Report of Cruise # 21-2001 of RV 'LANCE'

Investigations of the Hydrography in the Greenland Sea

September 2001

Tromsø – Longyearbyen
7. September – 2. October, 2001

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1. Introduction

The cruise LANCE 21-2001 was made by the Institute of Oceanography, University of Hamburg, within the scope of two German research projects – ARKTIEF II and SFB 512. In September 2001 oceanographic and biological measurements were carried out aboard the Norwegian research vessel LANCE at the Greenland Sea. Special emphasis was given to the recovery of eight and to the deployment of nine moorings, located at around 74° N, 10° W, at the East Greenland Shelf edge.
Below the scientific background and the purpose of the cruise are briefly described. This is followed by a short narrative of activities, and a brief summary of preliminary findings.

2. Scientific Background

2.1. ARKTIEF II

The Arctic Mediterranean consists of several deep sea basins with each of them showing a different prevailing mechanism of water mass modification. Water exchanges between these basins set up a complex system which generates the outflow into the North Atlantic. We assume that changes within this system could have strong influences to large areas of the world ocean. During the past, water mass modification in the Greenland Sea was dominated by deep convection. However, during the last two decades deep convection did not occur whereas changes of the Greenland Sea's deep and bottom water were measured simultaneously. Obviously, other processes of deep water modification play an important role in the Greenland Sea. The aim of ARKTIEF II is the examination of density driven, near bottom flows at the East Greenland Shelf edge. These flows are assumed to be forced by suspended sediment and to be steered by narrow topographic channels, which reach from the shelf edge down to the abyssal plain. In this context, deep water renewal would be performed by at least two steps. Shallow convection and lateral advection transport water masses down to medium depth where they could be entrained by down slope currents at the shelf edge and thus could be transported down to the deep sea. Furthermore, high energetic near bottom currents could considerably effect living and sedimentation conditions in the deep sea. Therefore, the knowledge of these currents is necessary in order to understand the benthic ecosystem.

2.2. SFB 512

The main contribution to the Arctic Mediterranean's outflow into the North Atlantic is made by the East Greenland Current (EGC). In addition to sea ice, low salinity Polar Surface Water (PSW) and Atlantic Water recirculating in Fram Strait, the EGC transports deeper lying waters exiting the Arctic Ocean – the overflow. Both, the PSW and the overflow are important components of the Atlantic's thermohaline circulation system. The aim of SFB 512 is to examine the EGC's variability, concerning both the net volume flux and its composition of water masses. A new mooring technique (so called "tube moorings") is applied to the East Greenland Shelf which provides temperature and salinity records measured under the pack ice. Together with more conventional moorings located further east, time series of the EGC's transport are produced which will be added to historical hydrographic and atmospheric data. The correlation between oceanic and atmospheric structures will be examined. This will improve our understanding of an ocean-atmosphere interaction – the link between the EGC and the North Atlantic Oscillation.

2.3. The mysterious 75° N eddy

In March 2001 Jürgen Holfort and Markus Janout, University of Hamburg and their colleagues aboard RV Jan Mayen discovered at around 75° N and 0° E an area of homogeneous temperature and salinity with a horizontal extend of 10 – 20 km reaching from the surface down to a depth of 2500 m. It was assumed to be a deep convection cell generated by the descent of atmospherically cooled surface water. One month later, Peter Wadhams aboard RV Lance and four months later Gereon Budéus aboard RV Polarstern visited the same place. Surprisingly, both expeditions found the phenomenon at nearly the same position and measured nearly the same temperature and salinity structure. However, now the area was covered by a warm and less saline surface layer which excluded the persistence of convection. Therefore the attempts of explanation changed to a former convection cell which is stabilised by rotational effects leading to a rotation period of 10 to 20 days. This eddy and its well mixed interior could be able to survive until the next winter allowing the atmosphere to stir up again convection. The eddy would reload cold and saline surface water. But why the eddy's position is almost stationary? How old is it and how long will it exist? Another explanation assumes the eddy to be produced by an interaction between circulation and topography. The observed temperature and salinity fields would be effects of the eddy's secondary circulation, the life time would depend on circulation patterns. However, Budéus found two more similar eddies in the Greenland Sea on her cruise which indicates that the 75° N eddy is not a unique feature. Within the scope of ARKTIEF II, one basic question arises: Do these eddies play a significant role in ventilating the deep Greenland Sea?

3. Purpose and Tasks of the Cruise LANCE 21-2001

The cruise LANCE 21-2001 covered the following scientific aims:

- Determination of the September 2001 hydrography of the western Greenland Sea at 74° North, between 18° W and 9° W, including the structure of the East Greenland Current;
- Search for sediment driven near bottom currents along a submarine channel at the East Greenland Shelf edge , determination of temperature, salinity, near bottom turbidity and sedimentation in this region;
- Determination of the concentration of organic matter in the western Greenland Sea;
- Determination of the hydrographic structure of an eddy located at around 75° N, 0° E;

The different tasks which were conducted during the cruise can be divided roughly into four parts:

1) Recovery of eight moorings which were laid out in September 2000 and deployment of nine moorings. Deep CTD profiling at each mooring position. All positions are between 73° 55' N and 74° 26' N, 15° 45' W and 10° 8' W, most of them are located in a submarine channel. The moorings are equiped with CTDs, current meters, ADCPs and sediment traps.

2) A transect across the East Greenland Shelf edge at around 74° N from 18° W to 9° W, with CTD profiling and water sampling for the analysis of: seston, chlorophyll a, phytoplankton pigments (HPLC), particulate organic carbon and nitrogen (POC/N), particulate silica (PSi), stable isotope content ($^{13}C/^{15}N$), plankton composition and the determination of inorganic dissolved nutrients (N, P, Si). The transect's normal horizontal resolution is around 8 km whereas it increases over steep parts of the shelf edge. Because of two reasons, the transect forms a slightly curved line: 1. The transect runs perpendicular to isobaths, thus perpendicular to the EGS's stream lines; 2. The CTD stations along the transect are close to the mooring positions, this meant a saving of time during the combined mooring/transect programme.

3) Six transects (Yo-Yos) across a submarine channel, with CTD and transmission profiling. Each section length is around 10 km, the horizontal resolution is around 1 km. Vertically the measurements are restricted to water columns lowest 500 m.

4) A grid of CTD stations centered around 75° N, 0° E with a horizontal resolution between 2.5 and 5 km and maximum depth between 2500 and 3000 m.

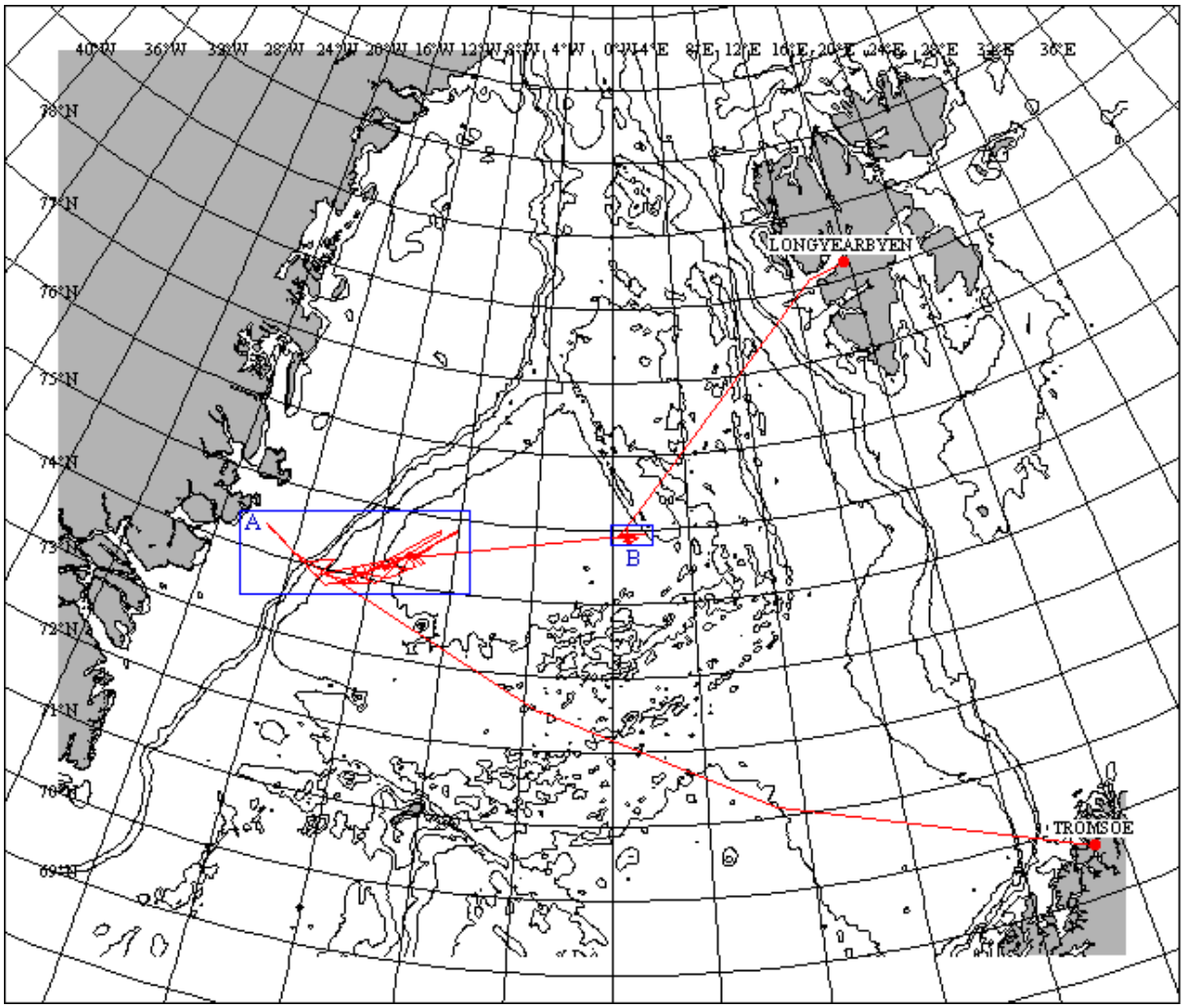

Figure 1a: Cruise track and bathymetry of the Greenland Sea (100, 500, 1000, 2000 and 3000 m isobaths). Boxes A and B are shown in Figure 1b and 1c.

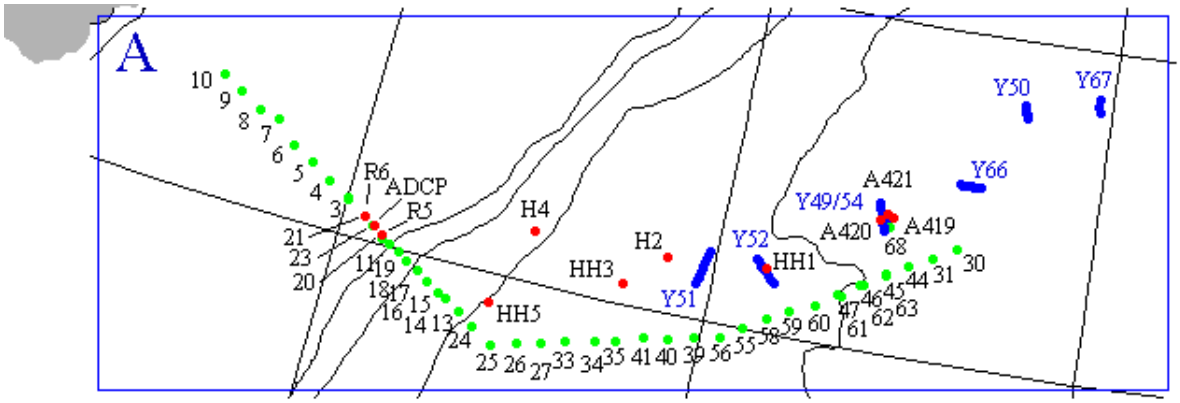

Figure 1b: Stations at the East Greenland Shelf edge. Green – CTD stations, red – moorings, blue – yo-yo stations.

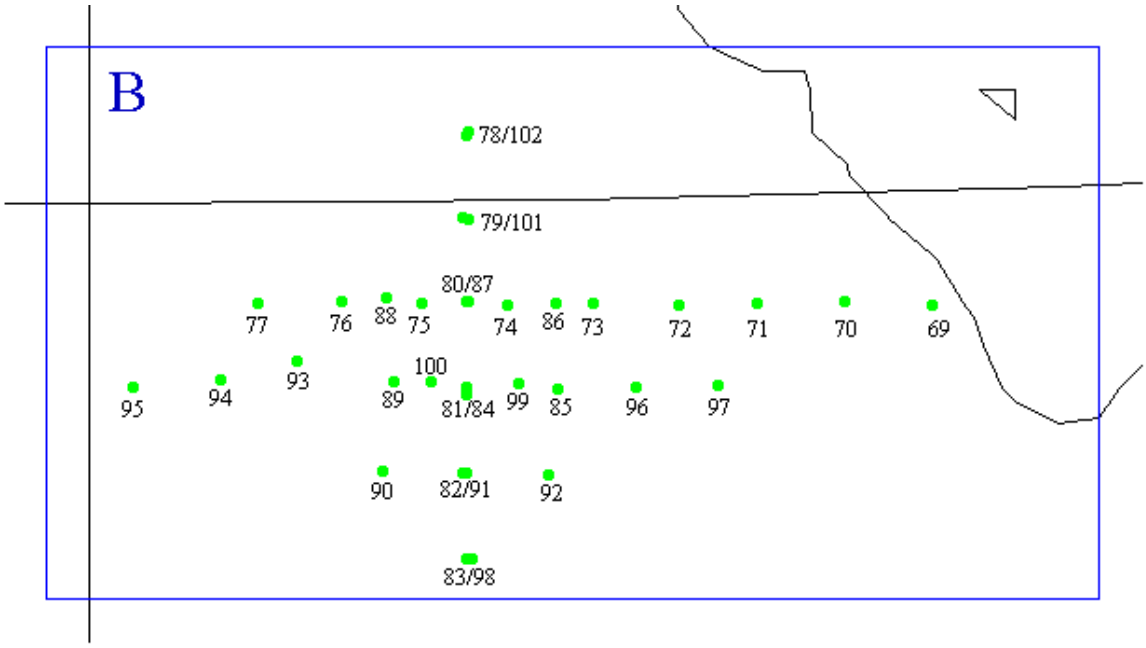

Figure 1c: The grid of CTD stations around the 75° N eddy's centre.

4. Narrative

4.1. The Moorings

RV LANCE, under command of Captain Asmunn Johnson, left port of Tromsø at Friday morning on September 7th, 2001, heading north-west from Hekkingen towards the Greenland Sea. The scientific programme, after conducting two CTD test stations – (#1) in the northern Norwegian Sea and (#2) in the southern Greenland Sea – commenced on Monday, 10th of September at station #3.2 (74° 3' N, 15° 38' W) with the mooring of an ADCP on the East Greenland Shelf. Until Friday morning, September 14th, three more moorings were deployed

(R5, R6 and AWI421-2) and four moorings were recovered (R2, H4, H1 and AWI421-1). Later on Friday and during the next day, mooring works were not possible because of rough seas combined with a wind speed up to 20 m/s. The work was continued Sunday, 16th of September with the recovery of moorings H3 and H2. On Saturday, 22nd of September the rest of the mooring programme – recovery of AWI420-1and AWI419-2, deployment of HH5, AWI419-3, AWI420-2 and HH1 – was finished.

Table 1: Recovered Moorings

mooring	laid out	recovered	latitude	longitude	depth [m]	measurement	measure-ment's depth range [m]
Rohr 2	22.09.00	11.09.01	74° 01.716‘ N	15° 31.149‘ W	320	C,T	20 – 100
H 4	24.09.00	11.09.01	74° 09.03‘ N	13° 57.23‘ W	1910	C,T,V	1750 – 1905
H 1	23.09.00	13.09.01	74° 12.80‘ N	11° 25.60‘ W	3045	C,T,V,Tr	2900 – 3040
AWI 421-1	20.09.00	13.09.01	74° 25.75‘ N	10° 08.18‘ W	3160	C,T,V,Tr	3100 – 3155
H 3	24.09.00	16.09.01	74° 03.55‘ N	12° 54.64‘ W	2820	C,T,V,Tr	2700 – 2815
H 2	23.09.00	16.09.01	74° 10.08‘ N	12° 29.94‘ W	2920	C,T,V,Tr	2800 – 2915
AWI 420-1	18.09.00	17.09.01	74° 23.929‘ N	10° 19.484‘ W	3146	T,V,Tr	2700 – 3141
						sedimentation	800, 2700
AWI 419-2	17.09.00	18.09.01	74° 24.40‘ N	10° 12.245‘ W	3165	C,T,V	100 - 3160
						Tr	3160
						sedimentation	300, 3100

C: conductivity, T: temperature, V: current speed and direction, Tr: transmission

Table 2: Deployed Moorings

mooring	laid out	latitude	longitude	depth [m]	measurement	measurement's depth range [m]
ADCP	10.09.01	74° 02.879‘ N (74° 02.56’ N)*	15° 38.113‘ W (15° 38.26’ W)*	205	V	0 – 205
Rohr 5	12.09.01	74° 01.678‘ N	15° 31.303‘ W	340	C,T	20 – 100
Rohr 6	12.09.01	74° 03.956‘ N	15° 45.139‘ W	203	C,T	20 – 100
AWI 421-2	14 .09.01	74° 25.209‘ N	10° 15.567‘ W	3160	C,T,V,Tr	3100 – 3155
HH 5	17.09.01	73° 54.809‘ N	14° 15.477‘ W	2110	C,T,V	100 – 2105
					Tr	2100
AWI 419-3	19.09.01	74° 24.515‘ N	10° 12.152‘ W	3164	C,T,V	100 – 3160
					Tr	3159
					sedimentation	300, 3100
AWI 420-2	20.09.01	74° 23.940‘ N	10° 19.480‘ W	3146	C,T,V	2700 – 3141
					Tr	3141
					sedimentation	800, 2700
HH3	21.09.01	74° 03.536‘ N	12° 54.546‘ W	2755	C,T,V	40 – 2750
					Tr	2750
HH1	22.09.01	74° 11.426‘ N	11° 25.976‘ W	3022	C,T,V	100 – 3017
					Tr	3017

C: conductivity, T: temperature, V: current speed and direction, Tr: transmission
* position of railway wheel connected to the ADCP

4.2. The Transect

The measurements along the transect were mainly carried out during night time preserving the day light for mooring operations. The works started on Monday, 10th of September at station #3.1 (74° 7’ N, 15° 59’ W). Until morning of September 11th, seven more CTD stations were carried out reaching to the westernmost position of our cruise station #10 (74° 22’ N, 17° 39’ W) which is around 15 sm away from Greenland’s coast. Float ice did not obstruct the ship. Not even small ice floes were seen. Until Friday, September 14th, 18 more CTD stations along the transect were carried out. During the following night, we had to break off station #36 because of rough seas, therefore this profile only extends down to a depth of 500 m. (Measurements at this position, down to the bottom at 2700 m were repeated at station #41.) On Sunday, 16th of September, the work was taken up again with station #39. On Saturday, 22nd of September, the transect with a total length of 153 sm was completed with station #63. At around every other station biological samples were taken with the CTD’s rosette sampler. At station #29, #65 and #68 three CTD-casts were necessary to obtain enough water (around 300 l) to ensure sampling of sufficient amount of organic matter.

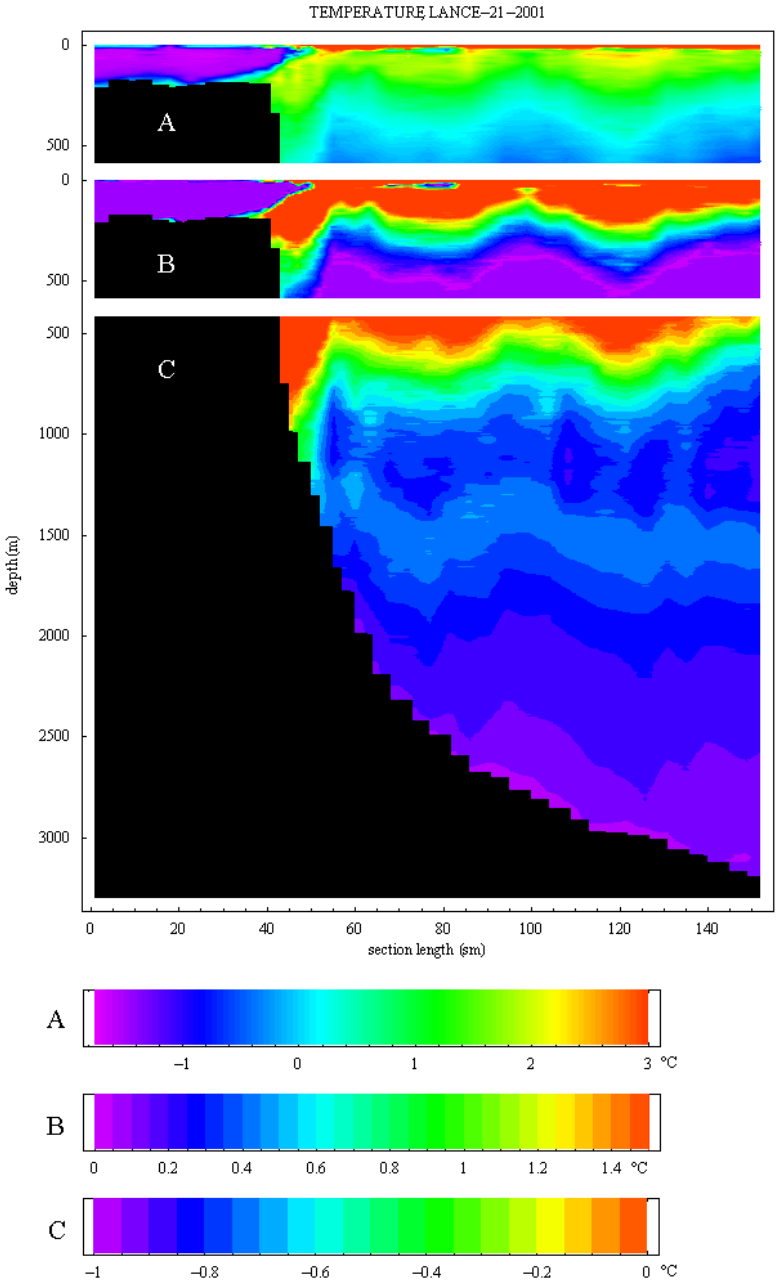

Figure 2a: In situ temperature along the transect

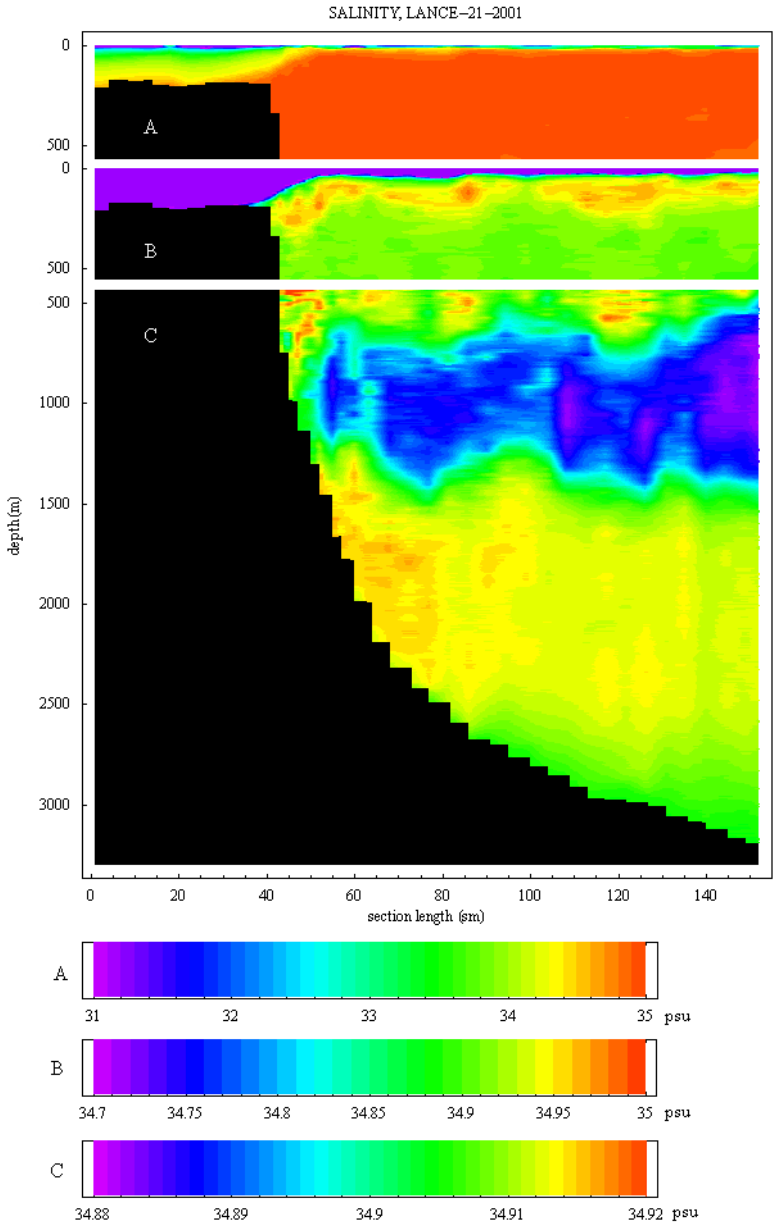

Figure 2b: Salinity along the transect

4.3. The Yo-Yos

On Tuesday evening, 18th of September, the first yo-yo station #49 was started. The RV LANCE stopped around 5 km south of the submarine channel at 74° 22' N, 10° 16' W. The CTD sonde was lowered down to the bottom at 3100 m. Then the ship started to drift slowly, with around 1 kn, to the position 74° 26' N, 10° 21' W, around 5 km north of the channel. Meanwhile the CTD was hove to a depth of 2500 m and again lowered down to the bottom. This up and down movement of the CTD was repeated eight times during station #49. All other yo-yo stations followed a similar procedure. Until Sunday, 23rd of September, six more yo-yo stations were carried out, #50, #51, #52, #54, #66 and #67. They form north-south sections across the submarine channel at around 9° W, 12° W, 11° 30' W, 10° 20' W, 9° 25' W and 8° W respectively. We assumed that station #49 did not extend far enough to the north, so station #54, which is a northward continuation of station #49, was added to our programme. During station #67 only three down casts could be recorded because of a premature drift of the ship.

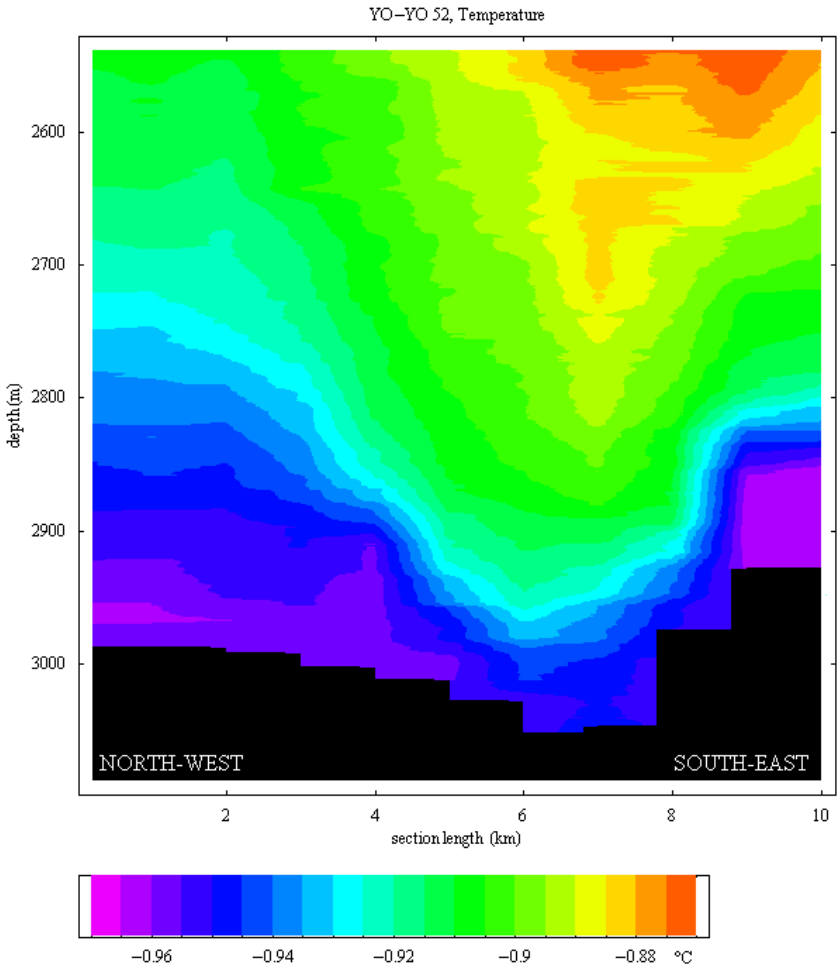

Figure 3a: Potential temperature along yo-yo section 52.

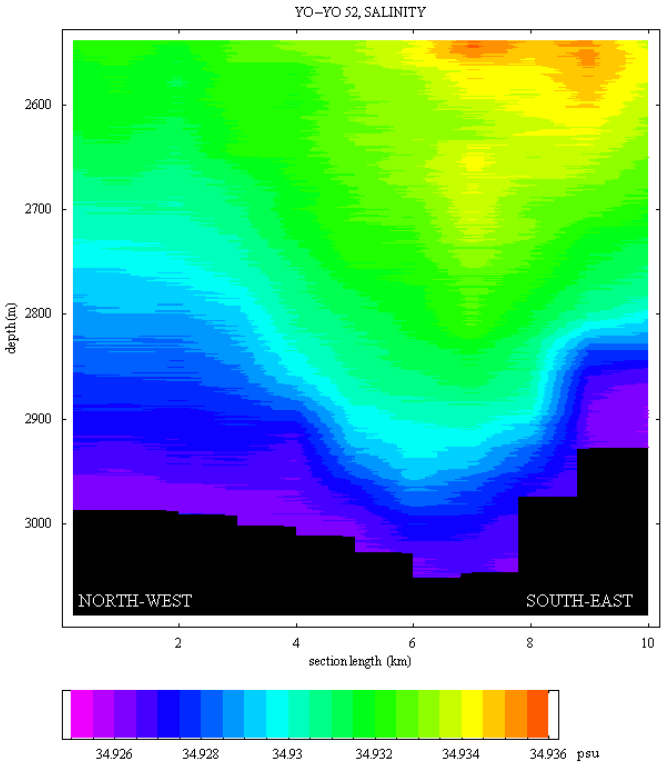

Figure 3b: Salinity along yo-yo section 52.

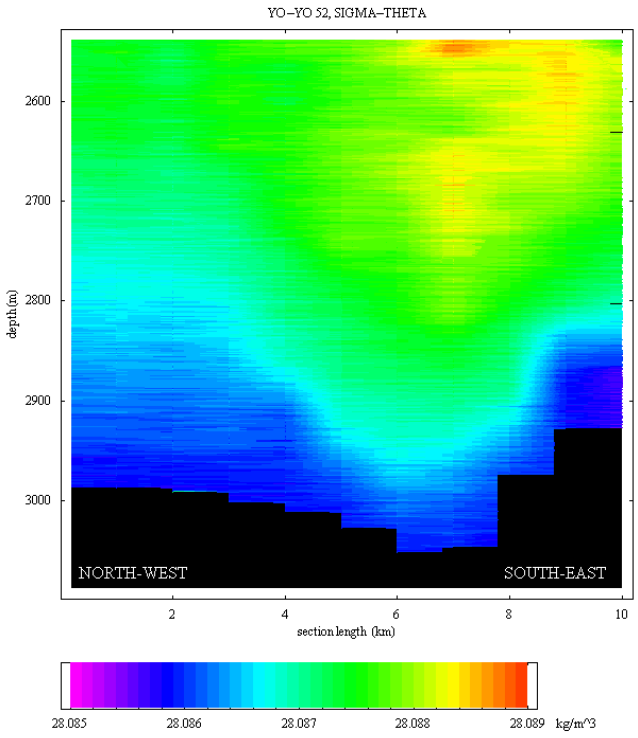

Figure 3c: Potential density σ_Θ along yo-yo section 52.

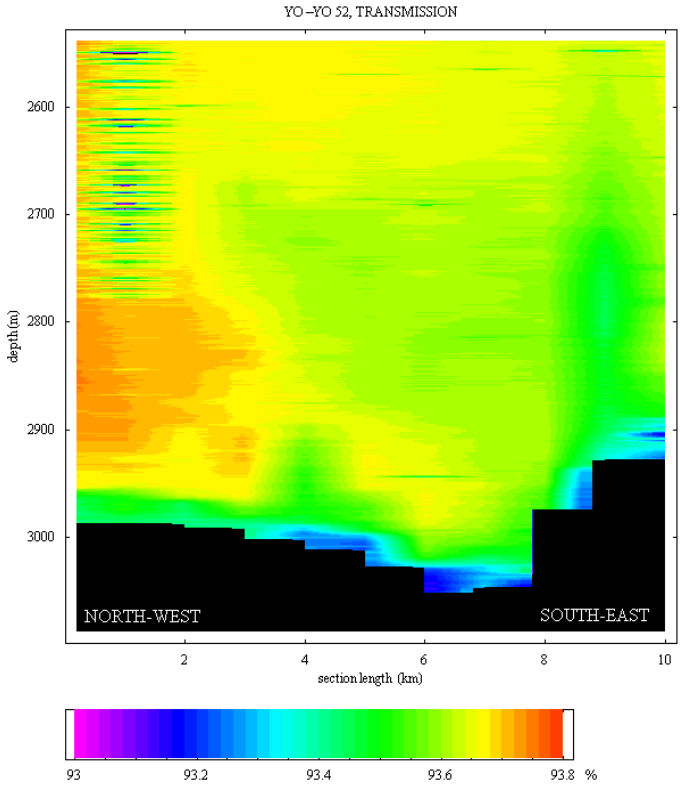

Figure 3d: Transmission along yo-yo section 52.

4.4. The Hydrographic Survey of the 75° N Eddy

On Saturday, 22nd of September, a drifting buoy caught by the 75° N eddy and thus held on to its centre, surfaced at 74° 53' N, 1° 5' E and sent its position, temperature and salinity data via satellite to the Niels Bohr Institute, Copenhagen. On Sunday evening, 23rd of September, our scientific programme at the East Greenland Shelf edge was finished and RV LANCE set course for 75° N, 0° E, i.e. headed for the eastern margin of the Greenland Sea's deep sea basin. The position was reached on Monday afternoon, 24th of September. However, CTD stations were hampered by rough seas due to a wind speed of around 20 m/s and our measurements were restricted to Acoustic Doppler Current Profiling. On Tuesday, 25th of September, we received an Email from Detlef Quadfasel, University of Copenhagen, containing the drifting buoy's latest data. The storm reached its peak on Wednesday 26th of September with a wind speed of 25 m/s and until Thursday evening, 27th of September, our situation remained unchanged, when the storm finally calmed down. Hence, the hydrographic survey could start. First, two transects with CTD profiling down to a depth of 300 m were carried out (station #69 to #83). When they were finished, on Friday morning, 28th of September, the eddy's centre was localised at 74° 54' N, 0° 46' E. After that, deep CTD stations were carried out, which form a horizontal grid with a spacing of 2.5 to 5 km around the eddy's centre. On Sunday morning, 30th of September, we had to break off these works with station #102 due to our charter contract and RV LANCE headed towards Svalbard, Spitsbergen. The ship called port of Longyearbyen on Monday morning 1st of October 2001.

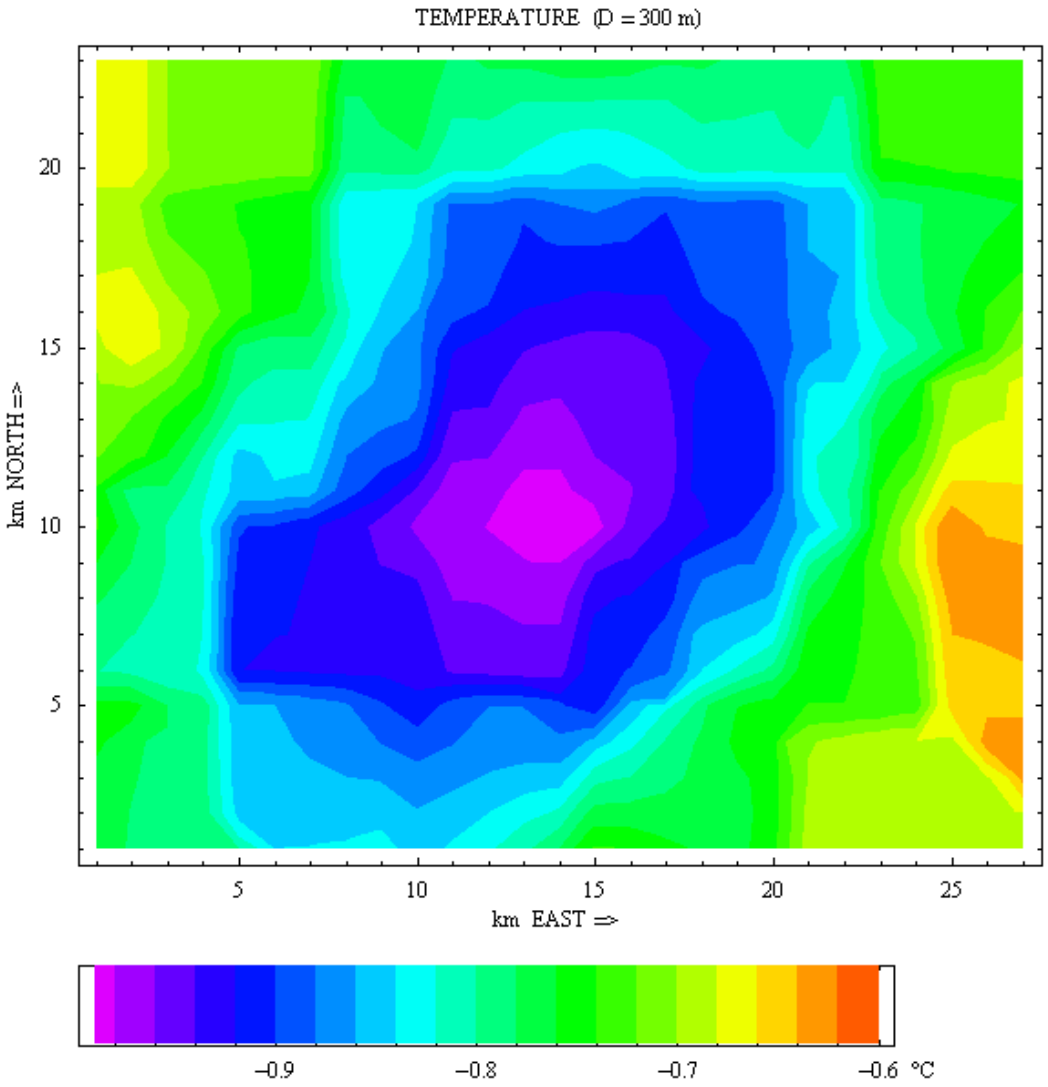

Figure 4a: Temperature at a depth of 300 m at the location of the 75° N eddy.

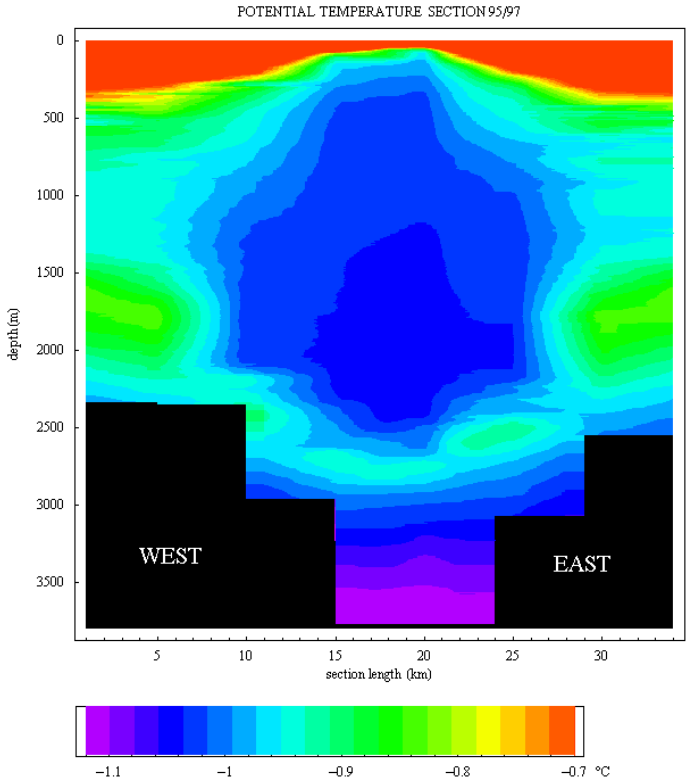

Figure 4b: Zonal section of potential temperature across the 75° N eddy.

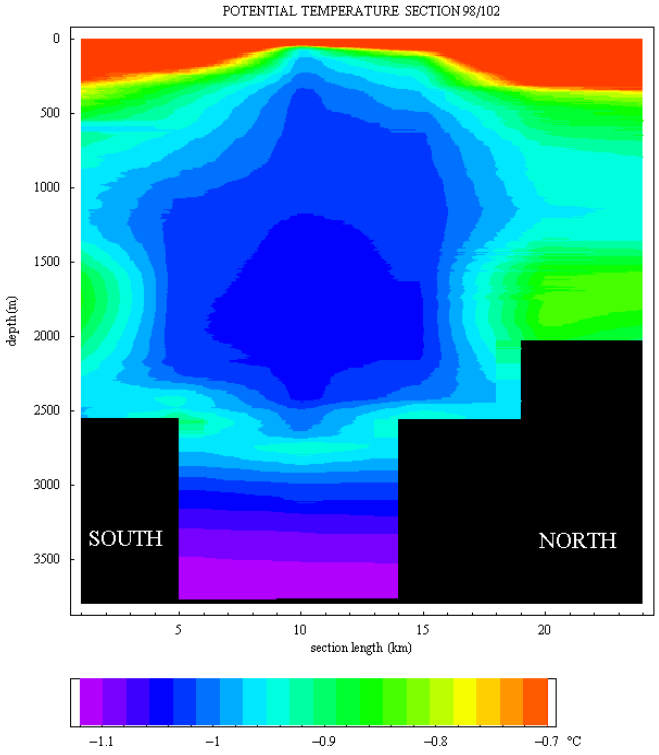

Figure 4c: Meridional section of potential temperature across the 75° N eddy.

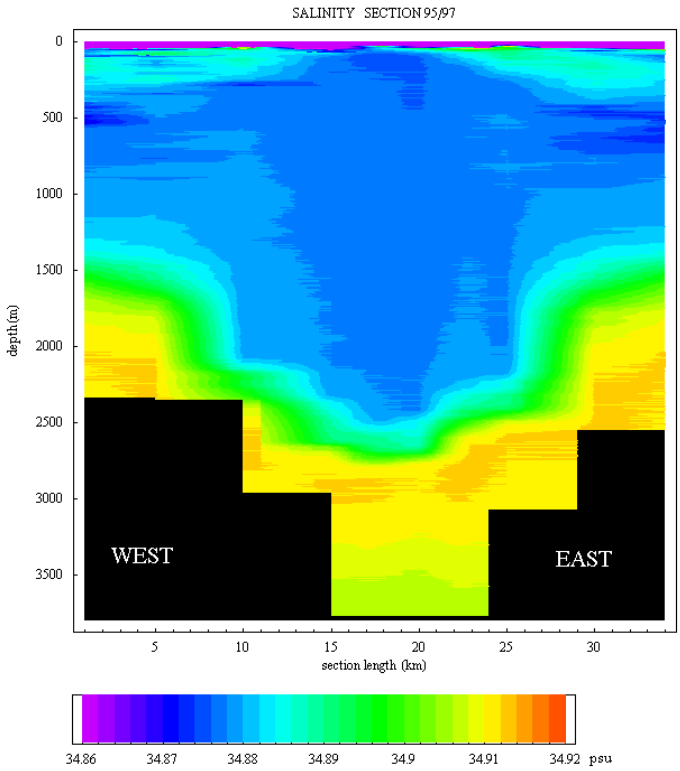

Figure 4d: Zonal section of salinity across the 75° N eddy.

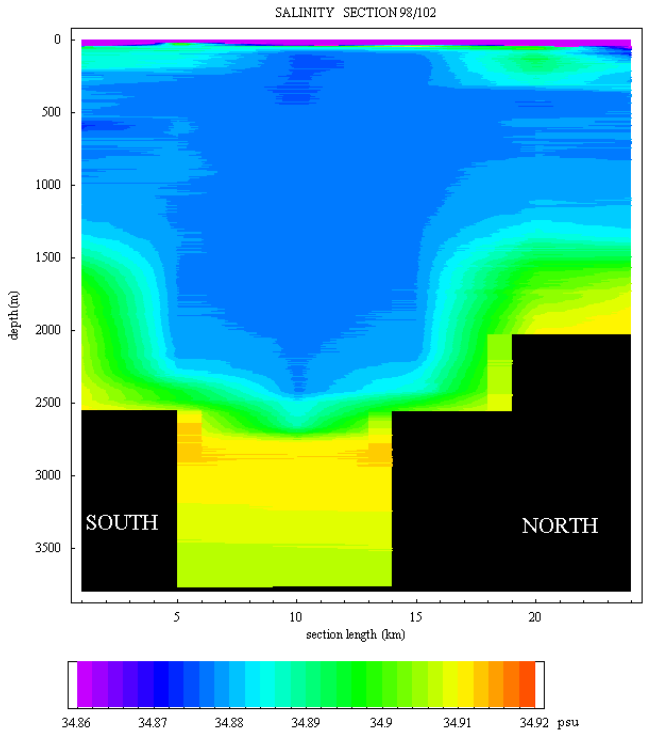

Figure 4e: Meridional section of salinity across the 75° N eddy.

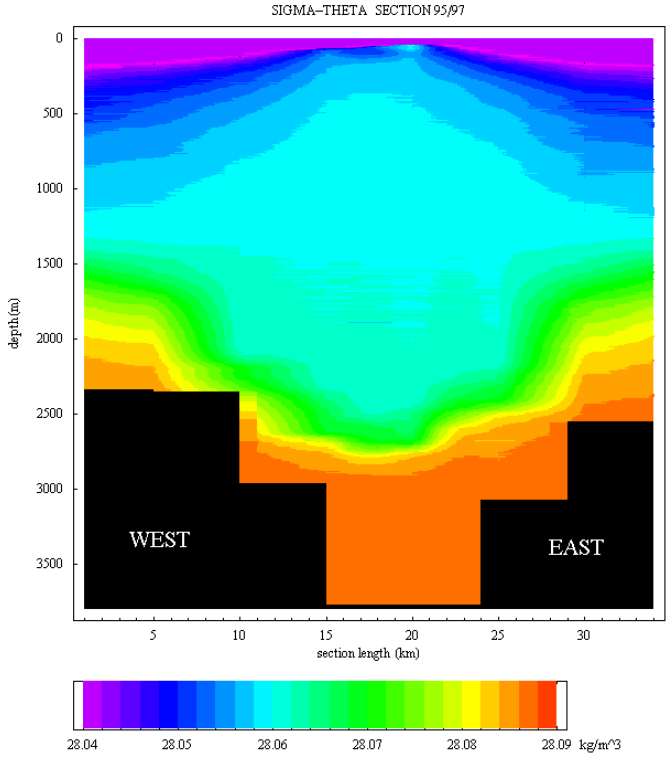

Figure 4f: Zonal section of potential density σ_Θ across the 75° N eddy.

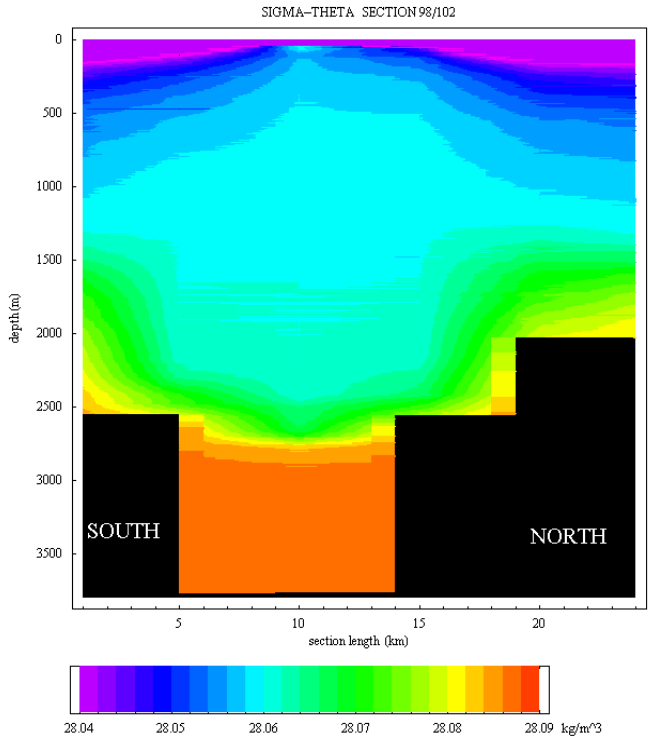

Figure 4g: Meridional section of potential density σ_Θ across the 75° N eddy.

5. First Results

In September 2001, the East Greenland Current at 74° N showed no ice coverage, east of 18° W. Atlantic water was found on the East Greenland Shelf below a depth of 150 m between 16° W and 18° W. The Yo-Yo-CTD sections across the submarine channel showed no indications of a sediment driven near bottom current. However, a distinct along-channel depression of isopycnals was measured which may indicate an topographically steered down-slope flow which would explain the slightly lower transmission inside the channel. The 75° N eddy still existed at the end of September 2001. Its hydrographic structure showed no big differences compared to former measurements. Between 27th and 30th of September the position of the eddy's centre was 74° 54' N, 0° 46' E. Its radius is 20 km at a depth of 1500 m.

6. Instruments used on LANCE 21-2001

- Falmouth scientific 3-dimension acoustic current meters with CTD-sensor head
- Aanderaa current meters (partly with temperature, pressure and conductivity sensor)
- Sea-Bird Electronics MicroCat CT and CTD recorders
- Sea-Bird Electronics SeaCat CTD recorders with attenuation sensor
- Sea-Bird Electronics 911plus CTD system incl. altimeter and attenuation sensor
- Sea-Bird Electronics 12 bottles rosette sampler
- sediment traps
- Influx current meters with attenuation sensor
- CTD-Profiler (MARUM-University of Bremen)
- APL upward looking sonar
- Seatek Seapath 200 acoustic doppler current profiler
- SC acoustic doppler current profiler
- Simrad EK 60 echo sounder
- SIS reversing pressure meters
- protected reversing mercury thermometers
- Guildline AUTOSAL salinometer

7. Scientific Staff

Simon Albrecht, Torsten Albrecht, Carolin Arndt, Eduard Bauerfeind, Markus Bergenthal, Mauricio Brichta, Ulrich Drübbisch, Filip Hacker, Ute Hochbaum, Markus Janout, Sandra Kamp, Kai Logemann, Matthias Monsees, Malte Müller, Harald Rohr, Christoph Stegert, Iris Theil, Inger Thoma, Gunda Wieczorek.

8. Institutions involved

- Institut für Meereskunde, Universität Hamburg
- Alfred Wegener Institut für Polar- und Meeresforschung, Bremerhaven
- Optimare GmbH, Bremerhaven
- Institut für Ostseeforschung, Warnemünde

- MARUM Zentrum für Marine Umweltwissenschaften, Bremen
- Norsk Polarinstitutt, Tromsø
- Niels Bohr Institutet for Astronomi, Fysik & Geofysik, Copenhagen
- Institut für Meereskunde, Universität Kiel

9. Acknowledgement

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The research project SFB 512 is funded by the 'Deutsche Forschungsgemeinschaft' (DFG). ARKTIEF II is funded by the 'Bundesministerium für Bildung und Forschung' (BMBF).

Table 3: List of Stations – Lance 21-2001

No.	LAT	LON	DATE	UTC	DEPTH	TYPE OF WORK
001	71 07.7	07 10.3	08.09.2001	13 29	2956	CTD
002.01	72 31.3	-03 13.3	09.09.2001	12 20	2970	CTD
002.02	72 30.7	-03 13.5	09.09.2001	13 02	2962	CTD
002.03	72 30.7	-03 13.5	09.09.2001	13 27	2962	CTD
003.01	74 06.5	-15 59.3	10.09.2001	14 54	191	CTD,BIO
003.02	74 02.879	-15 38.113	10.09.2001	13 46	205	ADCP↓
004	74 08.6	-16 13.1	10.09.2001	15 48	198	CTD
005	74 10.8	-16 27.1	10.09.2001	16 58	223	CTD,BIO
006	74 12.9	-16 41.4	10.09.2001	18 02	226	CTD
007	74 16.6	-16 55.8	10.09.2001	19 03	205	CTD,BIO
008	74 17.4	-17 09.9	10.09.2001	20 10	184	CTD
009	74 19.5	-17 24.5	10.09.2001	21 06	215	CTD,BIO
010	74 21.6	-17 39.2	10.09.2001	22 12	225	CTD
011.01	74 00.4	-15 25.3	11.09.2001	03 51	742	CTD
011.02	74 01.624	-15 31.230	11.09.2001	06 32	358	R2↑
012.01	74 09.0	-13 57.8	11.09.2001	15 24	1866	CTD
012.02	74 09.03	-13 57.23	11.09.2001	13 00	1866	H4↑
013	73 51.9	-14 31.6	11.09.2001	18 56	1981	CTD,BIO
014	73 53.4	-14 41.5	11.09.2001	21 02	1786	CTD
015	73 54.2	-14 46.8	11.09.2001	22 56	1672	CTD,BIO
016	73 55.7	-14 56.5	12.09.2001	00 54	1468	CTD
017	73 57.0	-15 03.6	12.09.2001	02 40	1314	CTD,BIO
018	73 58.3	-15 11.8	12.09.2001	04 15	1146	CTD
019	73 59.4	-15 18.6	12.09.2001	05 33	1004	CTD,BIO
020.01	74 01.1	-15 31.2	12.09.2001	07 02	368	CTD
020.02	74 01.678	-15 31.303	12.09.2001	08 50	340	R5↓
021.01	74 04.0	-15 45.1	12.09.2001	10 23	196	CTD,BIO
021.02	74 03.956	-15 45.139	12.09.2001	14 00	203	R6↓
022	74 06.3	-15 59.2	12.09.2001	11 40	193	CTD
023	74 02.8	-15 38.7	12.09.2001	12 53	206	CTD
024	73 49.8	-14 21.4	12.09.2001	18 01	2190	CTD
025	73 47.4	-14 07.1	12.09.2001	19 53	2318	CTD,BIO
026	73 48.7	-13 51.0	12.09.2001	22 02	2419	CTD
027	73 49.7	-13 36.6	13.09.2001	00 13	2488	CTD,BIO
028.01	74 12.9	-11 24.7	13.09.2001	08 13	2995	CTD
028.02	74 12.604	-11 27.078	13.09.2001	06 13	2996	H1↑
029.01	74 25.9	-10 07.5	13.09.2001	15 46	3186	CTD,BIO
029.02	74 25.5	-10 07.9	13.09.2001	18 23	3184	CTD,BIO
029.03	74 26.0	-10 07.7	13.09.2001	19 42	3186	CTD,BIO
029.04	74 25.75	-10 08.18	13.09.2001	11 54	3186?	AWI421-1↑
030	74 20.8	-09 27.0	13.09.2001	22 36	3199	CTD
031	74 18.6	-09 41.4	14.09.2001	01 37	3166	CTD
032.01	74 25.1	-10 15.3	14.09.2001	04 55	3158	CTD
032.02	74 25.209	-10 15.567	14.09.2001	09 42	3132	AWI421-2↓
033	73 51.2	-13 22.2	14.09.2001	19 31	2572	CTD
034	73 52.2	-13 03.2	14.09.2001	22 25	2655	CTD,BIO
035	73 53.3	-12 50.5	15.09.2001	00 59	2676	CTD
036	73 54.3	-12 35.2	15.09.2001	03 31	2700	CTD_{500}
037.01	74 03.8	-12 54.3	16.09.2001	10 13	2758	CTD,BIO
037.02	74 03.511	-12 54.918	16.09.2001	07 34	2753	H3↑
038.01	74 10.0	-12 30.0	16.09.2001	15 01	2864	CTD

Table 3 (continued)

No.	LAT	LON	DATE	UTC	DEPTH	TYPE OF WORK
038.02	74 09.953	-12 29.919	16.09.2001	12 54	2864	H2↑
039	73 56.6	-12 02.7	16.09.2001	19 29	2826	CTD
040	73 55.6	-12 19.0	16.09.2001	21 20	2785	CTD,BIO
041	73 55.0	-12 34.5	16.09.2001	23 56	2751	CTD
042.01	73 55.2	-14 21.2	17.09.2001	05 14	2024	CTD,BIO
042.02	73 54.809	-14 15.477	17.09.2001	07 16	2110	HH5↓
043.01	74 24.2	-10 19.5	17.09.2001	19 03	3149	CTD,BIO
043.02	74 23.929	-10 19.484	17.09.2001	15 28	3146	AWI420-1↑
044	74 16.5	-09 56.3	17.09.2001	22 36	3129	CTD
045	74 14.5	-10 09.7	18.09.2001	01 27	3087	CTD
046	74 11.6	-10 25.1	18.09.2001	04 22	3044	CTD
047	74 09.1	-10 36.0	18.09.2001	07 16	3020	CTD
048.01	74 25.0	-10 13.4	18.09.2001	13 51	3148	CTD
048.02	74 24.40	-10 12.245	18.09.2001	10 40	3165	AWI419-2↑
049.01	74 21.9	-10 16.0	18.09.2001	16 50	3078	CTD-YoYo
049.02	74 22.5	-10 16.7	18.09.2001	17 18	3072	CTD-YoYo
049.03	74 22.8	-10 17.2	18.09.2001	17 43	3075	CTD-YoYo
049.04	74 23.3	-10 17.9	18.09.2001	18 09	3076	CTD-YoYo
049.05	74 23.9	-10 18.5	18.09.2001	18 42	3144	CTD-YoYo
049.06	74 24.5	-10 15.0	18.09.2001	19 16	3151	CTD-YoYo
049.07	74 25.0	-10 20.0	18.09.2001	19 45	3130	CTD-YoYo
049.08	74 25.8	-10 21.1	18.09.2001	20 27	3118	CTD-YoYo
050.01	74 46.2	-08 54.6	19.09.2001	01 49	3258	CTD-YoYo
050.02	74 46.6	-08 55.6	19.09.2001	02 28	3320	CTD-YoYo
050.03	74 46.9	-08 56.1	19.09.2001	03 01	3324	CTD-YoYo
050.04	74 47.2	-08 56.8	19.09.2001	03 51	3268	CTD-YoYo
050.05	74 47.6	-08 57.2	19.09.2001	04 08	3263	CTD-YoYo
050.06	74 48.0	-08 57.8	19.09.2001	04 40	3261	CTD-YoYo
050.07	74 48.5	-08 58.0	19.09.2001	05 15	3261	CTD-YoYo
050.08	74 24.515	-10 12.152	19.09.2001	12 32	3164	AWI419-3↓
051.01	74 06.5	-12 08.8	19.09.2001	17 16	2829	CTD-YoYo
051.02	74 07.1	-12 08.2	19.09.2001	17 42	2829	CTD-YoYo
051.03	74 07.6	-12 07.6	19.09.2001	18 06	2825	CTD-YoYo
051.04	74 08.0	-12 07.4	19.09.2001	18 33	2836	CTD-YoYo
051.05	74 08.6	-12 07.1	19.09.2001	19 03	2908	CTD-YoYo
051.06	74 09.1	-12 06.8	19.09.2001	19 33	2934	CTD-YoYo
051.07	74 09.7	-12 06.3	19.09.2001	20 08	2935	CTD-YoYo
051.08	74 10.4	-12 05.5	19.09.2001	20 52	2920	CTD-YoYo
051.09	74 11.1	-12 04.8	19.09.2001	21 27	2904	CTD-YoYo
051.10	74 11.8	-12 04.2	19.09.2001	22 04	2929	CTD-YoYo
051.11	74 12.5	-12 03.8	19.09.2001	22 36	2926	CTD-YoYo
052.01	74 12.9	-11 33.7	20.09.2001	01 41	2952	CTD-YoYo
052.02	74 12.5	-11 32.3	20.09.2001	02 09	2959	CTD-YoYo
052.03	74 12.1	-11 31.0	20.09.2001	02 37	2970	CTD-YoYo
052.04	74 11.7	-11 29.7	20.09.2001	03 06	2986	CTD-YoYo
052.05	74 11.4	-11 28.7	20.09.2001	03 30	3016	CTD-YoYo
052.06	74 11.1	-11 27.6	20.09.2001	03 56	3016	CTD-YoYo
052.07	74 10.8	-11 26.4	20.09.2001	04 22	2997	CTD-YoYo
052.08	74 10.3	-11 24.5	20.09.2001	04 52	2908	CTD-YoYo
052.09	74 09.8	-11 22.8	20.09.2001	05 16	2891	CTD-YoYo
052.10	74 09.4	-11 21.3	20.09.2001	05 39	2887	CTD-YoYo
052.11	74 09.0	-11 20.1	20.09.2001	05 59	2890	CTD-YoYo

Table 3 (continued)

No.	LAT	LON	DATE	UTC	DEPTH	TYPE OF WORK
053.01	74 24.0	-10 18.7	20.09.2001	10 15	3144	CTD
053.02	74 23.940	-10 19.480	20.09.2001	12 39	3146	AWI420-2↓
054.01	74 24.9	-10 19.5	20.09.2001	13 54	3141	CTD-YoYo
054.02	74 25.4	-10 20.1	20.09.2001	14 21	3123	CTD-YoYo
054.03	74 25.8	-10 20.6	20.09.2001	14 46	3119	CTD-YoYo
054.04	74 26.2	-10 21.1	20.09.2001	15 11	3118	CTD-YoYo
054.05	74 26.6	-10 21.6	20.09.2001	15 38	3118	CTD-YoYo
054.06	74 27.0	-10 22.1	20.09.2001	16 03	3120	CTD-YoYo
055	74 00.1	-11 34.2	20.09.2001	21 22	2931	CTD
056	73 57.8	-11 47.0	20.09.2001	23 58	2877	CTD
057.01	74 03.6	-12 54.2	21.09.2001	04 06	2757	CTD
057.02	74 03.536	-12 54.546	21.09.2001	08 38	2755	HH3↓
058	74 02.5	-11 20.1	21.09.2001	12 12	2942	CTD
059	74 04.7	-11 06.4	21.09.2001	14 58	2956	CTD
060	74 06.7	-10 51.6	21.09.2001	17 39	2972	CTD
061	74 09.2	-10 38.1	21.09.2001	20 17	3018	CTD
062	74 11.7	-10 23.1	21.09.2001	23 06	3050	CTD
063	74 14.0	-10 09.5	22.09.2001	01 38	3088	CTD
064.01	74 11.5	-11 25.8	22.09.2001	05 38	3025	CTD
064.02	74 11.426	-11 25.976	22.09.2001	09 35	3022	HH1↓
065.01	74 24.6	-10 16.1	22.09.2001	12 57	3153	CTD,BIO
065.02	74 25.7	-10 15.9	22.09.2001	15 10	3150	CTD_{3000},BIO
065.03	74 24.6	-10 15.8	22.09.2001	17 12	3151	CTD_{2000},BIO
065.04	74 21.6	-10 15.8	22.09.2001	18 24	3154	CTD_{100},BIO
066.01	74 32.6	-09 18.0	22.09.2001	21 14	3181	CTD
066.02	74 32.5	-09 19.8	22.09.2001	21 36	3181	CTD-YoYo
066.03	74 32.5	-09 21.1	22.09.2001	21 57	3174	CTD-YoYo
066.04	74 32.5	-09 22.3	22.09.2001	22 17	3180	CTD-YoYo
066.05	74 32.5	-09 23.6	22.09.2001	22 40	3248	CTD-YoYo
066.06	74 32.5	-09 24.8	22.09.2001	23 02	3224	CTD-YoYo
066.07	74 32.5	-09 26.1	22.09.2001	23 24	3212	CTD-YoYo
066.08	74 32.5	-09 27.7	22.09.2001	23 49	3209	CTD-YoYo
066.09	74 32.5	-09 29.2	23.09.2001	00 13	3207	CTD-YoYo
066.10	74 32.5	-09 30.9	23.09.2001	00 41	3197	CTD-YoYo
066.11	74 32.5	-09 32.1	23.09.2001	01 06	3191	CTD-YoYo
067.01	74 51.5	-08 08.3	23.09.2001	06 25	3322	CTD-YoYo
067.02	74 49.9	-08 08.9	23.09.2001	07 16	3323	CTD-YoYo
067.03	74 49.2	-08 07.1	23.09.2001	07 56	3325	CTD-YoYo
068.01	74 22.8	-10 13.4	23.09.2001	15 00	3081	CTD,BIO
068.02	74 23.1	-10 12.9	23.09.2001	17 15	3085	CTD_{2500},BIO
068.03	74 23.1	-10 12.7	23.09.2001	19 12	3085	CTD_{2500},BIO
068.04	74 22.9	-10 13.5	23.09.2001	20 55	3079	CTD_{300},BIO
069	74 56.4	01 43.6	27.09.2001	17 11	3269	CTD_{300}
070	74 56.6	01 33.0	27.09.2001	17 53	3707	CTD_{300}
071	74 56.6	01 22.15	27.09.2001	18 40	3706	CTD_{300}
072	74 56.6	01 12.5	27.09.2001	19 26	3707	CTD_{300}
073	74 56.7	01 02.0	27.09.2001	20 07	3708	CTD_{300}
074	74 56.7	00 51.5	27.09.2001	20 44	3710	CTD_{300}
075	74 56.8	00 41.0	27.09.2001	21 27	3708	CTD_{300}
076	74 56.9	00 31.0	27.09.2001	22 04	3706	CTD_{300}
077	74 56.8	00 20.7	27.09.2001	23 00	3704	CTD_{300}
078	75 02.2	00 46.9	28.09.2001	00 39	3706	CTD_{300}
079	74 59.4	00 46.7	28.09.2001	01 29	3707	CTD_{300}

Table 3 (continued)

No.	LAT	LON	DATE	UTC	DEPTH	TYPE OF WORK
080	74 56.8	00 46.6	28.09.2001	02 18	3708	CTD_{300}
081	74 54.1	00 46.2	28.09.2001	02 55	3709	CTD_{300}
082	74 51.4	00 46.1	28.09.2001	03 53	3709	CTD_{300}
083	74 48.7	00 46.7	28.09.2001	04 47	3707	CTD_{300}
084	74 53.9	00 46.3	28.09.2001	06 27	3709	CTD
085	74 54.0	00 57.5	28.09.2001	09 17	3710	CTD,BIO
086	74 56.7	00 57.4	28.09.2001	12 24	3708	CTD,BIO
087	74 56.8	00 46.5	28.09.2001	15 09	3708	CTD,BIO
088	74 57.0	00 36.5	28.09.2001	17 56	3707	CTD,BIO
089	74 54.3	00 37.3	28.09.2001	20 34	3709	CTD,BIO
090	74 51.5	00 35.8	28.09.2001	23 25	3708	CTD,BIO
091	74 51.4	00 45.6	29.09.2001	02 10	3709	CTD,BIO
092	74 51.3	00 56.2	29.09.2001	05 02	3708	CTD
093	74 55.0	00 25.6	29.09.2001	07 53	3706	CTD
094	74 54.4	00 16.2	29.09.2001	09 50	3705	CTD
095	74 54.2	00 05.3	29.09.2001	11 42	3702	CTD,BIO
096	74 54.0	01 07.1	29.09.2001	15 17	3708	CTD_{3000}
097	74 54.0	01 17.2	29.09.2001	17 22	3708	CTD_{2500},BIO
098	74 48.7	00 46.0	29.09.2001	20 12	3708	CTD_{2500}
099	74 54.2	00 52.7	29.09.2001	22 38	3709	CTD
100	74 54.3	00 42.0	30.09.2001	01 11	3709	CTD,BIO
101	74 59.5	00 46.2	30.09.2001	03 38	3707	CTD
102	75 02.1	00 46.7	30.09.2001	05 14	3706	CTD

CTD_{DDD} – CTD profile with a maximum depth of DDD m.
BIO – biological sampling
XXX↑ – recovery of mooring XXX
XXX↓ – deployment of mooring XXX