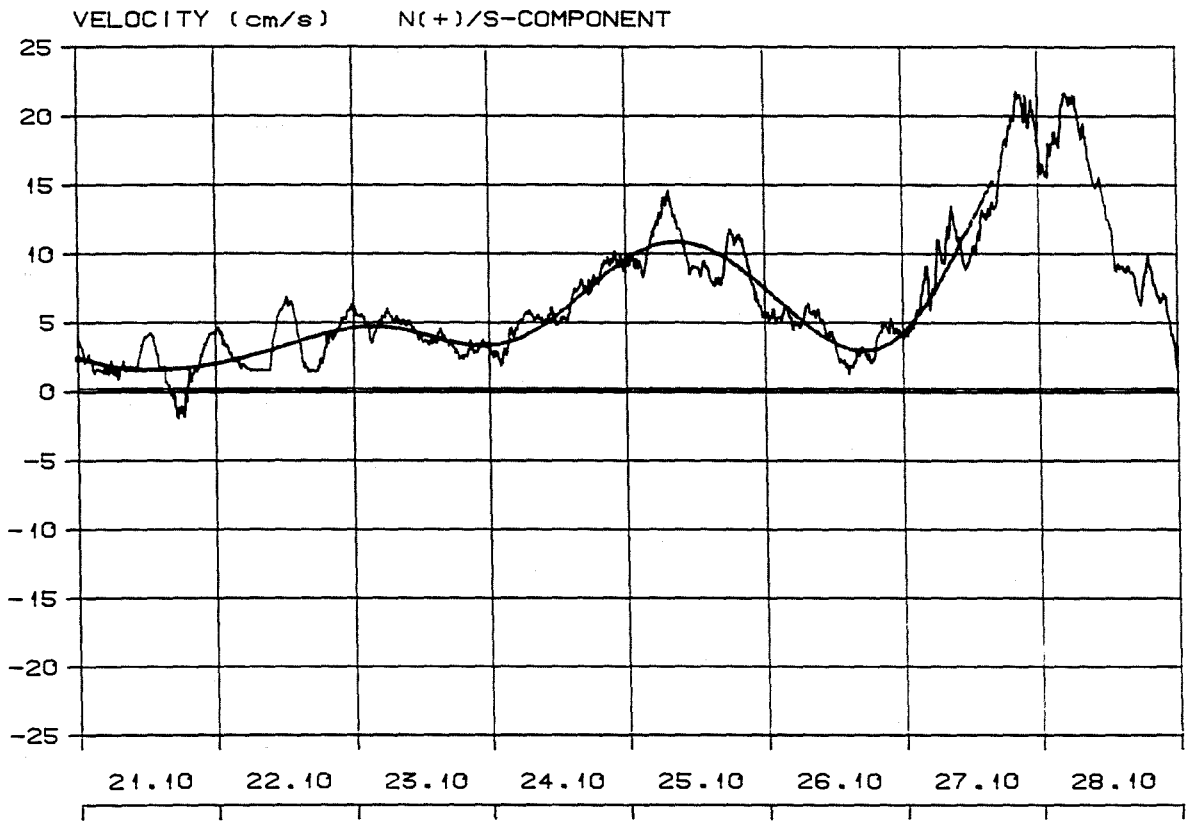
Instrument depth : 275.0 m Bottom depth : 285.0 m

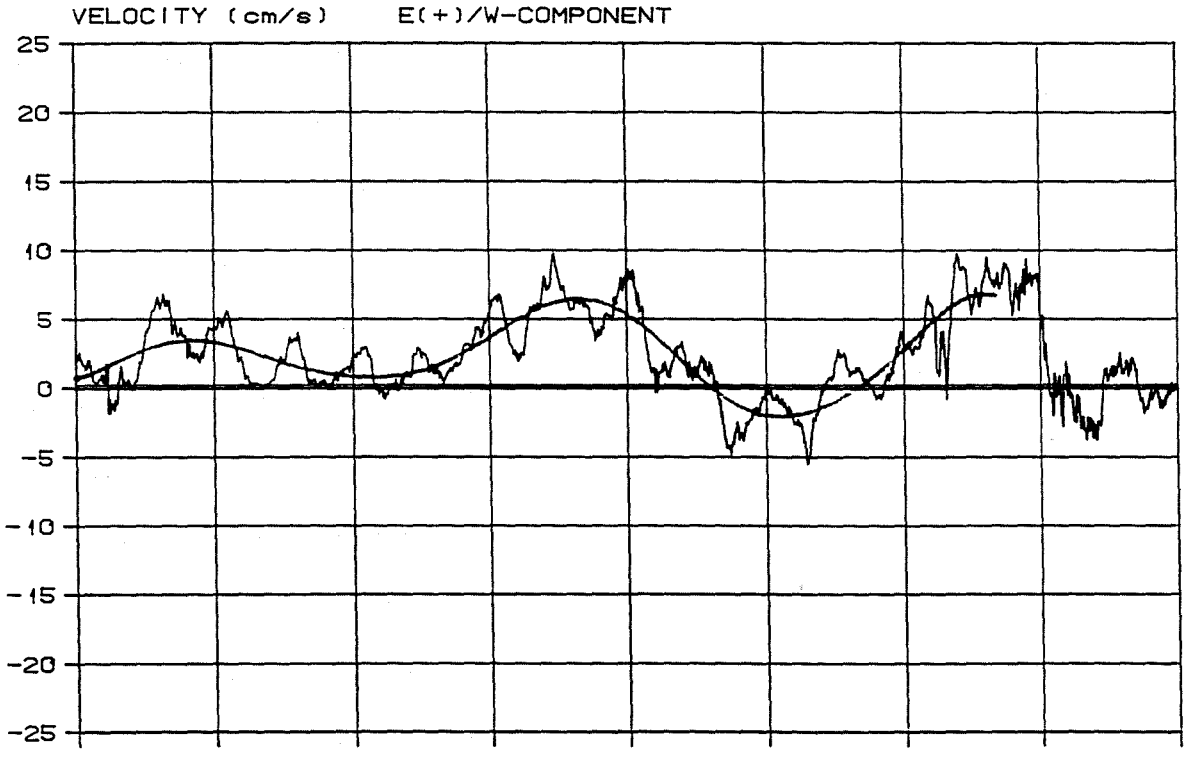
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

Fig. 3-4-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

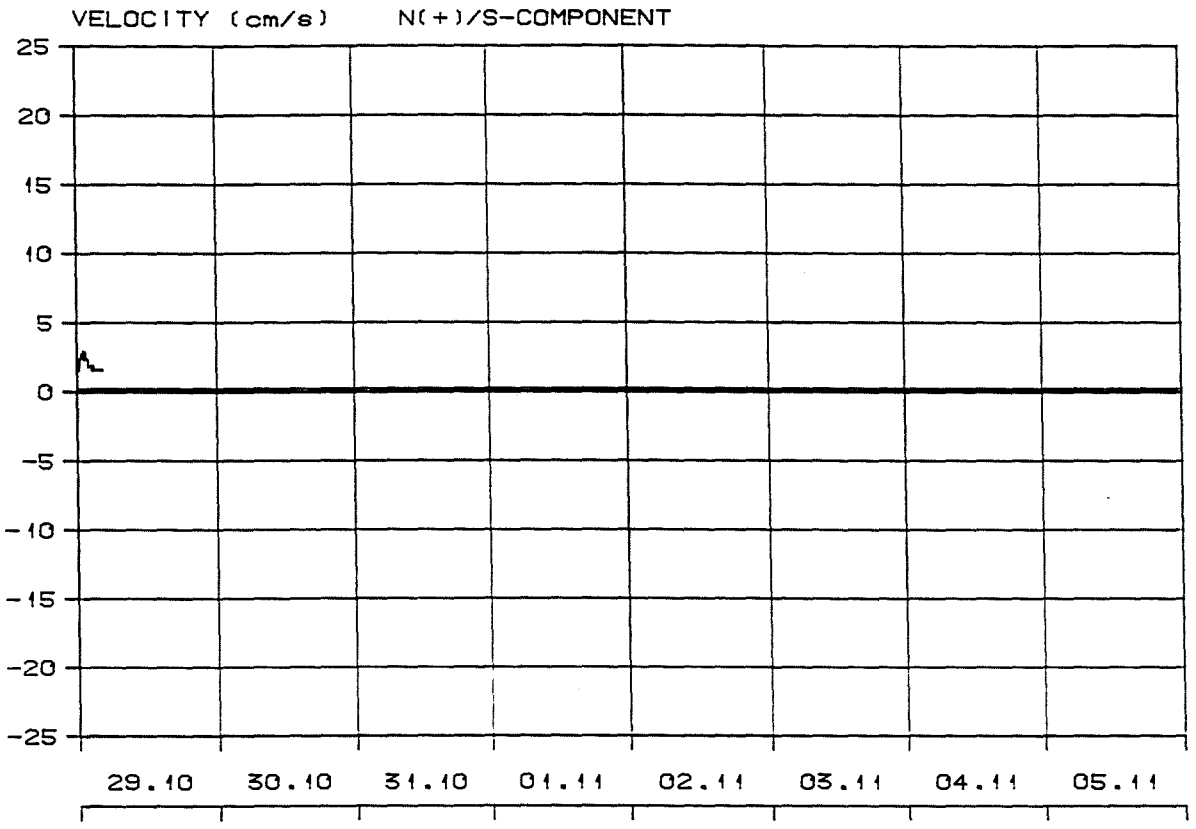
Time interval : 10.00 minutes.

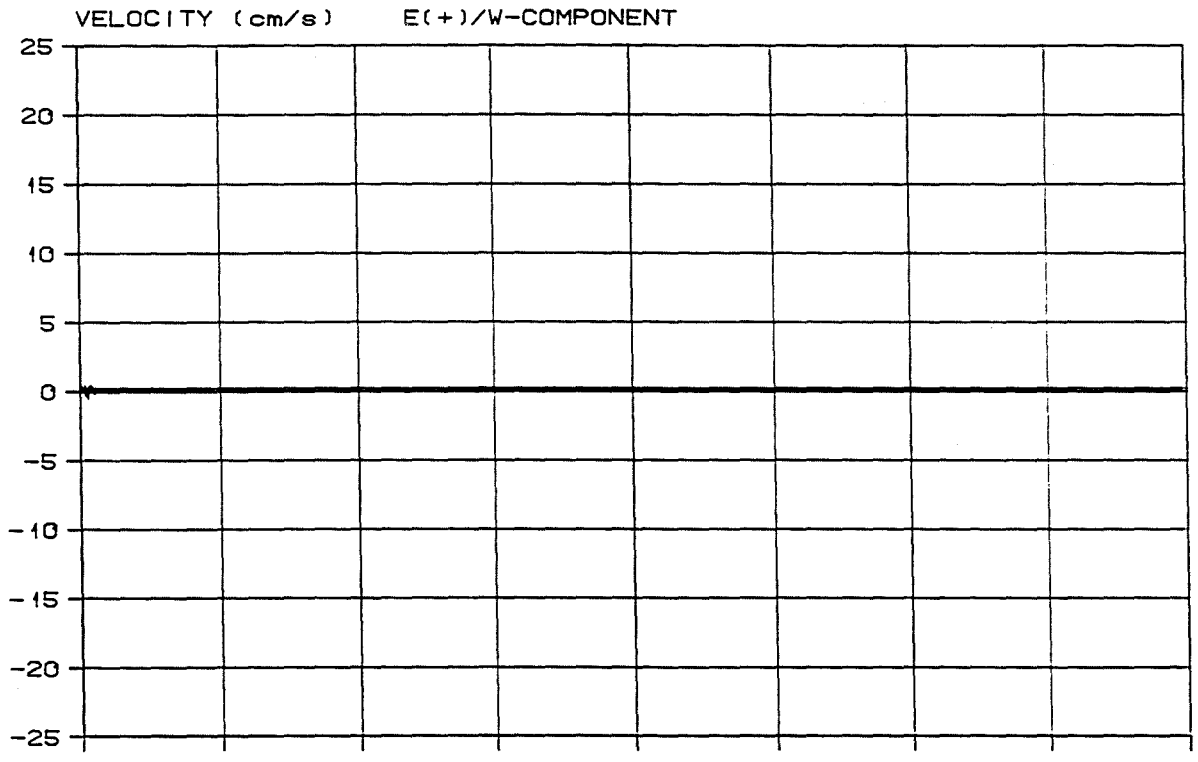
Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

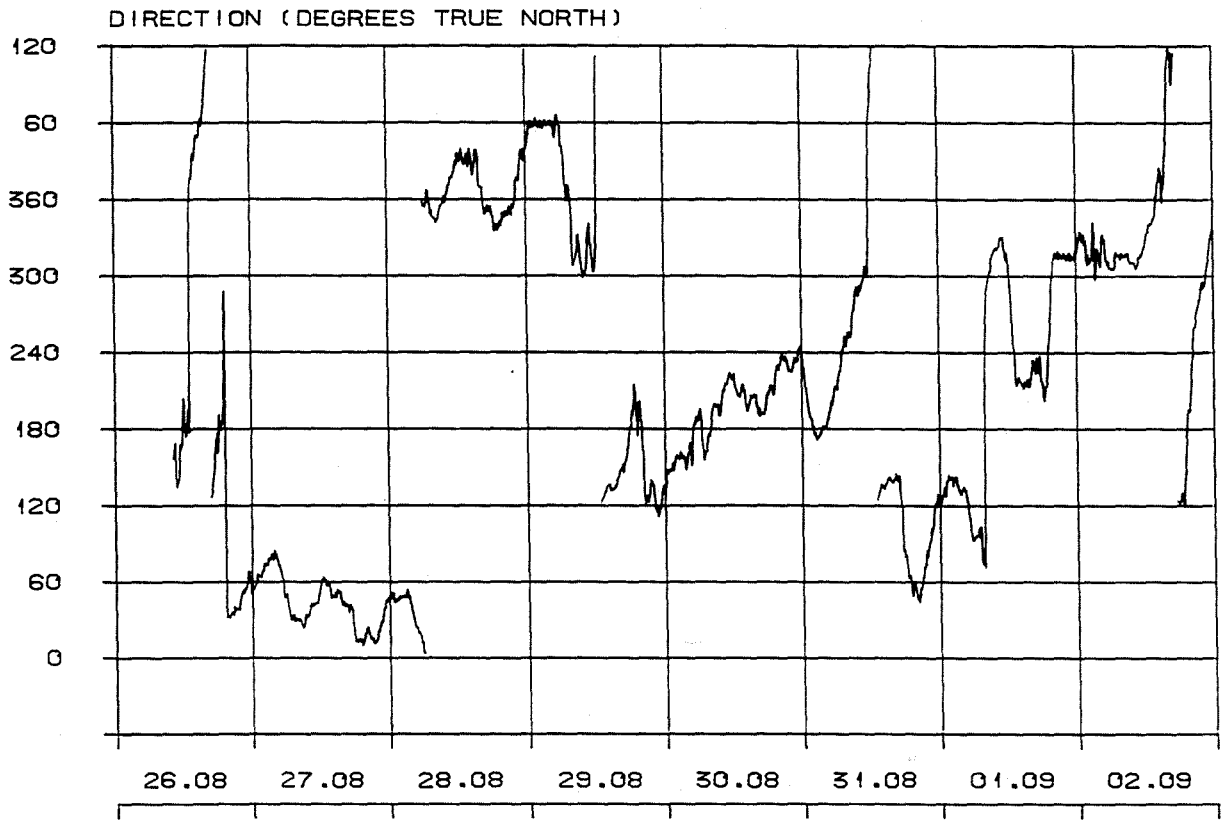
Time interval : 10.00 minutes.

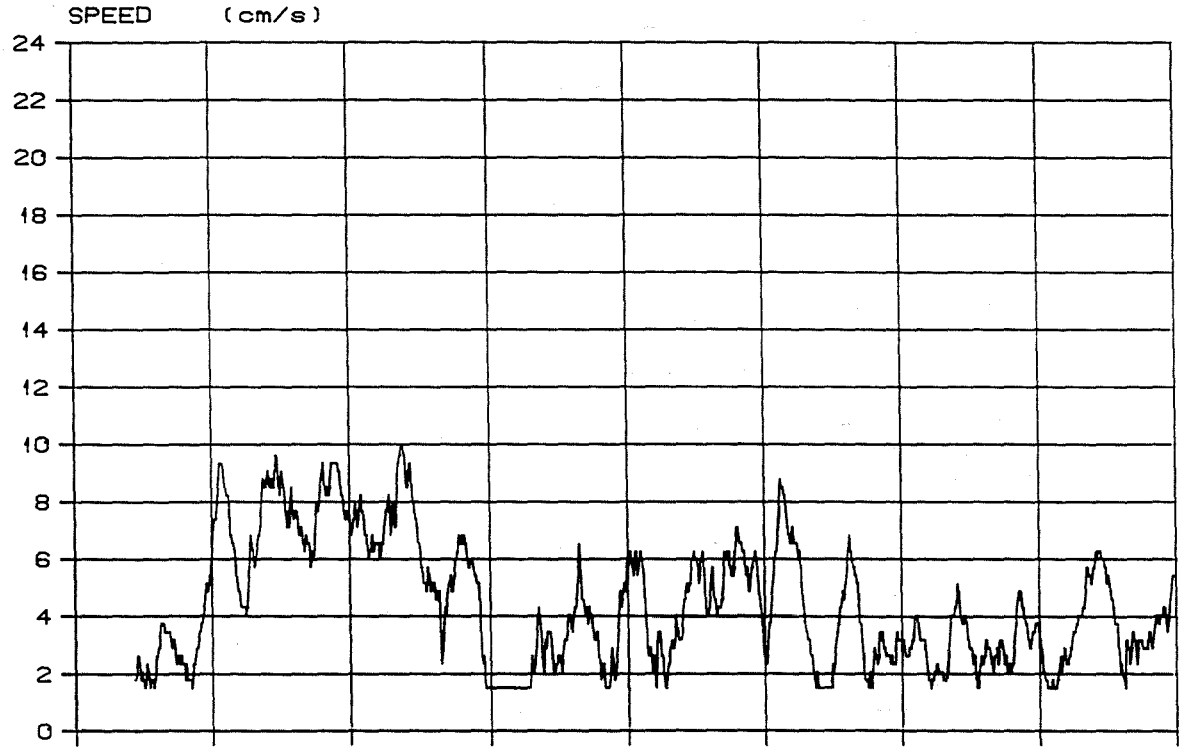
Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-6

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

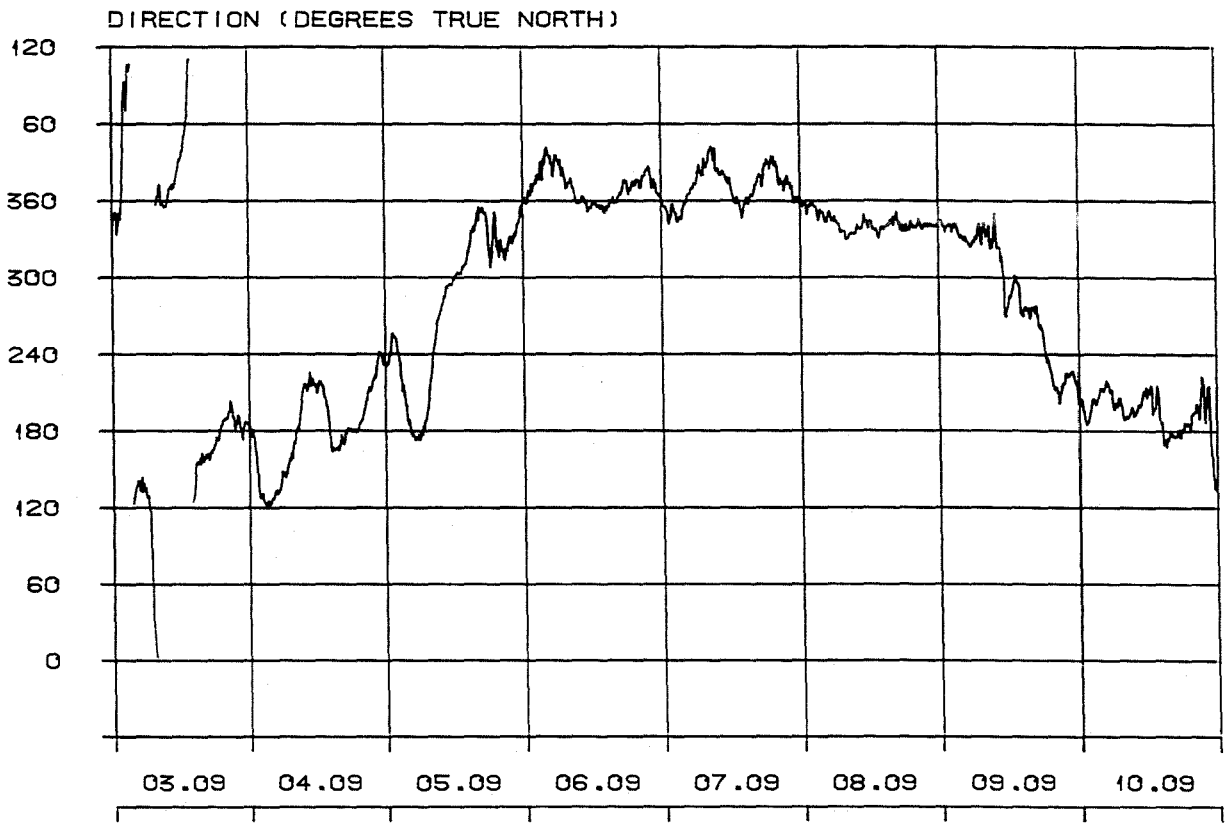
Instrument depth : 275.0 m Bottom depth : 285.0 m

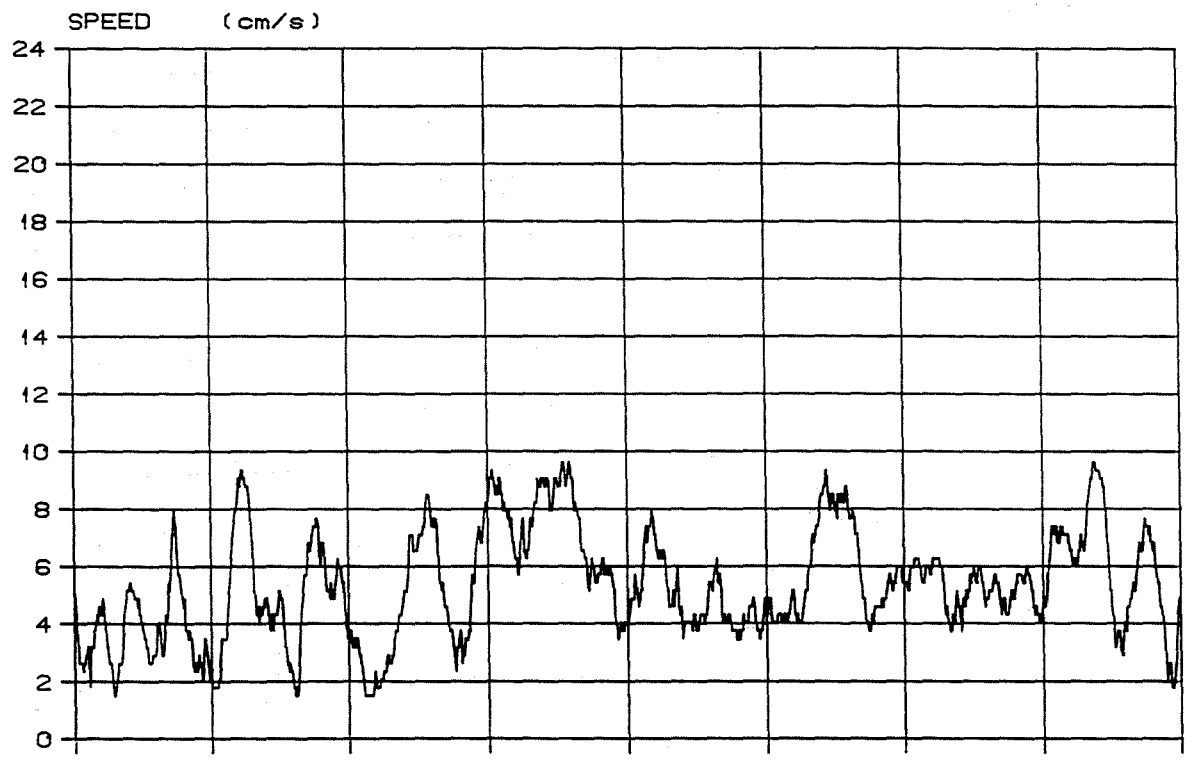
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H I

Fig. 3-4-7 Speed and direction of current.





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

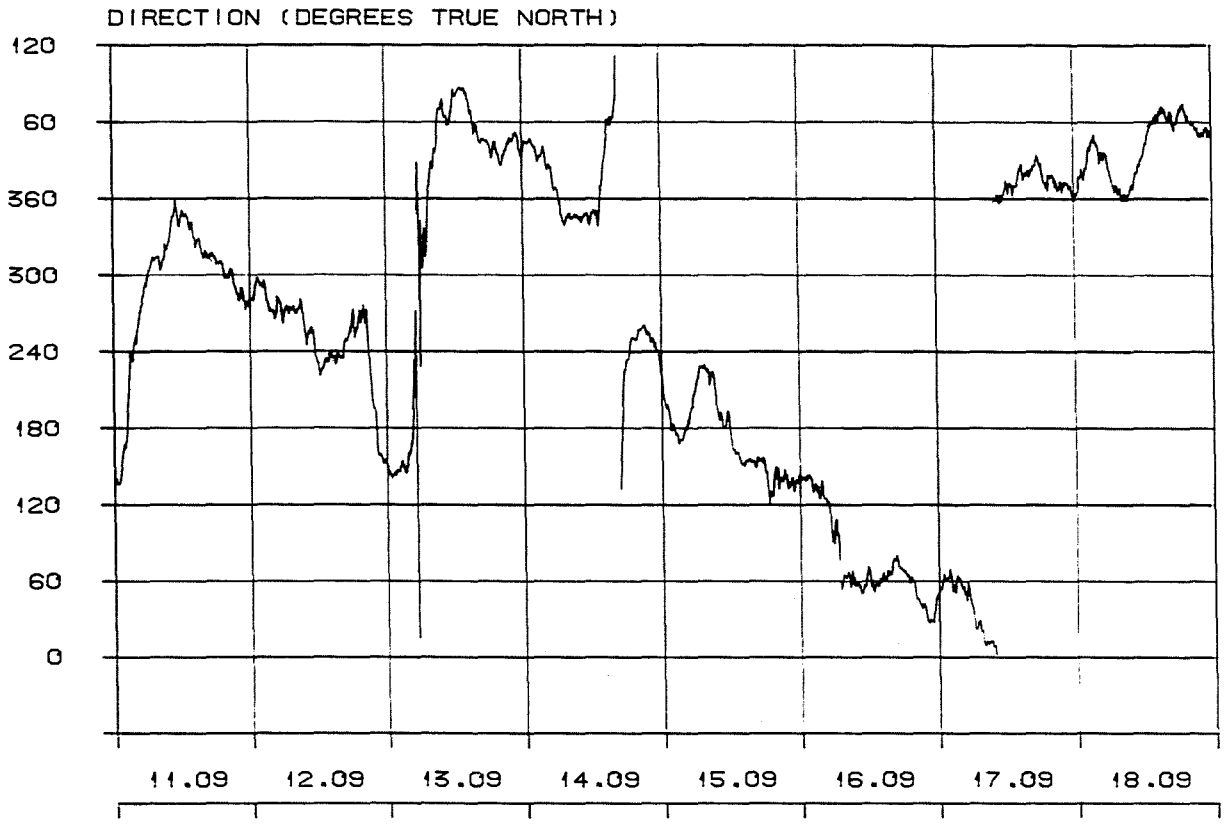
Time interval : 10.00 minutes.

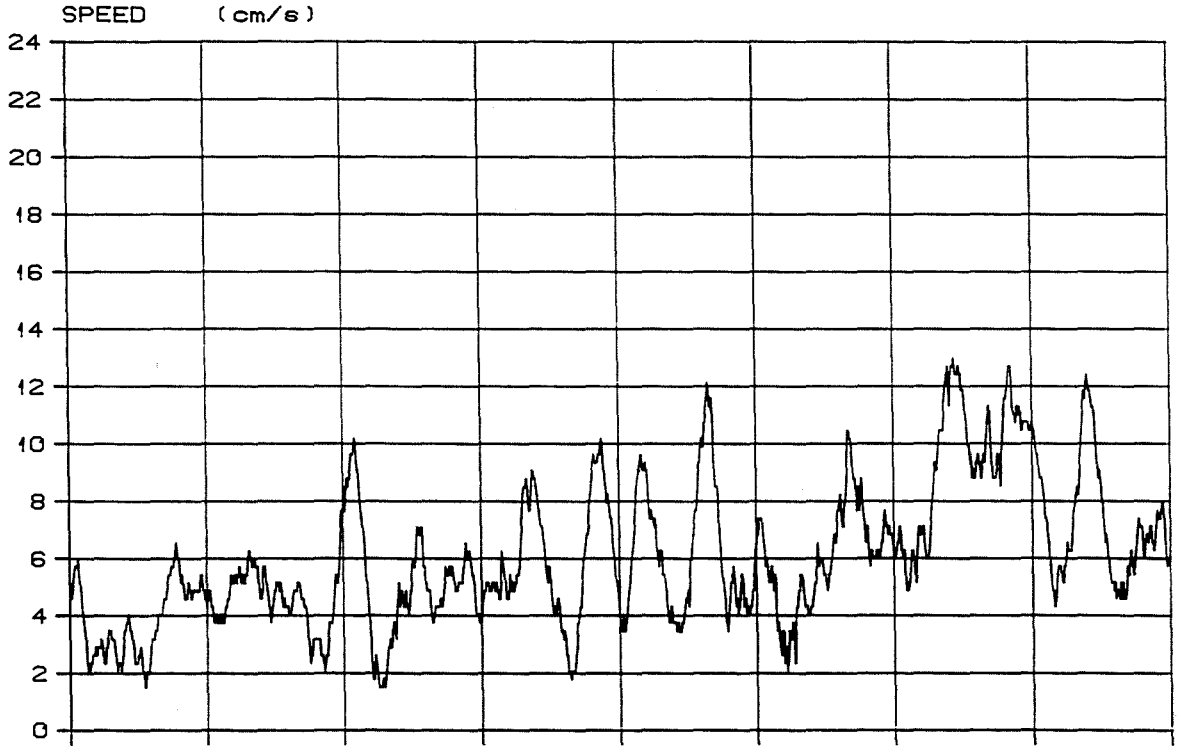
Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H I

Fig. 3-4-7

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

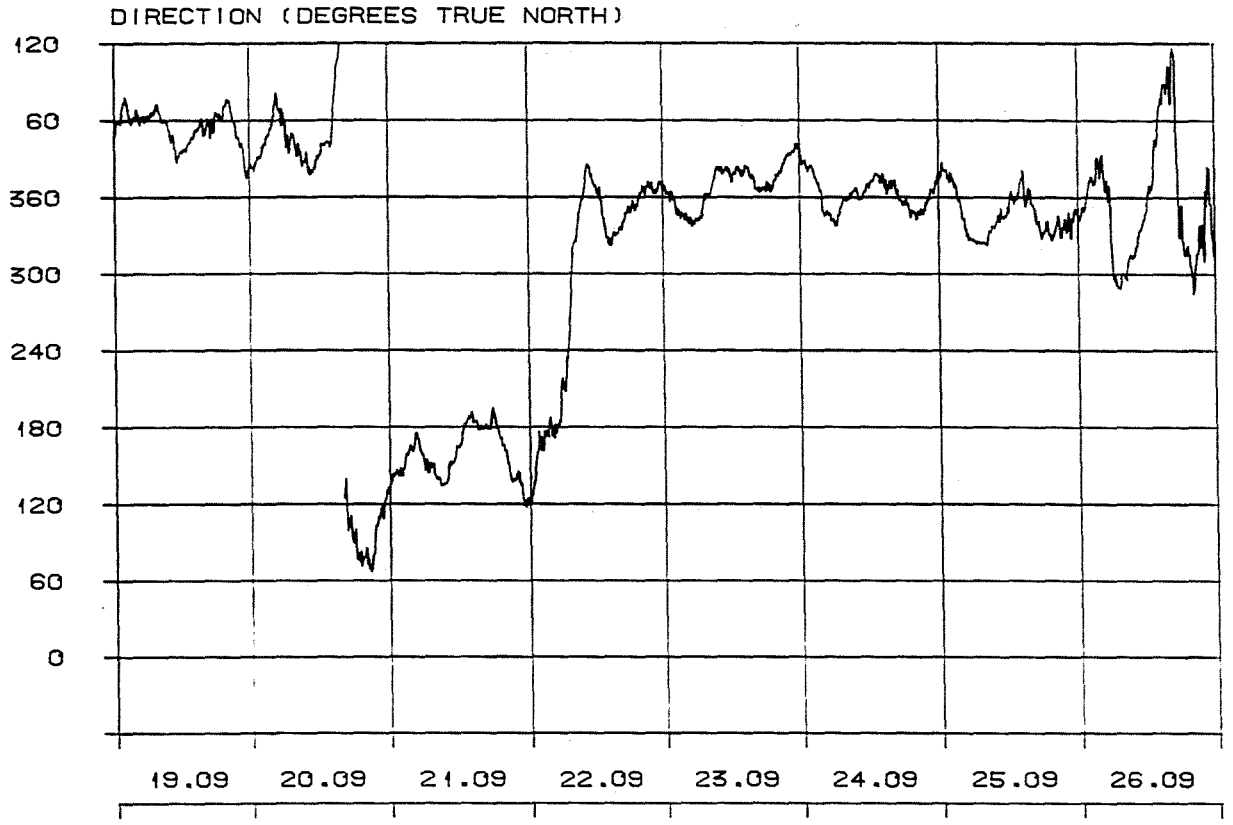
Time interval : 10.00 minutes.

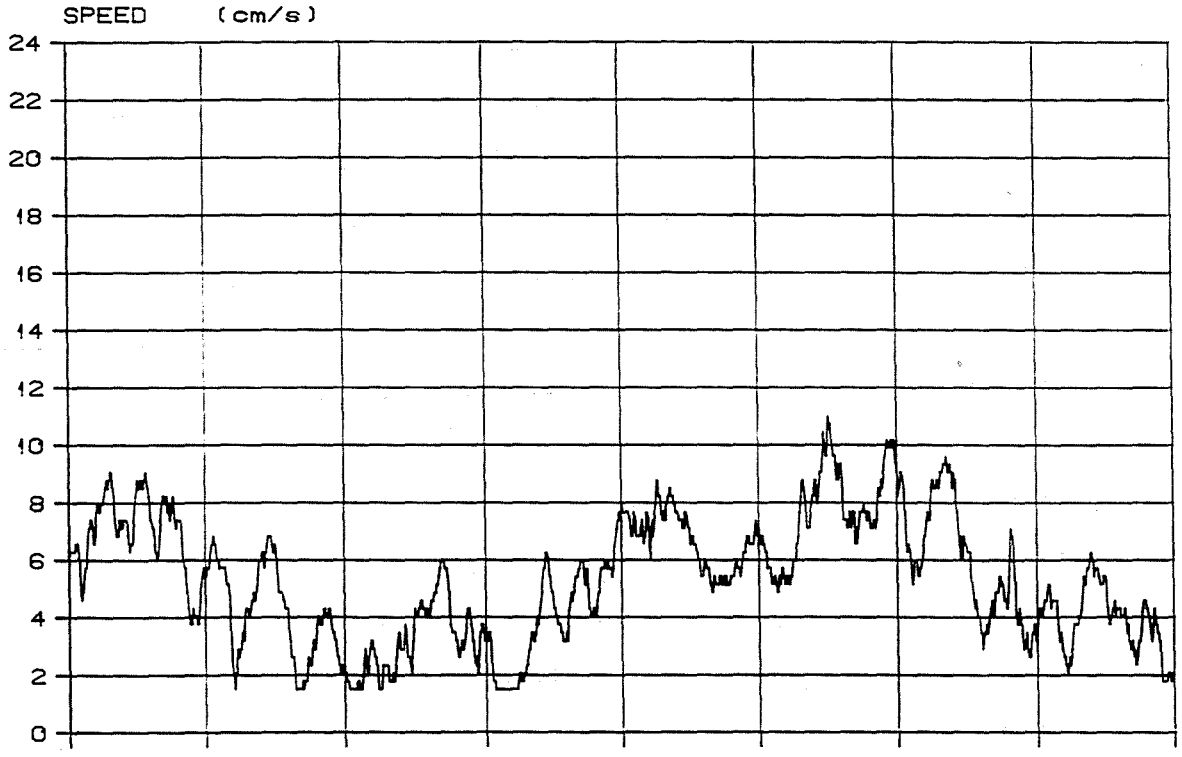
Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-7

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

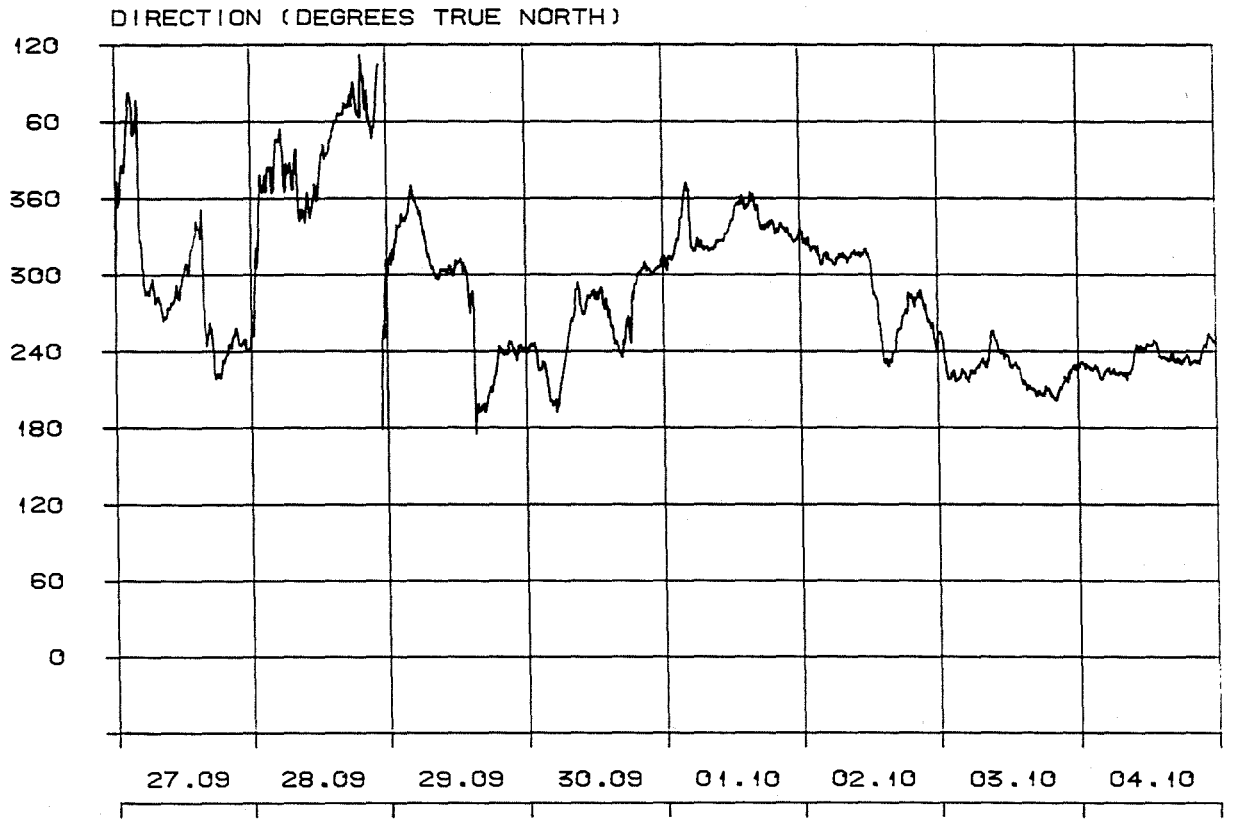
Instrument depth : 275.0 m Bottom depth : 285.0 m

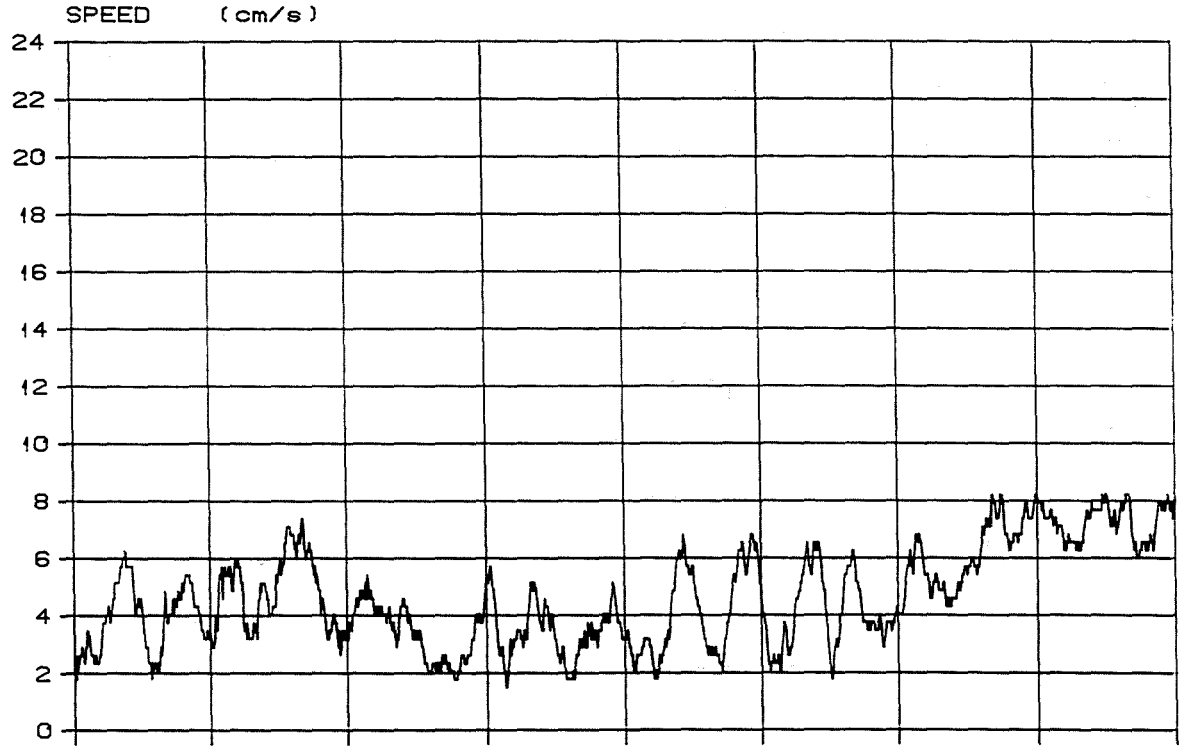
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

Fig. 3-4-7

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

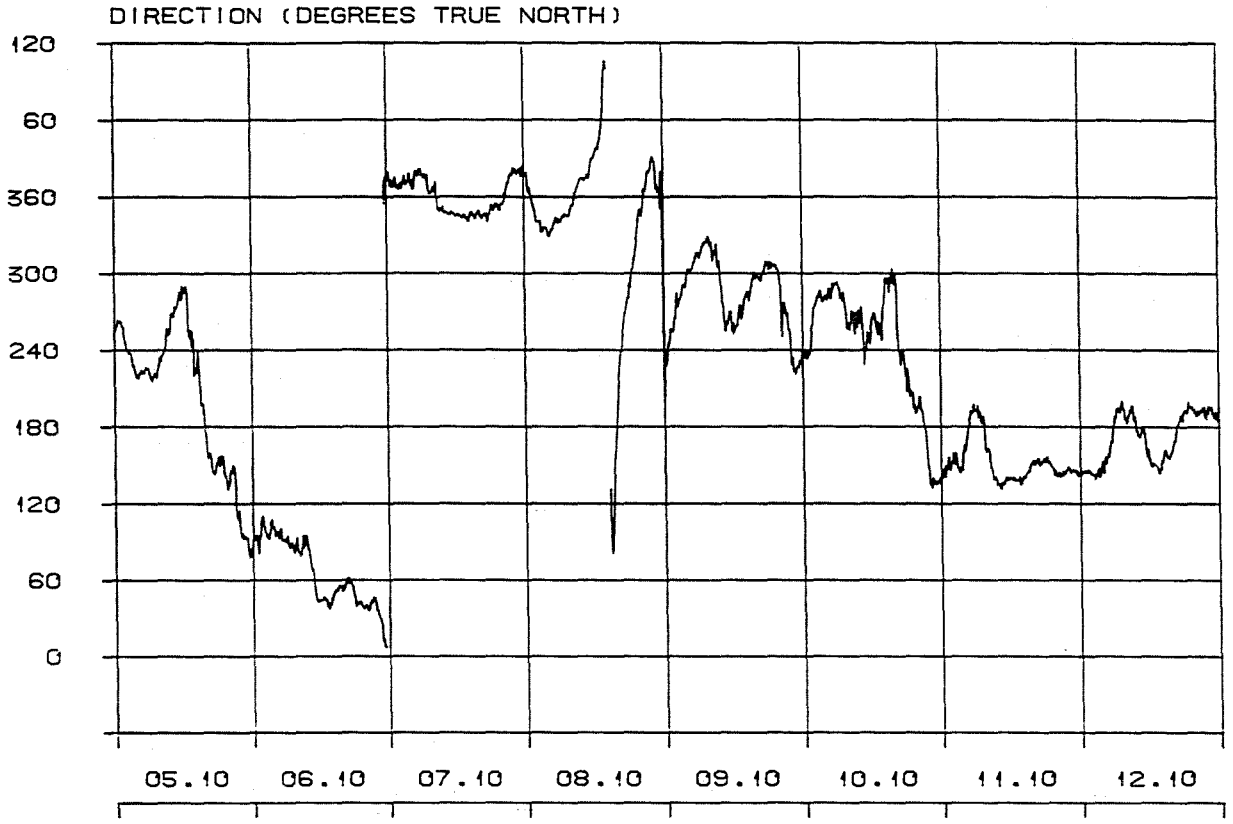
Time interval : 10.00 minutes.

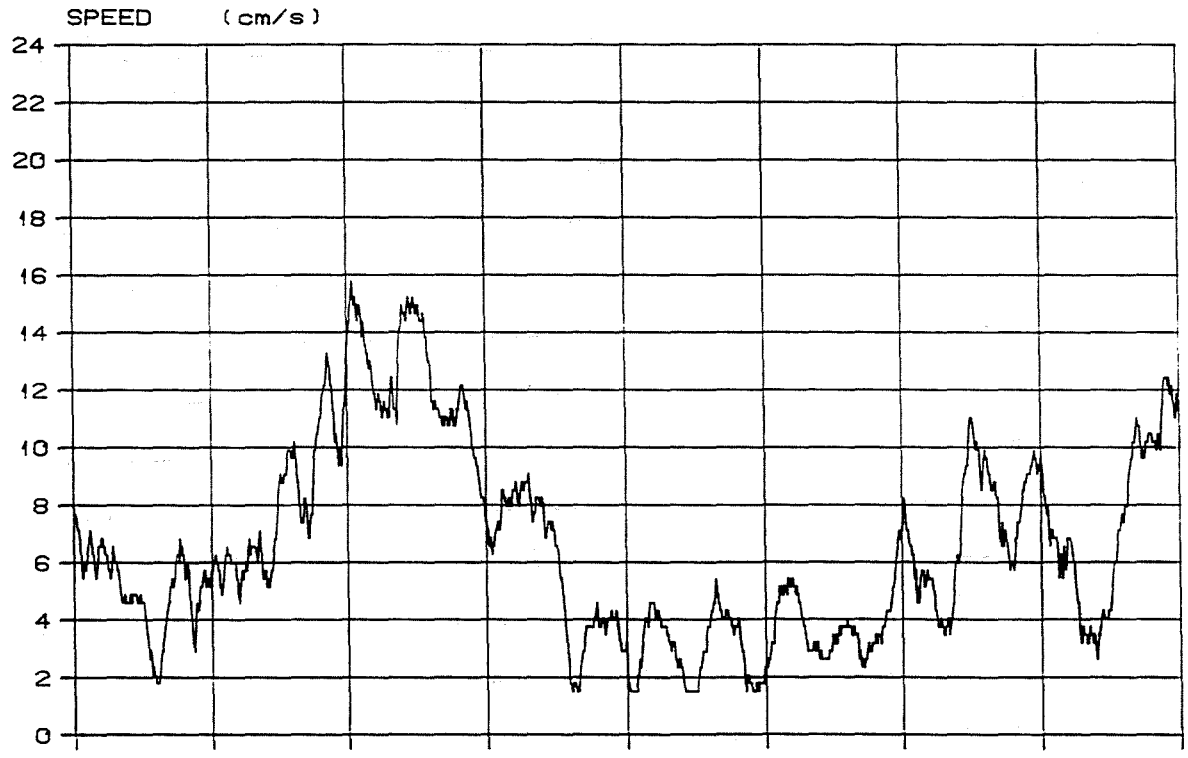
Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H I

Fig. 3-4-7

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

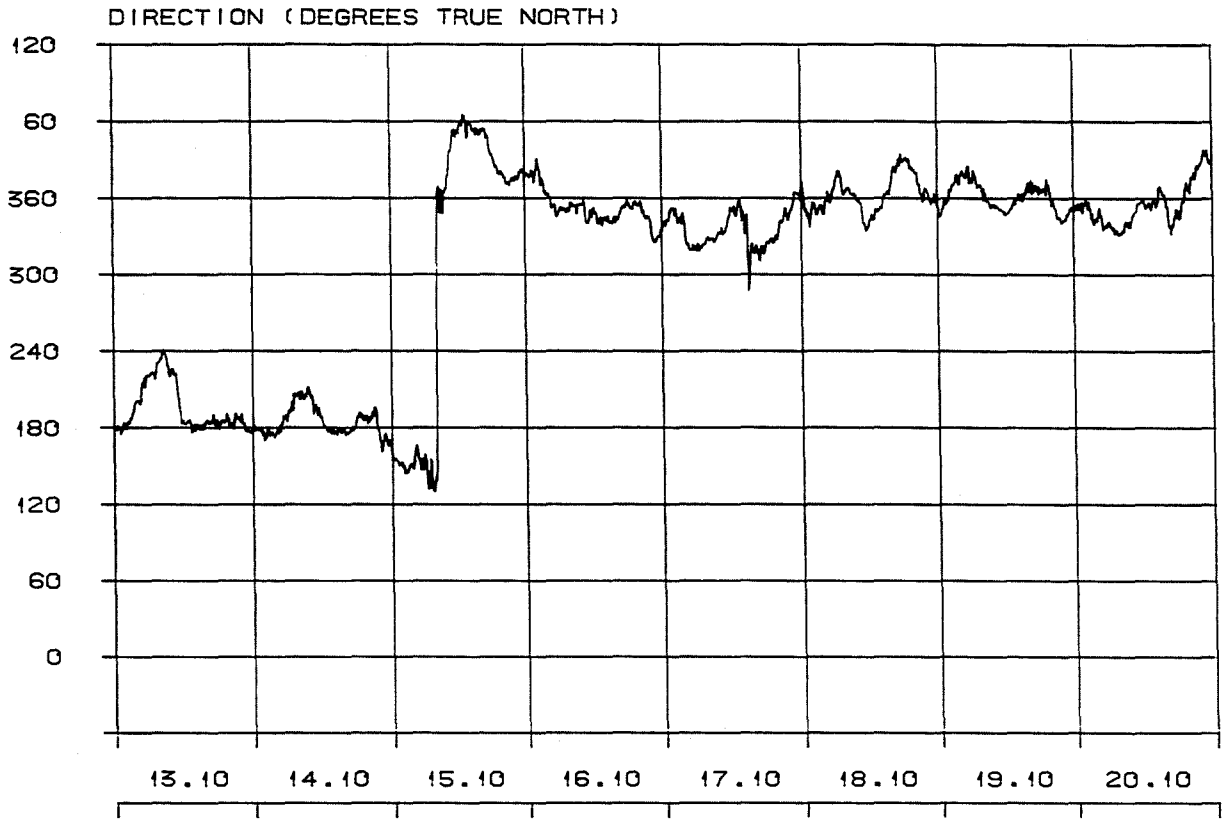
Time interval : 10.00 minutes.

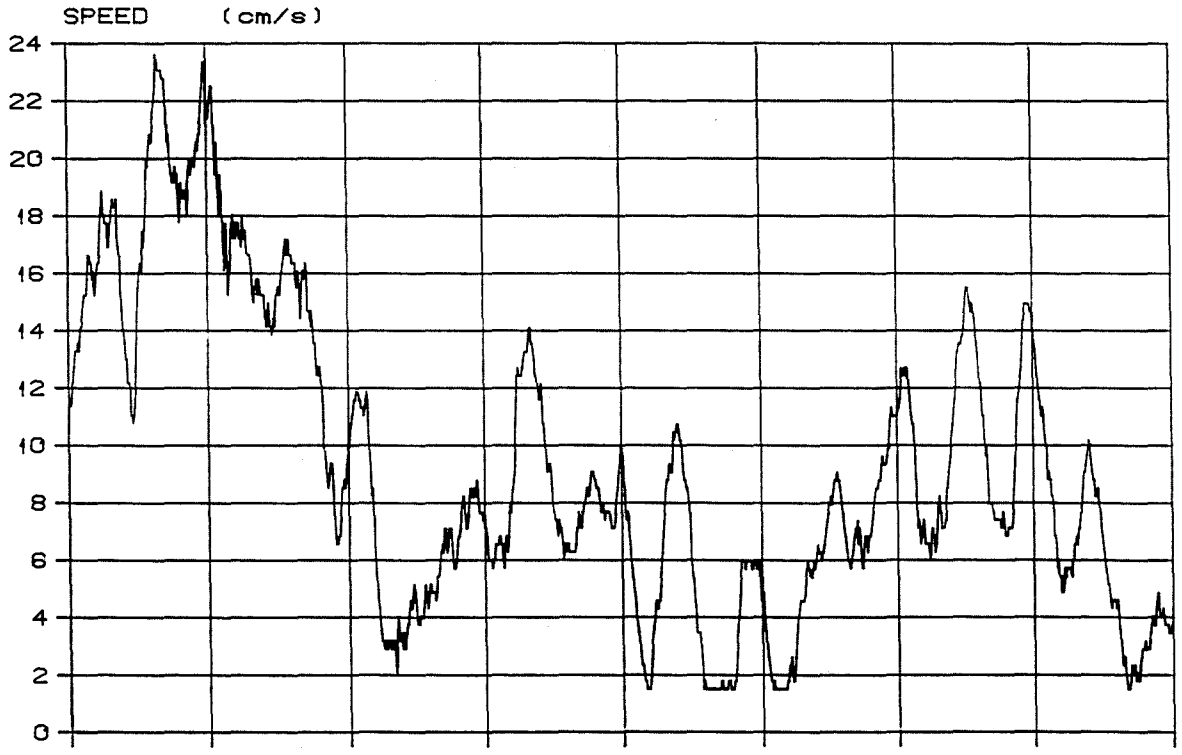
Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-7

Continues.....





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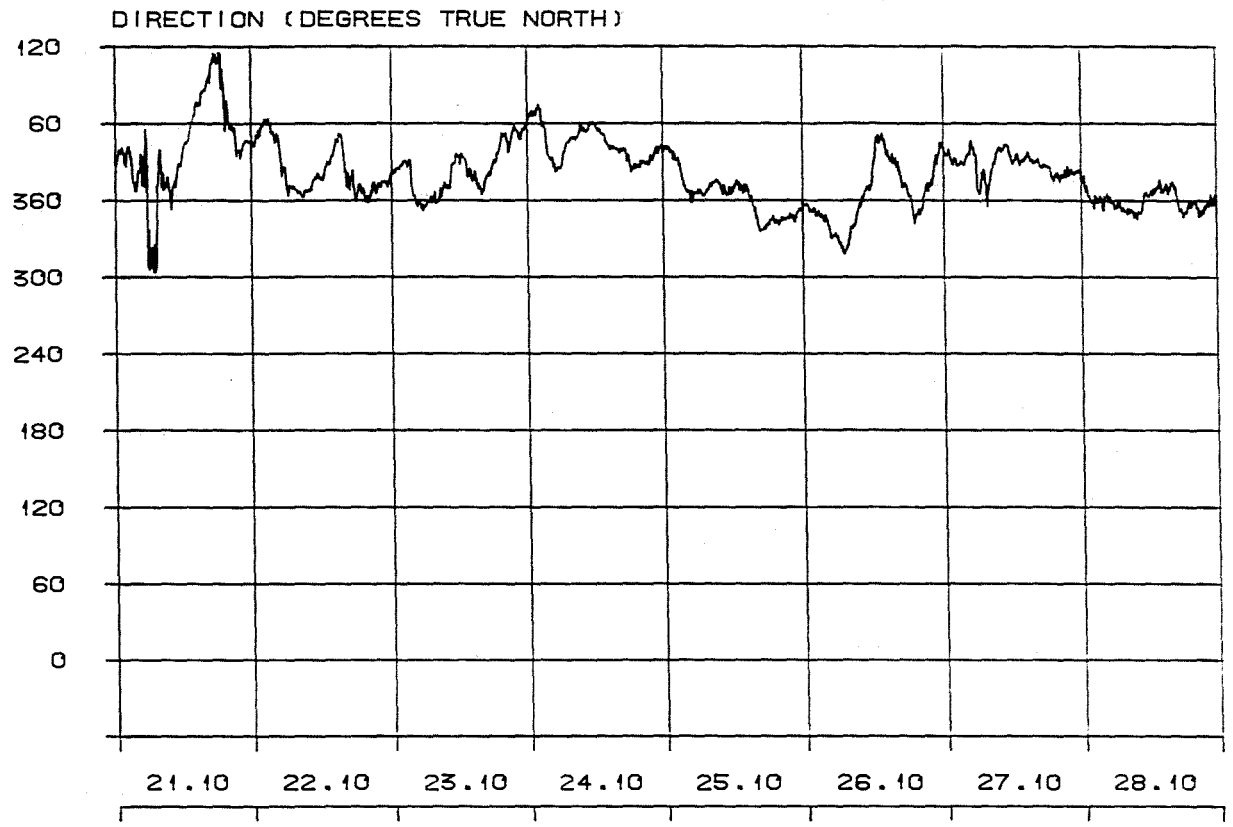
Time interval : 10.00 minutes.

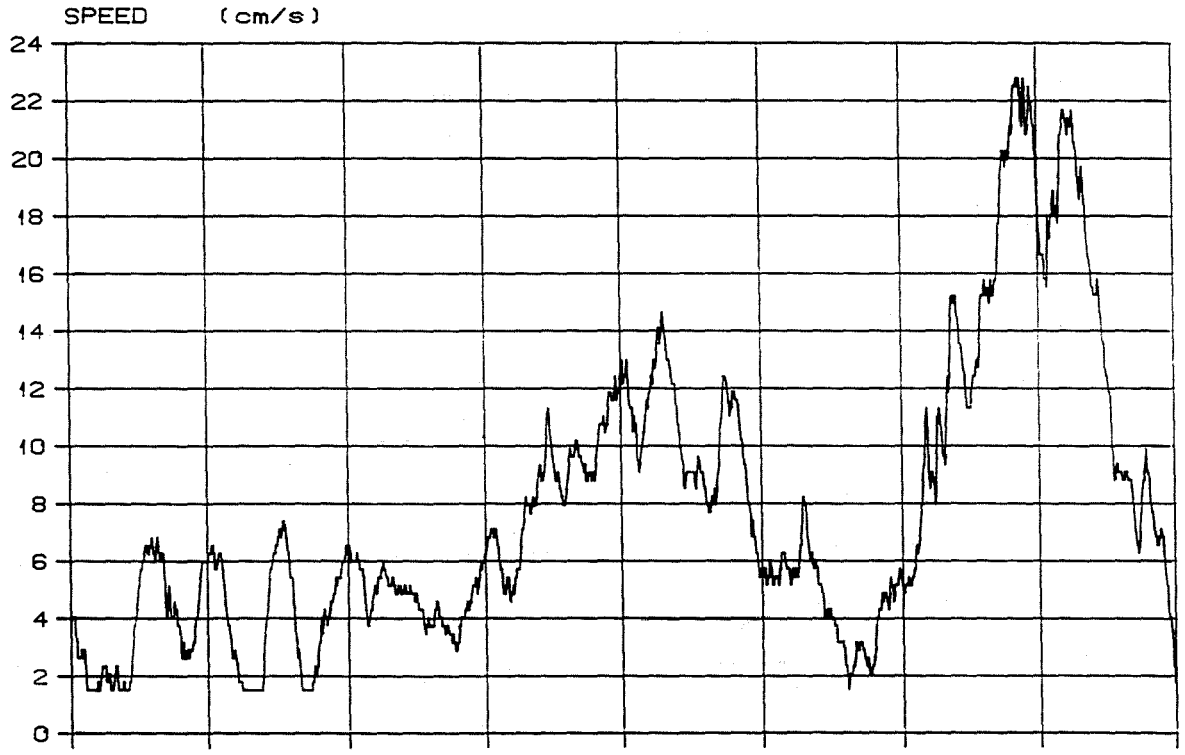
Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-7

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

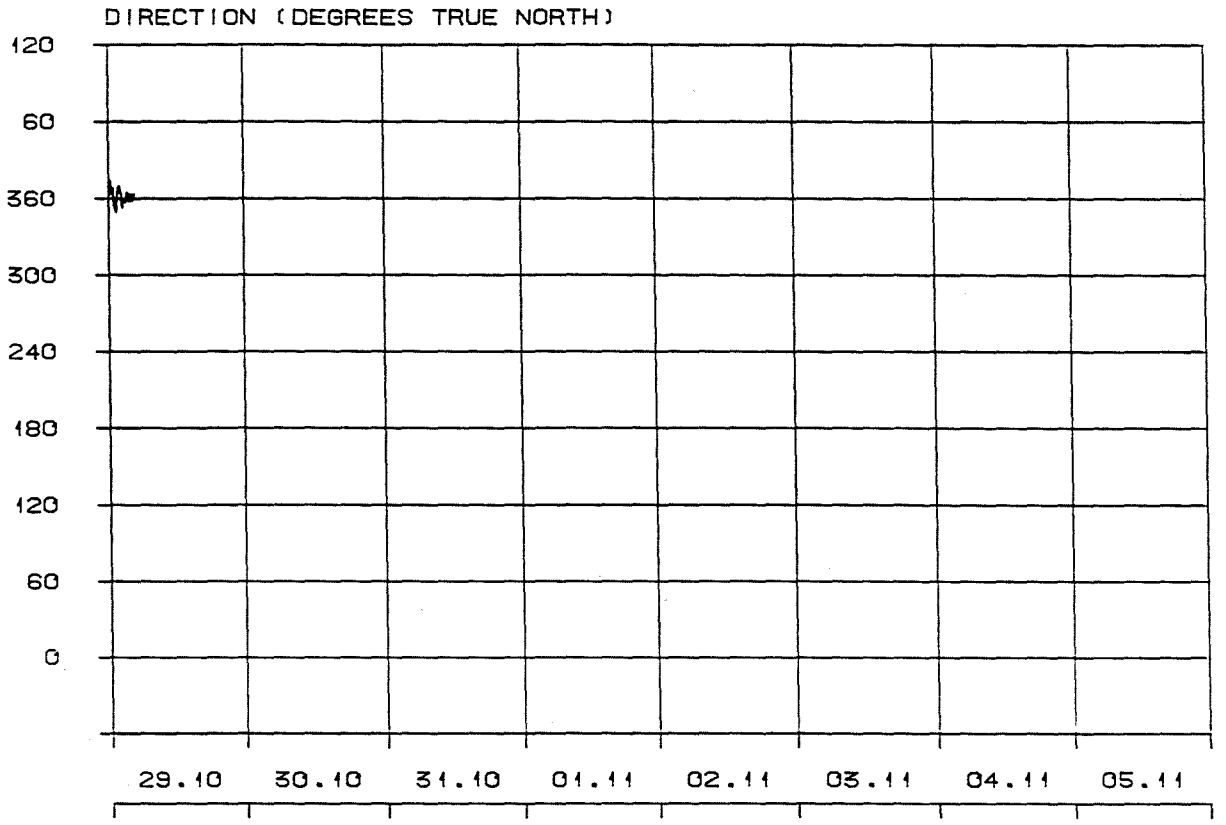
Time interval : 10.00 minutes.

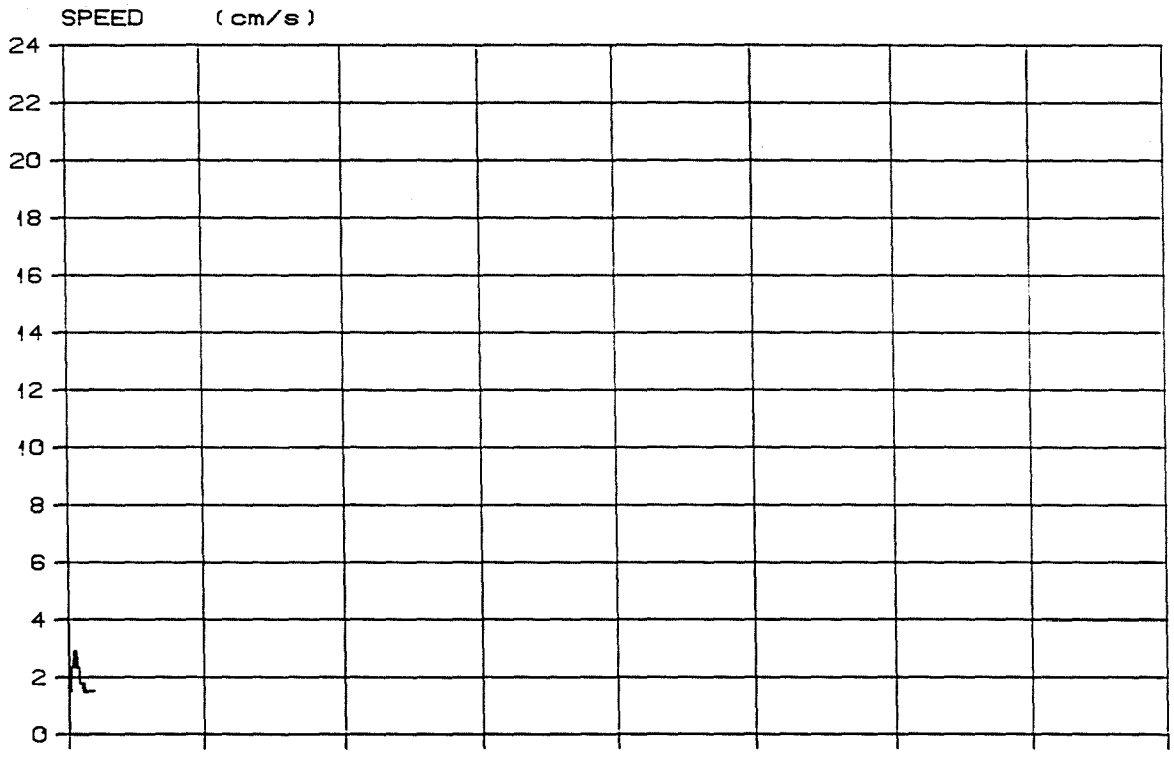
Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1.

Fig. 3-4-7

Continues.....





The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

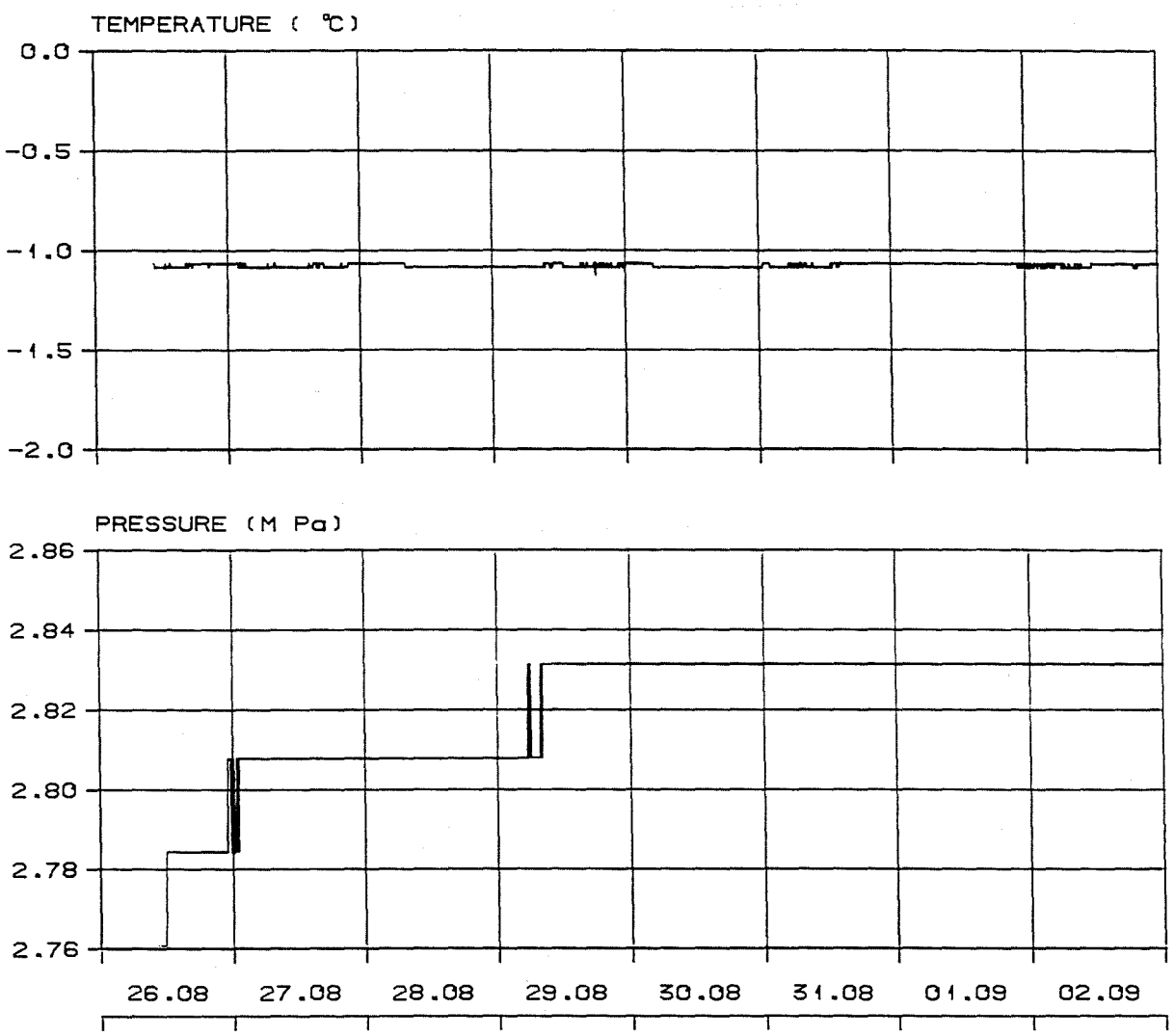
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-7

Continues.....



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

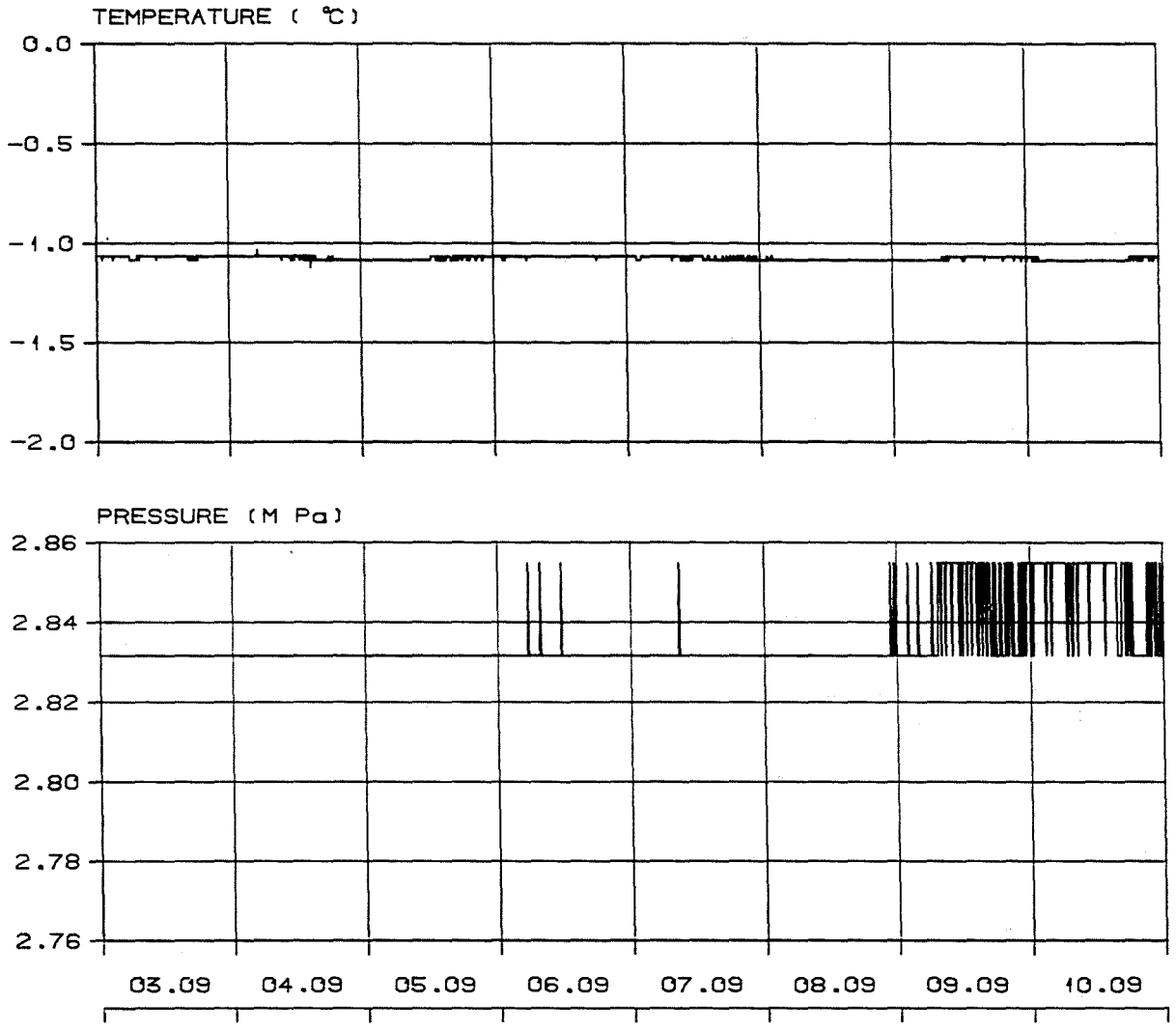
Instrument depth : 275.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-8 Temperature and pressure.



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

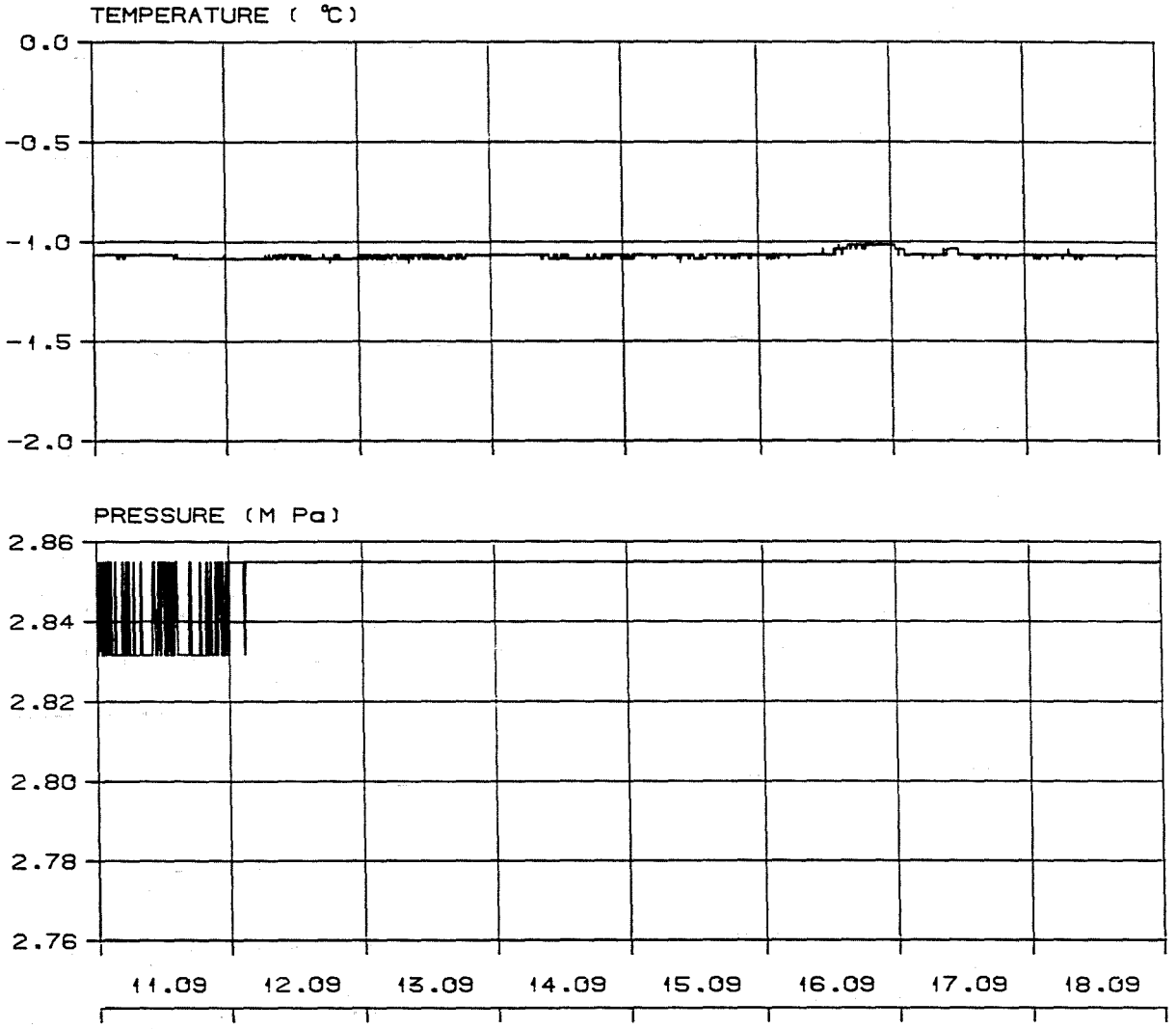
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-8

Continues.....



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

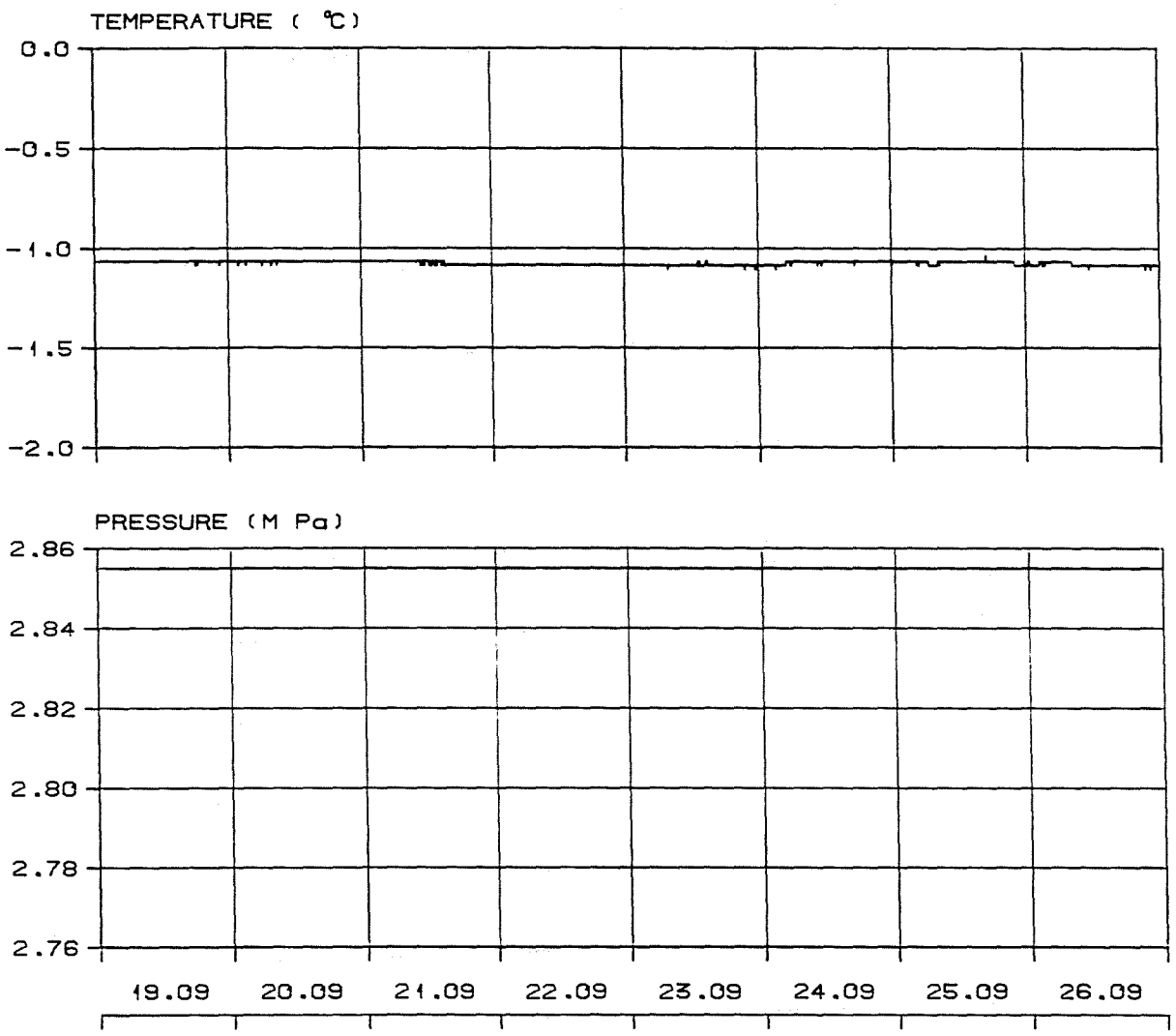
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-8

Continues.....



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

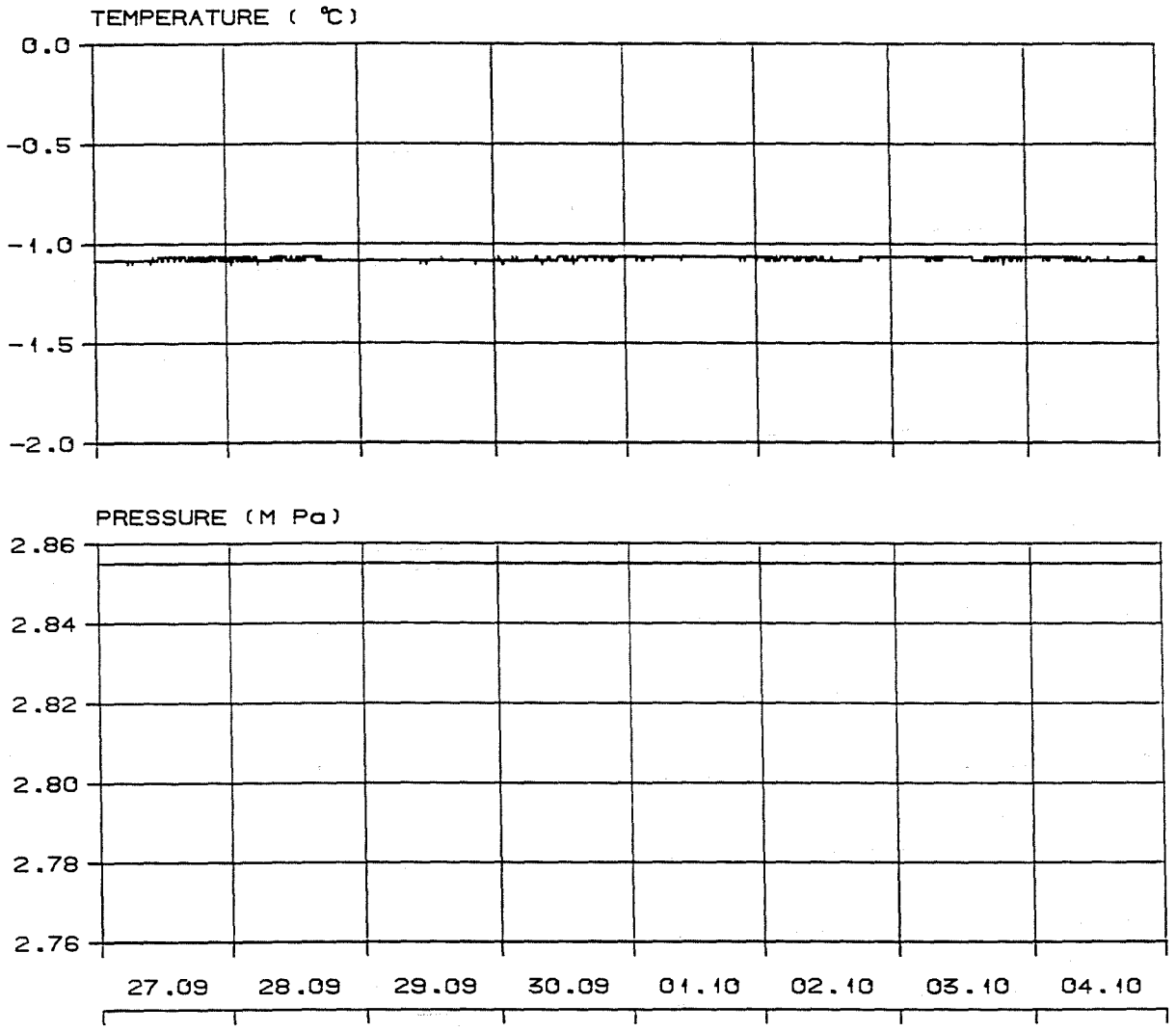
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-8

Continues.....



The Barents Sea

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Instrument depth : 275.0 m Bottom depth : 285.0 m

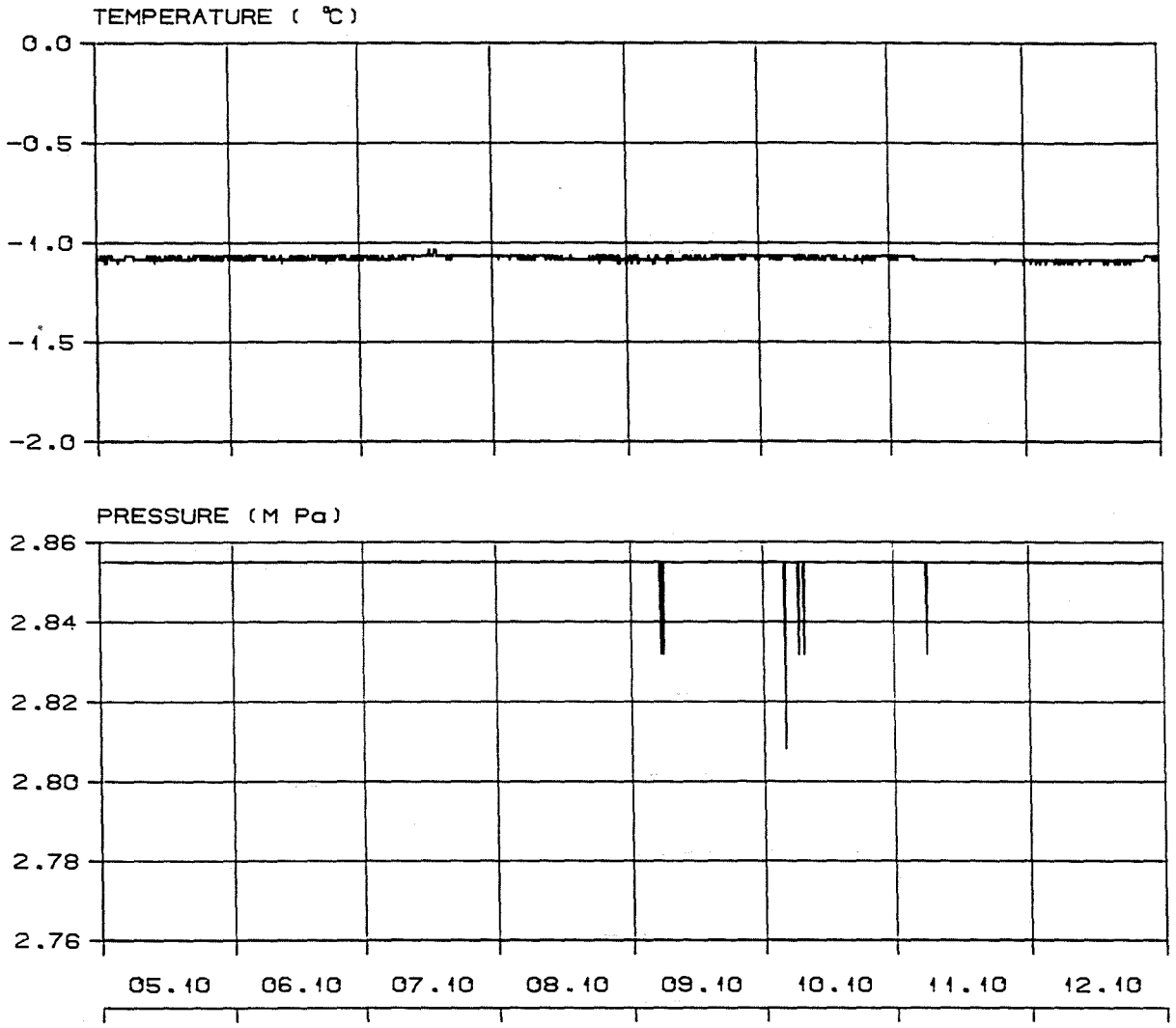
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-8

Continues.....



The Barents Sea

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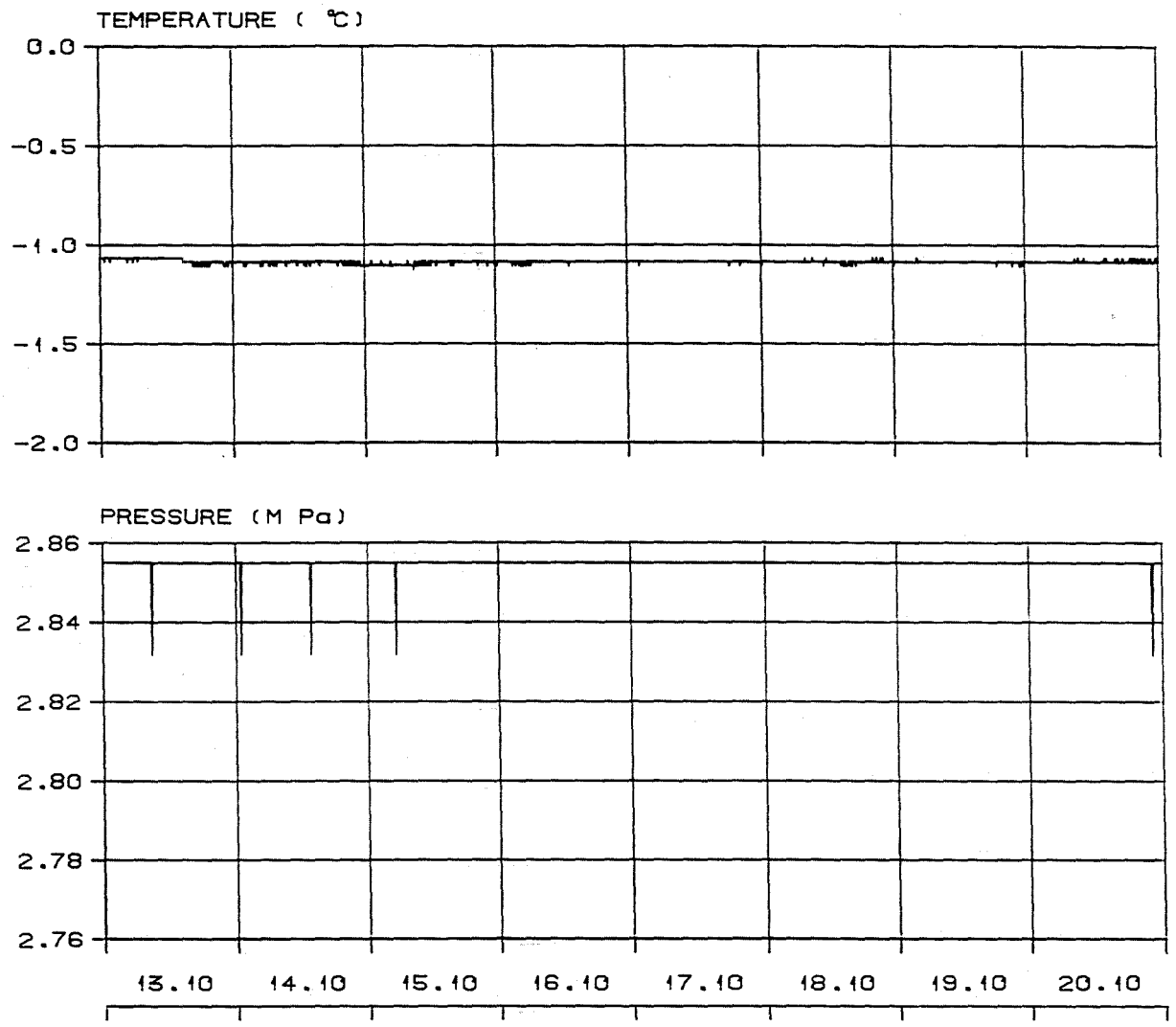
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-8

Continues.....



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

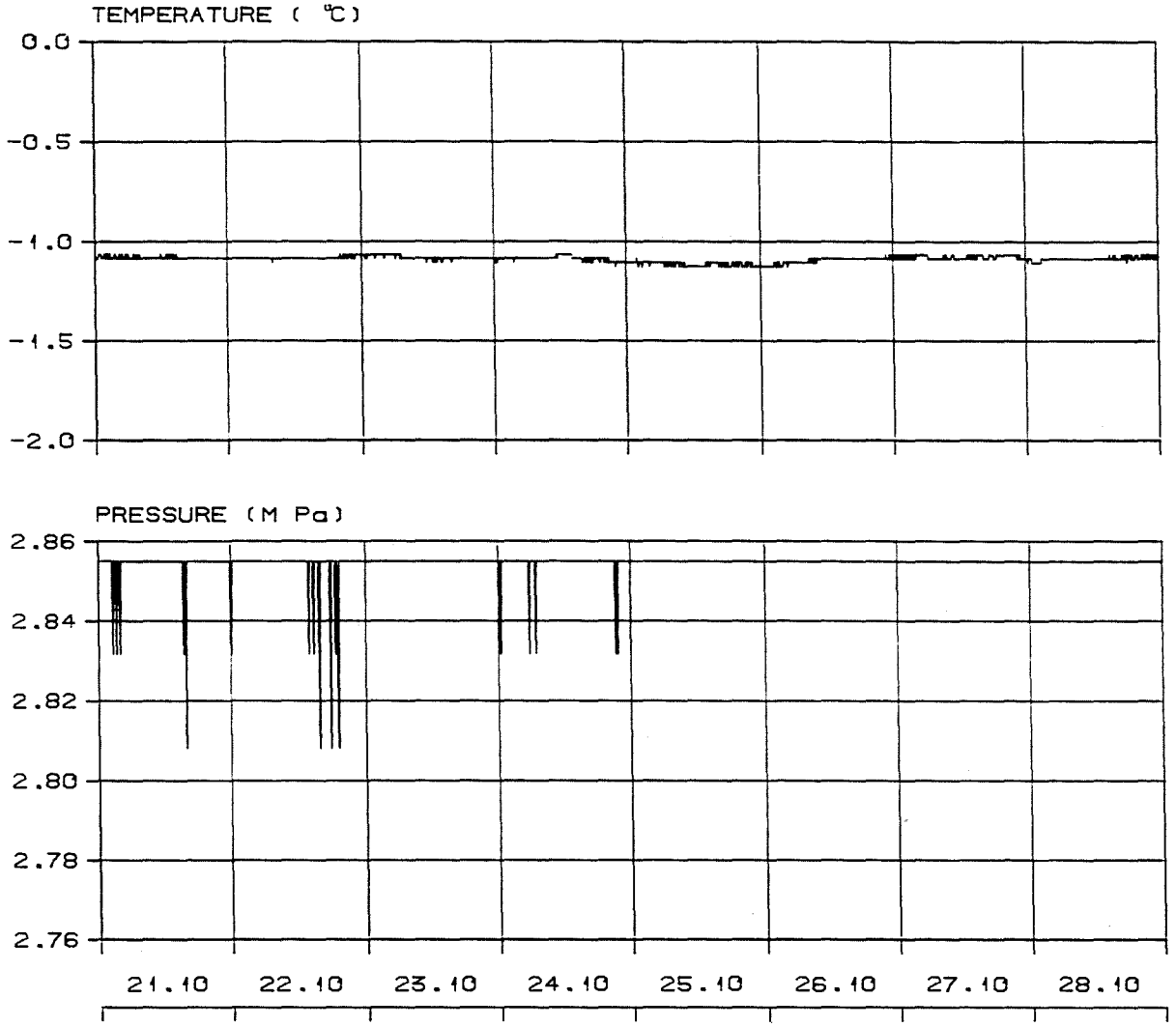
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-8

Continues.....



The Barents Sea

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Instrument depth : 275.0 m Bottom depth : 285.0 m

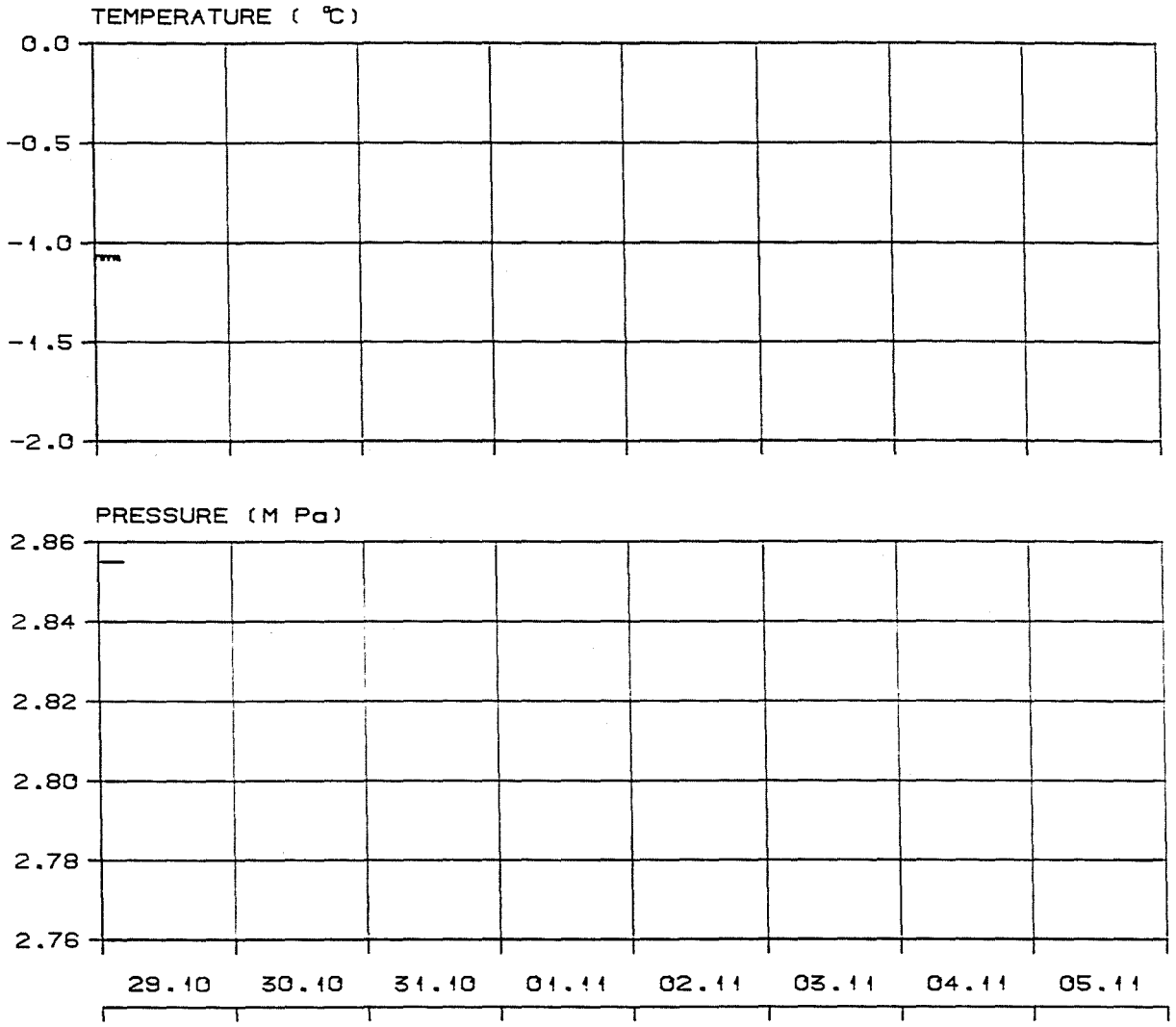
Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-8

Continues.....



The Barents Sea

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Instrument depth : 275.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

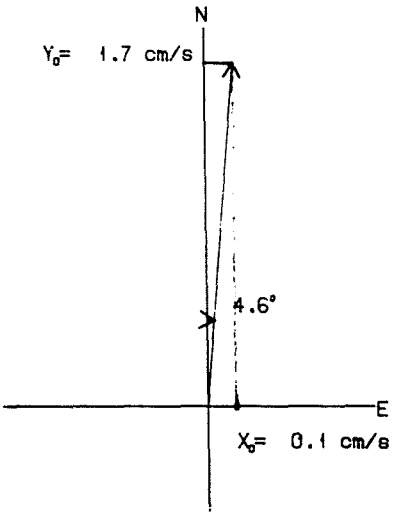
Fig. 3-4-8

Continues.....

HARMONIC ANALYSIS OF CURRENTS

CONSTITUENTS			DECOMPOSED CURRENT				TIDAL CURRENT ELLIPSE				
			E/W		N/S						
Symbol	Period hours	Frequense °/hour	X_j cm/s	g_{xj} °	Y_j cm/s	g_{yj} °	Major axis A_1 cm/s	Minor axis B_1 cm/s	θ_j °	g_j °	BETA. °
MM	661.31	0.5	1.5	44.9	2.5	114.9	2.5	1.3	15.8	106.5	161.8
MSF	354.37	1.0	0.4	199.1	2.3	169.2	2.3	-0.2	188.0	349.8	61.1
M2	12.42	29.0	1.2	97.1	1.0	263.0	1.5	0.2	310.3	271.2	168.8
S2	12.00	30.0	0.7	70.3	1.0	305.4	1.1	-0.5	148.1	108.4	78.5

MEAN CURRENT



The Barents Sea

Position : N 74° 29.70' E 43° 0.60'

Instrument depth : 275.0 m Bottom depth : 285.0 m

Time interval : 10.00 minutes.

Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-9 Harmonic analysis of currents.

A discription of the model and its definitions :

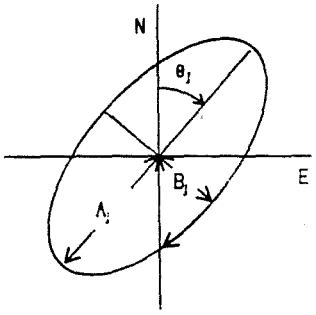
Current-vector decomposed in E/W (real) - and N/S (imaginary) - direction :

$$Z(t)=X_0+\sum_{j=1}^{n}(X_j\cos(\sigma_j t+(V_0+u)_j-g_{xj})+i(Y_0+\sum_{j=1}^{n}Y_j\cos(\sigma_j t+(V_0+u)_j-g_{yj}))$$

g_{xj} , g_{yj} : Greenwich-phase for E/W- and N/S-components of each constituent.

With ellipseparameters :

$$Z(t)=\sum_{j=1}^{n}\exp(i(90^\circ-\theta_j))(A_j\cos(\sigma_j t+(V_0+u)_j-g_j)+iB_j\sin(\sigma_j t+(V_0+u)_j-g_j))$$



g_j : Greenwich phase of the current-vector for each constituent.

Rotationdirection : anticlockwise when $B_j > 0$, clockwise when $B_j < 0$

BETA : The angle between t=0 and major halv axis in the ellipse.

Common for both modles :

σ_j : Frequence in degrees/hour.

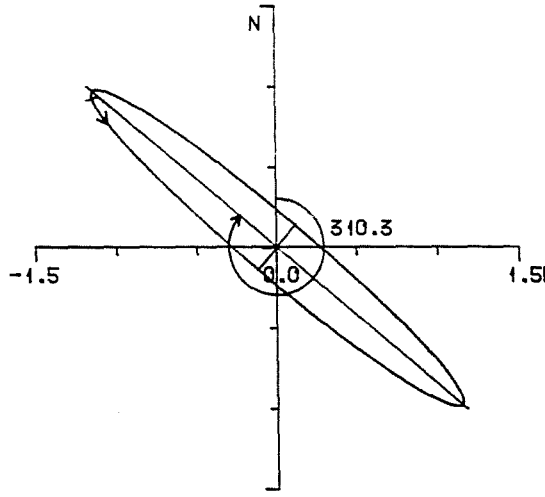
$(V_0+u)_j$: Astronomic argument relative to Greenwich-meridian.

During the calculation of Z(t) will V_0+u be put into the formulas at the time t=0.

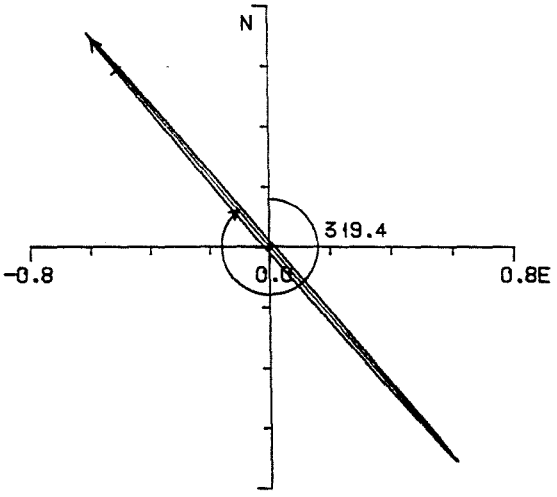
The time t is in houres; the same timezone as the analysed data.

t=0 in the midle of the measurement series : 1989 27.09 H. 0700 , marked with a line on the ellipse.

M2-ellipse



K1-ellipse



The Barents Sea

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Observation period: 1989 26.08 H. 1020 - 1989 29.10 H. 0430

H 1

Fig. 3-4-10 M2 and K1 ellipse.