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BERT RUDELS:

Cruises with R/V Lance to the Barents Sea and the Fram Strait summer 1986

NORSK POLARINSTITUTT

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1. Cruise with R/V LANCE in summer 1986

BACKGROUND AND OBJECTIVES

The geophysical work on the two cruises with R/V LANCE arranged by NP in the summer of 1986 was an integral part of the NP programmes devoted to the study of the oceanographic and sea-ice conditions in the Barents Sea, the Fram Strait and the Polar Ocean. These programmes are primarily concerned with the climatological importance of the transports of water and ice between the Polar Ocean and the North Atlantic. However, in addition to monitoring work great efforts are made to study the mixing processes and the water mass transformations, especially those connected with cooling, ice formation and ice melt. The ultimate goal is to gain understanding of the mechanisms driving the circulation in the Arctic Mediterranian Seas. A major problem, which holds the attention of several groups and research institutes and is in the focus of an increased and deepening international cooperation.

The first cruise (17/7 - 13/8) was to concentrate on the Barents Sea and the basic NP programmes in physical oceanography and sea-ice were supplemented by radiations studies (NP), a substantial chemical oceanography programme in cooperation with the dept. of Analytical and Marine Chemistry, Univ of. Gøteborg, and further sea-ice work together with Mullard Space Centre, Cambridge and SINTEF, Trondheim. Moreover, a biological team from Univ. in Tromsø joined the cruise to study the ice fauna.

Some land based activity was also included. Tide gauges, put out by the topographical dept. at NP had to be recovered and the automatic weather stations on Phippsøya, Kvitøya and Kong Karls Land were to be repaired or replaced. A work to be done on behalf of the DNMI, if opportunities should arise.

The second cruise (13/8 - 22/8), jointly financed by NP and the Univ. of Washington, Seattle, was primarily allocated to the recovery of moorings deployed by R/V POLARSTERN last year in the ice covered part of the Fram Strait. This is part of a long time monitoring programme run by the Alfred-Wegener-Institut, the Univ. of Washington, the Univ. of Bergen, the Univ. of Hamburg and NP (sea-ice transports).

Due to the limited time available only basic oceanography, sea-ice and ice fauna programmes could be accomodated, on an opportunity basis, in addition to the mooring work.

FIELD WORK

The original intention was to work in the Northern Barents Sea between Svalbard and Frans Josef Land and on the northern continental shelf and slope as far into the Polar Ocean as the ice conditions would permit. The main objectives were to study the exchanges of water and ice between the Barents Sea and the Polar Ocean and the sea-ice and water mass characteristics in the area. Of special interest was to obtain samples of the brine enriched bottom waters of the northern and eastern depressions and determine its chemical constituents. How large is the interaction with the organic matter deposit at the bottom? Does the water penetrates to the Polar basin, affecting the deep circulation? Are these processes important for the CO_2 uptake and nutrient balances of the Polar Ocean?

However, due to political considerations no observations were to be made east of 35^0E. This forced us to rework the entire cruise plan and shift the focus towards the Polar Ocean north of Svalbard.

The first cruise started from Hammerfest on the evening the 17th of July and the first days, before the helicopters became available, were dedicated to the retrieval of current meter moorings deployed in December 1985 from K/V NORDKAPP and to oceanographic work in the Sentralbanken-Svalbardbanken-Storbanken area. A hydrographic section was taken from the Norwegian coast to Sentralbanken, immediately followed by a second section from Sentralbanken to Svalbardbanken and the first mooring position.

The retrieval of the system depoyed at $76^0$15'N, $25^0$53'E southeast of Hopen was unsuccessful and after 36 hours of dredging the attempt had to be abandoned. The search coverage of the area was so complete that either the system is gone, or the positioning has been faulty.

After thr dredging operation the topography team was brought ashore on Halvmåneøya to prepare the retrieval of a tide gauge put out from LANCE last summer, while LANCE continued east towards the second mooring position ($77^0$11'N, $30^0$11'E) doing oceanographic work on route. The main section between Edgeøya and Storbanken was interupted by shorter north-south sections towards the ice edge, which was reached once (at $78^0$10'N, $26^0$00'E) and a biological station could be taken.

When the mooring position was approached, the weather was not good enough to allow for dredging and LANCE continued up on Storbanken and a short section was then taken down slope towards the north-west before the mooring work begun. The weather had improved. The bottom line was caught on the second crossing and the instruments were retrieved.

Some further oceanographic work was done in the Storbanken area before LANCE returned to Halvmåneøya, the topography team and the retrieval of the tide gauge, a task which was smoothly accomplished with the diving assistance of the biologists.

The work in the southern Barents Sea ended in Storfjorden, where an section with hydrographic and intense chemical observations was taken to study the characteristics of the bottom water. It was also possible to occupy the first ice station and some biological work was done.

The unknown ice situation and the weather conditions, which forced us to bring the helicopters onboard off the west coast of Spitbergen, made us decide to work our way into the northern Barents Sea from the north by sailing around the west and north coast of Spitsbergen. On the 26th of July, one day later than originally planned, the helicopters and the remaining cruise members were taken onboard from Longyearbyen and Ny-Ålesund and LANCE continued directly to Kinnvika and the second tide gauge.

When the topography team had been put ashore the scientific activity commenced on the shelf area north of Nordaustlandet. For the first time all groups in sea-ice and meteorology as well as in oceanography and biology could work.

Unfortunately, one helicopter was unoperative and after putting a team ashore on Phippsøya to repair the weather station the second helicopter was sent to Widjefjorden to fetch the needed spare.

When the helicopter returned the first ice reconnaissance towards the east could be made. It showed that it was possible to reach Kvitøya and the Barents Sea through the passage between Kvitøya and Storøya. It was then decided that the work should proceed eastward with north-south sections across the ice edge as deep into the ice as possible.

This decision forced us to bring the topographer onboard by helicopter before the marine work continued eastward. Still another 20 hours later the team on Phippsøya was taken onboard after a successful repair of the weather station. LANCE could now proceed unhampered and concentrate on the marine work until we reached Kvitøya and the weather station.

However, ice prevented LANCE from approaching Andreeneset and fog made flying impossible. The attempt to replace the weather station therefore had to be postboned. A CTD section was taken between Kvitøya and Storøya and we started to sail south towards Kong Karls Land to inspect the weather station at Tømmerneset and to put out a new tide gauge.

However, we got, over radio, new information about the ice distribution based upon one day old satellite pictures. The ice conditions in the Barents Sea were difficult, but it appeared possible to come close to Kvitøya from the north. The work in the Barents Sea and on Kong Karls Land was then cancelled and another try to reach Andreeneset was made. By approaching from the north the captain also hoped that the adiabatic effect on the southerly winds, as they passed over the glacier, would improve the visibility enough to allow flying.

This conjecture proved correct and equipment and personell were brought ashore in a rather marginal operation in strong winds and low visibility on the night between the 1st and 2nd of August. The weather improved greatly during the 20 hours the work lasted and the team and the old station could be brought onboard without complications.

In the meantime sea-ice and biological work were done from LANCE in the area close to the island. When the work on Kvitøya was finished, LANCE returned directly to Kinnvika to retrieve the second tide gauge.

From Kinnvika a hydrographic section was taken north-west towards the Sofia Deep as far into the ice as possible. The work, involving all groups, then continued along the ice edge over the Nansen Ridge into the Fram Strait. The weather permitted flying over the ice cover, which made it possible to extend the biological, sea-ice and meteorological observations deeper into the Polar Ocean.

The CTD winch broke down at a deep station in the Fram Strait when 2000 m of cable were out. This temporarily stopped the oceanographic work, but the other programme could proceed as before. Thanks to the repair work made by the ships crew the oceanographic work could be resumed after 48 hours and all groups were operative when the observations ended on the evening the 8th of August.

LANCE sailed to Ny-Ålesund, where some marine geological sampling should be made from LANCE by a group from Scott Polar Research Institute. LANCE left Ny-Ålesund shortly after midnight on the 10th of August. A CTD section was run from Sørkapp to Bjørnøya, where a biological research team were taken onboard for further transport to Tromsø. Some additional CTDs were taken south of Bjørøya and Lance arrived in Tromsø in the late afternoon on the 12th of August.

After changes of crew and of some scientific personell LANCE left Tromsø on the evening the 13th of August for Bellsund and a rendez-vouz with R/V VALDIVIA. A CTD section was again taken between Norway and Svalbard and after the transfer of equipment and personell between the two vessels LANCE steamed westward to commence the mooring work.

The ice conditions in the western part of the Fram Strait were quite severe and only the easternmost mooring could be retrieved and replaced. The other two were situated to far west on the Greenland shelf to be reached in the time available.

The time spent on navigating through the ice curtailed the possibilities for other activities. Still some sea-ice and biological work could be done and a CTD section across the ice covered part of the Fram Strait was obtained.

The cruise ended in Longyearbyen on the 22nd of August and all scientific personnel left the ship.

COMMENTS

The ice conditions were heavier this year than they have been for the last 2-3 years, which severely hampered our work. Two facts were thereby brought into focus.

1: The difficulties to combine marine work with land operations, especially if these involve waiting or return after some time to the same position. The freedom to choose the best course from pure navigational considerations then becomes seriously circumscribed. The argument "since you will be there anyway" is not valid and gives no reason for the combination of marine and land operations. These observations naturally also apply to, late in the day, (un)offical visits arranged from land.

2: The importance of having helicopters onboard is also accentuated. The research activity can be extended into otherwise inaccessible areas and greatly increase the scientific returns of the cruise. Moreover, there will almost always be visibility enough to make a short reconnaissance take off, and opportunities will often arise for making those longer flights, which are invaluable for navigation in ice covered waters.

All things considered. The main part of the programmes could be carried out and the results look promising. The reader is refered to the individual project reports for further details.

ACKNOWLEDGEMENT

I would like to thank the ships crews for their wholehearted cooperation, advice and help, in the daily work and in critical situations, such as the operation off Kvitøya, the repair of the CTD winch and the sailing towards the moorings in the Fram Strait, where looming failure was turned into success.

Thanks are also due to the helicopter crew and to the participating scientists, who could live with the somewhat erratic planning by the chief scientist and still get their work done.

Bert Rudels

2. Participants

Name	Field	Address	Time onboard
Bert Rudels	Chief Scientist	Norsk Polarinstitutt	17.07.-22.08.
Øyvind Finnekåsa	Oceanography	Postboks 158	12.07.-22.08.
Vidar Hisdal	Meteorology	N-1330 Oslo Lufthavn	26.07.-13.08.
Torgny Vinje	Sea-ice	"	26.07.-22.08.
Matthew Colony	Sea-ice	"	17.07.-13.08.
Bjørn Lytskjold	Topography	"	17.07.-10.08.
Rasmus Gudbrandsen	Topography	"	17.07.-10.08.
Bjørn Erlingsson	Sea-ice	Univ. of Oslo	17.07.-22.08.
Hege Hisdal	Meteorology	Institutt for Geofysikk	26.07.-13.08.
Thomas Martinsen	Oceanography	Postboks 1022 Blindern	17.07.-13.08.
Arne Melsom	Oceanography	N-0315 Oslo 3	13.08.-22.08.
Halvor Slørdal	Oceanography	"	13.08.-22.08.
Bjørn Gulliksen	Ice-fauna	Univ. of Tromsø	17.07.-22.08.
Ole Jørgen Lønne	Ice-fauna	N-9000 Tromsø	17.07.-22.08.
Håkon Dahlen	Ice-fauna	"	17.07.-13.08.
Niels Nergaard	Sea-ice/ meteorology	C.M.I. Fantoftveien 38 N-5036 Fantoft	17.07.-22.08.
Sveinung Løseth	Sea-ice	NMC The Sintef Group Klæbuveien 153 N-7034 Trondheim-NTH	17.07.-13.08.

Seymour Laxon	Sea-ice	Mullard Space Science Centre Univ. College of London Holmbury St. Mary Dorking, Surrey RH5 6NT U.K.	17.07.-13.08.
Leif Anderson	Oceanography	Göteborgs Univ.	17.07.-13.08.
Roger Lindgren	Oceanography	Inst. for Analytisk och Marin Kemi CT4/GU S-412 96 Göteborg	17.07.-13.08.
Knut Aagaard	Oceanography	SOAA/PMEL BIN C 15700/Bldg 3 7600 Sand Point Way NE Seattle WA 98115-0070 U.S.A.	15.09.-22.08.
Clarc Darnall	Oceanography	Univ. of Washington School of Oceanography Seattle WA 98105 U.S.A.	15.08.-22-08.
Detlef Quadfasel	Oceanography	Universität Hamburg Inst. für Meereskunde Heimhuderstrasse 71 D-2000 Hamburg 13	13.08-15.08.

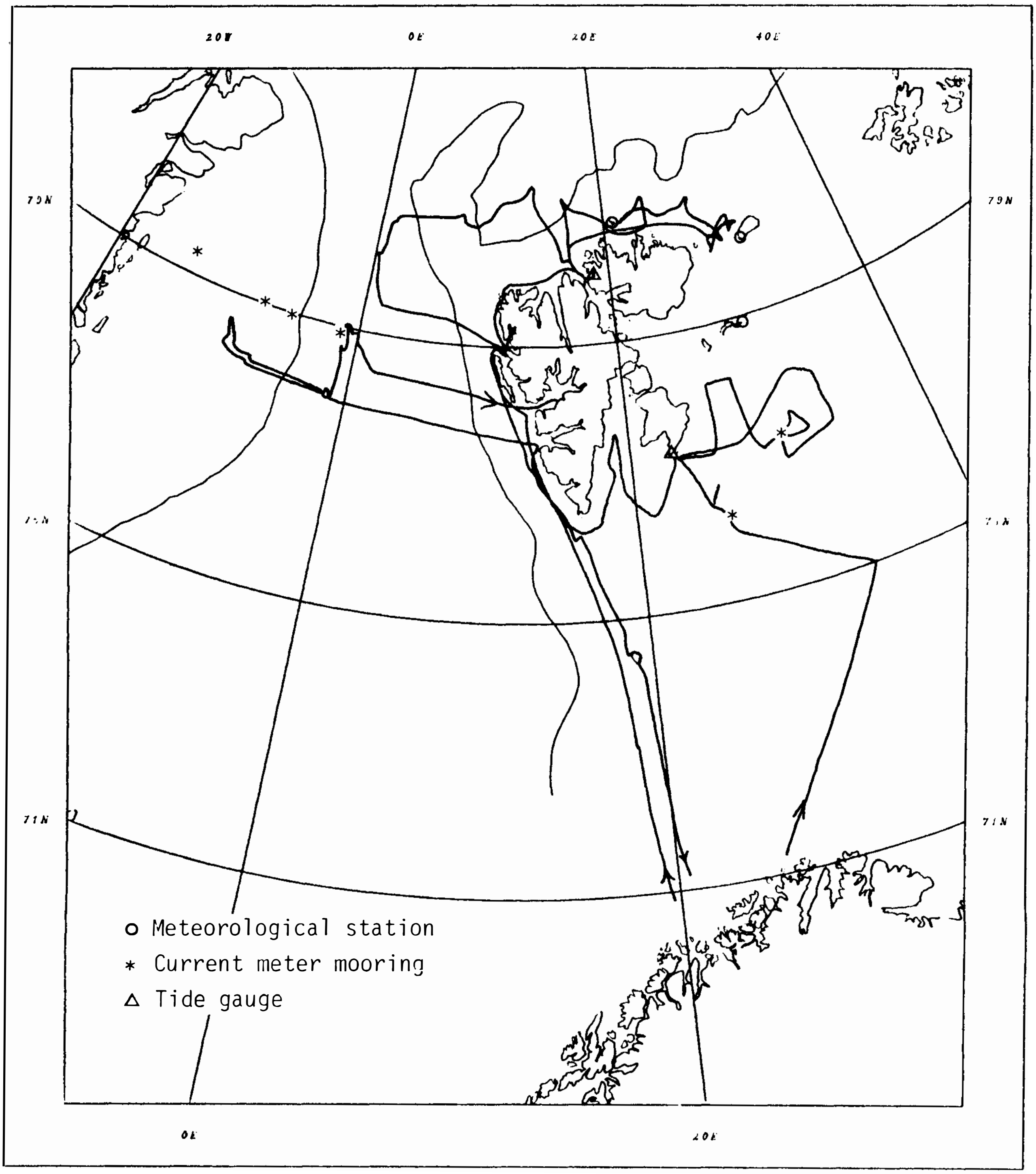

Fig. 1. - Cruise track.

4. Station List

O: Oceanography, C: Chemical sampling, *: Cesium sampling
I: Ice investigations
R: Radiation measurements

Stat. No.	Lat.	Long	Date	GMT	Depth m	Observations
74	71^0 15'N	25^0 00'E	860718	0040	295	O *
75	71^0 25'N	25^0 29'E	860718	0210	298	
76	71^0 35'N	25^0 44'E	860718	0345	285	
77	71^0 45'N	26^0 03'E	860718	0500	325	
78	72^0 00'N	26^0 33'E	860718	0655	270	
79	72^0 15'N	27^0 04'E	860718	0850	233	
80	72^0 30'N	27^0 35'E	860718	1040	297	
81	72^0 44'N	28^0 12'E	860718	1235	352	O *
82	72^0 59'N	28^0 45'E	860718	1440	337	
83	73^0 15'N	29^0 19'E	860718	1635	330	
84	73^0 30'N	29^0 51'E	860718	1825	380	
85	73^0 45'N	30^0 25'E	860718	2020	380	
86	74^0 00'N	31^0 00'E	860718	2215	285	
87	74^0 15'N	31^0 38'E	860718	0005	240	
88	74^0 30'N	32^0 18'E	860718	0210	205	
89	74^0 45'N	32^0 57'E	860718	0410	195	
90	75^0 00'N	33^0 30'E	860719	0600	146	O C *
91	75^0 04'N	33^0 00'E	860719	0715	176	
92	75^0 04'N	33^0 00'E	860719	0725	179	
93	75^0 08'N	32^0 29'E	860719	0830	222	
94	75^0 12'N	32^0 00'E	860719	1030	321	O C
95	75^0 20'N	31^0 00'E	860719	1130	367	
96	75^0 29'N	30^0 00'E	860719	1325	363	
97	75^0 37'N	29^0 00'E	860719	1515	314	O C
98	75^0 44'N	28^0 00'E	860719	1705	246	
99	75^0 48'N	27^0 30'E	860719	1805	245	
100	75^0 51'N	27^0 00'E	860719	1905	211	
101	75^0 56'N	26^0 30'E	860719	2000	142	
102	76^0 00'N	26^0 00'E	860719	2055	148	O C *
103	77^0 11'N	23^0 33'E	860721	1925	120	
104	77^0 10'N	24^0 30'E	860721	2105	70	
105	77^0 10'N	25^0 30'E	860721	2246	85	
106	77^0 20'N	26^0 00'E	860721	2355	138	

107	77^0 30'N	26^0 00'E	860721	0110	179		
108	77^0 40'N	26^0 00'E	860721	0215	180		
109	77^0 50'N	26^0 00'E	860722	0320	114		
110	78^0 00'N	26^0 00'E	860722	0425	170		
111	78^0 10'N	26^0 58'E	860722	0600	200		
112	78^0 10'N	27^0 00'E	860722	0915	113		
113	78^0 10'N	28^0 00'E	860722	1145	320	0 C *	
114	78^0 00'N	28^0 05'E	860722	1215	155		
115	77^0 50'N	28^0 10'E	860722	1315	229		
116	77^0 40'N	28^0 15'E	860722	1420	206		
117	77^0 25'N	28^0 22'E	860722	1555	172		
118	77^0 10'N	28^0 30'E	860722	1720	191		
119	77^0 09'N	29^0 31'E	860722	1855	209		
120	77^0 10'N	30^0 30'E	860722	2040	198		
121	77^0 10'N	31^0 30'E	860722	2220	188		
122	77^0 10'N	32^0 20'E	860722	2345	187		
123	77^0 15'N	32^0 10'E	860723	0030	182		
124	77^0 20'N	31^0 50'E	860723	0120	180		
125	77^0 25'N	31^0 30'E	860723	0205	170		
126	77^0 30'N	31^0 10'E	860723	0250	197		
127	77^0 20'N	31^0 10'E	860723	0355	182		
128	77^0 12'N	30^0 12'E	860723	0800	202		
129	77^0 00'N	30^0 10'E	860723	0945	232		
130	76^0 50'N	30^0 10'E	860723	1145	252	0 C	
131	76^0 54'N	30^0 55'E	860723	1225	235		
132	76^0 58'N	31^0 40'E	860723	1340	230		
133	77^0 02'N	32^0 30'E	860723	1500	185		
134	77^0 06'N	33^0 15'E	860723	1620	133		
135	77^0 10'N	34^0 00'E	860723	1730	165	0 C	
136	77^0 26'N	33^0 50'E	860723	1925	158		
137	77^0 41'N	33^0 37'E	860723	2100	193		
138	77^0 56'N	33^0 33'E	860723	2235	190		
139	77^0 59'N	32^0 55'E	860723	2335	140		
140	78^0 03'N	32^0 20'F	860724	0030	192		
141	78^0 06'N	31^0 45'E	860724	0125	208		
142	77^0 52'N	30^0 40'E	860724	0335	263		
143	77^0 42'N	29^0 45'F	860724	0510	219		
144	77^0 31'N	29^0 00'E	860724	0640	167		
145	77^0 12'N	27^0 30'E	860724	0920	226		
146	77^0 12'N	26^0 30'E	860724	1045	120		
147	77^0 00'N	22^0 50'E	860724	2240	96	0	I
148	76^0 50'N	22^0 30'E	860724	2345	118		
149	76^0 40'N	22^0 00'E	860725	0100	143		
150	76^0 25'N	21^0 15'E	860725	0255	250		
151	76^0 40'N	20^0 00'E	860725	0530	180		
152	76^0 50'N	19^0 30'E	860725	0650	157	0 C	

153	77^0 00'N	19^0 30'E	860725	0810	130	O	C			
154	77^0 10'N	19^0 20'E	860725	0925	161	O	C			
155	77^0 20'N	19^0 17'E	860725	1030	140	O	C			
156	77^0 30'N	19^0 12'E	860725	1145	185	O	C	*		
157	77^0 40'N	19^0 08'E	860725	1335	145	O			I	
158	76^0 23'N	17^0 56'E	860726	0150	274	O			I	
159	76^0 15'N	16^0 45'E	860726	0330	217					
160	80^0 06'N	16^0 58'E	860727	2030	388					
161	80^0 11'N	17^0 00'E	860727	2130	237	O			I	
162	80^0 20'N	17^0 01'E	860727	2225	37					
163	80^0 27'N	17^0 00'E	860727	2315	41					
164	80^0 35'N	17^0 00'E	860728	0015	156					
165	80^0 45'N	17^0 00'E	860728	0130	172					
166	80^0 49'N	16^0 59'E	860728	0215	508					
167	80^0 55'N	17^0 00'E	860728	0310	971					
168	81^0 05'N	16^0 50'E	860728	0620	1074	O	C		I	
169	81^0 07'N	16^0 45'E	860729	0845	1385					
170	81^0 05'N	16^0 26'E	860729	1125	1950	O	C	*	I	R
171	80^0 57'N	17^0 32'E	860729	1720	450					
172	80^0 55'N	18^0 00'E	860729	1805	178					
173	80^0 53'N	18^0 30'E	860729	1840	139					
174	80^0 50'N	19^0 04'E	860729	1910	170					
175	80^0 47'N	19^0 36'E	860729	1950	115					
176	80^0 45'N	10^0 02'E	860729	2030	132					
177	80^0 34'N	21^0 15'E	860730	0305	114					
178	80^0 34'N	21^0 46'E	860730	0405	134					
179	80^0 33'N	22^0 08'E	860730	0500	221					
180	80^0 33'N	22^0 45'E	860730	0600	105					
181	80^0 34'N	23^0 24'E	860730	0645	308					
182	80^0 34'N	23^0 52'E	860730	0740	173					
183	80^0 40'N	23^0 53'E	860730	0820	166	O			I	
184	80^0 45'N	23^0 49'E	860730	0855	183					
185	80^0 50'N	23^0 50'E	860730	0940	177					
186	80^0 55'N	23^0 51'E	860730	1020	293					
187	81^0 00'N	23^0 52'E	860730	1055	360					
188	81^0 02'N	23^0 54'E	860730	1140	391					
189	81^0 04'N	23^0 58'E	860730	1640	391					
190	80^0 45'N	21^0 43'E	860731	0000	191					
191	80^0 52'N	22^0 30'E	860731	0115	102					
192	80^0 52'N	23^0 15'E	860731	0255	125					
193	80^0 52'N	24^0 00'E	860731	0255	125					
194	80^0 43'N	24^0 75'E	860731	0455	140					
195	80^0 44'N	25^0 31'E	860731	0555	182					
196	80^0 44'N	26^0 22'E	860731	0645	110					
197	80^0 46'N	27^0 00'E	860731	0730	83					
198	80^0 46'N	27^0 43'E	860731	0825	97					

199	80° 55'N	27° 53'E	860731	1810	87	O C	I R
200	80° 38'N	28° 00'E	860731	2110	85		
201	80° 32'N	28° 17'E	860731	2155	209		
202	80° 23'N	29° 21'E	860801	0000	451	O C	I R
203	80° 14'N	29° 48'E	860801	0135	224	O	I
204	80° 07'N	29° 55'E	860801	0300	301	O	I
205	80° 12'N	30° 11'E	860801	0920	223	O	I
206	80° 13'N	29° 43'E	860801	1046	235		
207	80° 13'N	29° 13'E	860801	1156	245		
208	80° 13'N	28° 49'E	860801	1240	127		
209	80° 00'N	29° 06'E	860801	1450	307	O C	I
210	80° 24'N	31° 08'E	860802	0740	210		
211	80° 01'N	17° 40'E	860803	2115	378		
212	80° 15'N	16° 48'E	860803	2300	194		
213	80° 30'N	16° 00'E	860804	0100	349		
214	80° 41'N	15° 21'E	860804	0240	823	O C	
215	80° 43'N	15° 21'E	860804	0320	1225	O C	
216	80° 46'N	15° 12'E	860804	0440	1753	O C	
217	81° 10'N	13° 47'E	860804	0915	2175	O C	
218	81° 18'N	13° 56'E	860804	1350	2250	O C *	
219	81° 18'N	13° 52'E	860804	1930	2250	O C	I R
220	81° 05'N	11° 32'E	860805	0405	2130		
221	80° 57'N	10° 18'E	860805	0650	1290		
222	80° 51'N	10° 02'E	860805	0842	1043		
223	80° 43'N	08° 43'E	860805	1025	997		
224	80° 53'N	07° 35'E	860805	1715	893	O	I R
225	80° 39'N	05° 27'E	860806	0215	686		
226	80° 27'N	04° 00'E	860806	0500	935		
227	80° 14'N	03° 11'E	860806	0800	1350		
228	80° 10'N	03° 03'E	860806	0920	1900		
229	80° 06'N	02° 32'E	860806	1110	2500	O	I R
230	80° 09'N	02° 40'E	860808	0645	2034	O C *	I
231	80° 09'N	02° 40'E	860808	0830	2034	O C *	I
232	76° 19'N	16° 20'E	860810	1930	90		
233	76° 12'N	16° 32'E	860810	2010	254		
234	76° 05'N	16° 45'E	860810	2100	325		
235	75° 57'N	16° 57'E	860810	2200	322		
236	75° 47'N	17° 14'E	860810	2320	281		
237	75° 34'N	17° 32'E	860811	0035	158		
238	75° 18'N	17° 50'E	860811	0225	82		
239	75° 00'N	18° 25'E	860811	0435	62		
240	74° 45'N	18° 43'E	860811	0600	193		
241	74° 13'N	19° 33'E	860811	1410	93		
242	73° 58'N	19° 34'E	860811	1550	155		
243	73° 46'N	19° 38'E	860811	1710	316		
244	73° 29'N	19° 48'E	860811	1855	480		

245	72° 01'N	19° 06'E	860814	0800	336			
246	72° 10'N	19° 04'E	860814	0900	334			
247	72° 20'N	19° 00'E	860814	1010	360			
248	72° 32'N	18° 56'E	860814	1130	358			
249	72° 40'N	18° 54'E	860814	1225	374			
250	72° 50'N	18° 52'E	860814	1330	398			
251	73° 00'N	18° 48'E	860814	1437	418			
252	73° 10'N	18° 46'E	860814	1546	430			
253	73° 20'N	18° 42'E	860814	1655	463			
254	73° 30'N	18° 39'E	860814	1758	411			
255	73° 39'N	18° 33'E	860814	1908	314			
256	73° 50'N	18° 32'E	860814	2008	223			
257	74° 00'N	18° 30'E	860814	2109	131			
258	74° 10'N	18° 26'E	860814	2215	117			
259	74° 20'N	18° 21'E	860814	2315	91			
260	74° 30'N	18° 11'E	860815	0015	91			
261	74° 40'N	17° 57'E	860815	0115	102			
262	74° 50'N	17° 44'E	860815	0220	309			
263	75° 00'N	17° 33'E	860815	0325	117			
264	75° 10'N	17° 20'E	860815	0420	138			
265	75° 20'N	17° 08'E	860815	0525	152			
266	75° 30'N	16° 54'E	860815	0620				
267	75° 40'N	16° 41'E	860815	0717	290			
268	75° 50'N	16° 29'E	860815	0817	367			
269	76° 00'N	16° 15'E	860815	0925	378			
270	76° 10'N	15° 58'E	860815	1033	326			
271	76° 15'N	15° 55'E	860815	1114	247			
272	76° 20'N	15° 47'E	860815	1154	135			
273	78° 57'N	05° 15'W	860818	2215	1030			
274	78° 58'N	05° 37'W	860818	2340	809			
275	78° 58'N	05° 51'W	860819	0100	597			
276	78° 59'N	06° 07'W	860819	0200	403			
277	79° 01'N	05° 05'W	860819	1515	1266	O	I	R
278	78° 59'N	04° 36'W	860819	2015	1552	O	I	
279	78° 59'N	04° 12'W	860819	2130	1810			
280	79° 00'N	03° 35'W	860819	2330	2200	O	I	
281	79° 00'N	02° 35'W	860820	0245	2500	O	I	R
282	78° 56'N	00° 59'W	860820	1200	2620			
283	78° 49'N	00° 30'E	860820	1840	2580	O	I	
284	78° 45'N	02° 00'E	860820	2130	2570			

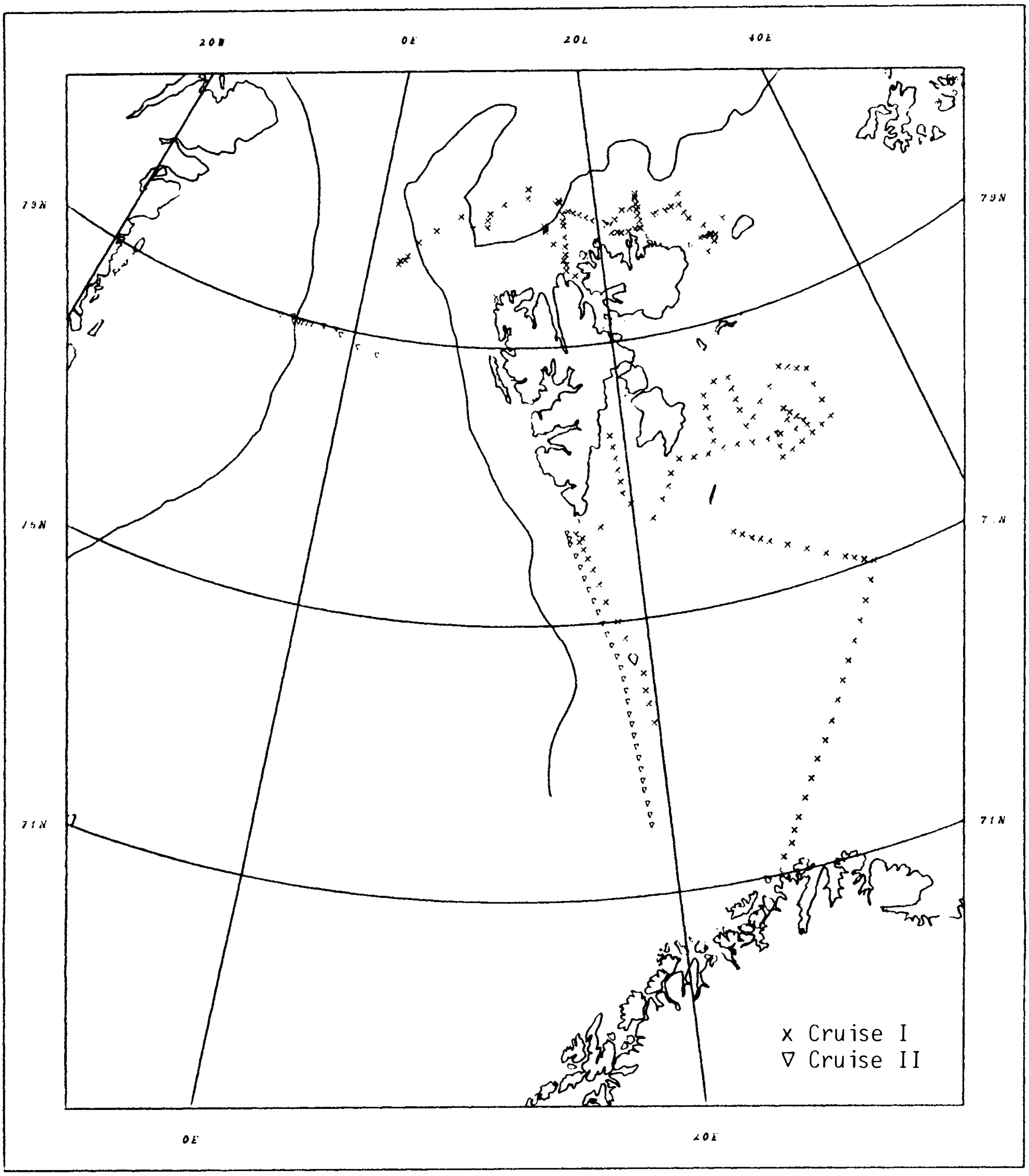

Fig. 2. - CTD stations.

6. Cruise Report: Physical Oceanography

Participants: Bert Rudels, Øyvind Finnekåsa, Thomas Martinsen, Arne Melsom, Halvor Slørdal, Knut Aagaard, Clark Darnall, Detlef Quadfasel.

OBJECTIVES

The heat loss and the resulting cooling and freezing of the surface water lead to convection and substantial transformations of the water masses in the Barents Sea. The varying topography, the tidal stirring and the background current field will affect the transformations and create a wide spectrum of water masses. In particular, dense water masses formed over shallow areas will drain into the deeper depressions. Another factor also influencing the mixing processes is the interaction between Atlantic and cold "Arctic" waters across the east-west running frontal zone in the Barents Sea.

Are the transport of Atlantic water over and the water mass productions in the Barents Sea large enough to be of importance for the circulation in the Polar Ocean? How intense are the interactions between the Polar Ocean and the Northern Barents Sea?

A serious attempt to work with these problems demands a long time study consisting of CTD and geochemical tracer observations combined with long term moorings. Only impressions of what is going on can be had on a single cruise. Impressions, which, however, may be of vital importance, when a deeper study shall be planned.

This years observations therefore should have concentrated on the area between Svalbard and Frans Josef Land and on the northern shelf and slope as far into the Polar Ocean as possible.

However, at present political considerations prevent us from working east of 35^0E, making sensible monitoring work impossible and excluding the interesting eastern shelves and depressions from observation.

The current work therefore has to focus on the nature and strength of the local mixing and convection processes and their interaction with surrounding water masses, on the exchanges between the "Arctic" and "Atlantic" parts of the Barents Sea and on the conditions in the Polar Ocean. Some of these aims were partly fulfilled during the first cruise this summer.

The second cruise were to contribute to the long-term international study of the exchanges through the Fram Strait and primarily assigned to mooring work in the ice covered part of the strait.

FIELDWORK

The physical oceanography programme onboard consisted of CTD observations and mooring work.

Sections were taken in the southern part of the Barents Sea to study the inflow of Atlantic water, the outflow of cold lowsaline water from the north and the strength and nature of the cooling and freezing processes.

In the area between Edgeøya and Storbanken a number of stations was taken to establish if Atlantic water from the south passed over the sill into the northern depressions or if it mostly recirculated further south.

In Storfjorden the ice production leads to the formation of very dense bottom water and a CTD section was taken into the fjord to study this water mass and its interaction with the surrounding waters.

The work north of Nordaustlandet had to be confined to the shelf areas due to heavy ice conditions. Two east-west and several north-south sections across the ice edge were taken to observe the horizontal variations in the water mass properties. A section was also taken across the passage between Kvitøya and Storøya.

North of Hinlopen it was possible to work over the shelf break and down the continental slope into the Sofia Deep. This is not far enough into the Polar Basin to obtain observations reporesentative for the deep waters of the Eurasian basin. Still, the deep is sheltered from direct influence from the Greenland/Norwegian Seas by the Nansen Ridge and its waters should exhibit some differences from the deep waters in the Fram Strait. Opportunity to study these differences was given as LANCE crossed the Nansen Ridge and completed the northerly work in the Fram Strait.

On the second cruise a long CTD section between the north coast of Norway and Svalbard was obtained, but due to the limited time available only the ice covered part of a section across the Fram Strait could be sampled.

The mooring work was not quite successful. The moorings put out by NP in the Barents Sea lacked transponders and had to be retrieved by dredging. The mooring deployed south-east of Hopen was not found in spite of an extensive 36 hours search. However, the second mooring at 77^0 11'N, 30^0 12'E was retrieved after only half an hours work at the position.

The system was placed at 200 m depth and consisted of 2 RCM-4 currentmeters at 150 and 190 m respectively and a 100 m long termistor chain between 40 and 140 m. The 10 termistors were equally spaced on the chain. The mooring was put out to study the north-south exchanges between the southern and northern parts of the Barents Sea and the effect of the winter cooling and freezing on the upper layers of the water column.

Also in the Fram Strait there were some reverses. Due to thick ice on the Greenland shelf the two western moorings could not be reached, and only after almost two days of sailing in heavy ice, trying different approaches, did we get to the third position. The mooring, deployed by the Univ. of Washington was equipped with acoustic transponder and the retrieval went without complications in spite of several large ice floes in the vicinity. A new mooring was put out at the same position to register for another year.

RESULTS

The observations have not yet been properly processed and calibrated and the discussion below, based solely on CTD observations, is to convey impressions not to present the results of analysis.

The sections taken between the Norwegian coast and Sentralbanken and between Sentralbanken and Svalbardbanken showed, in addition to the expected flow of Atlantic water towards the east and north, that a cold dense water mass was present on the slope of Sentralbanken and in the deeper parts of the sections. The dense water on the slope appears to be moving anticyclonally round the bank and slowly drain into the deep. The water mass could have been created by ice formation over Sentralbanken this winter.

The water in the Hopen Deep was the colder and denser than what has been observed on previous NP cruises. The density of the bottom water was higher than that found for the Norwegian and Greenland Seas bottom waters. One reason for the higher densities could be the large ice production this winter as compared with that i recent years.

Increased salinity and density were also found in Storfjorden, where the very high salinity of 35.45 as compared to 35.15 last year was observed in the bottom water. The temperature was constant and at the freezing point in a thick layer of increasing salinity, which indicates a draining and layering of water from shallower areas, with its salinity increasing with time throughout the winter.

Bottom water from Storfjorden is observed much diluted on the section between Sørkapp and Bjørnøya and the production is probably not large enough to greatly influence the water masses in the Fram Strait.

The bottom water in the Hopen Deep as well as the cold core resulting from local winter convection and observed in the northern Barents Sea and east of Hopen was not found on the section between Bjørnøya and the Norwegian coast. The bottom water appears to loose its characteristics by mixing with inflowing Atlantic water. The fate of the cold core is not clear, but if it passes westward over Svalbard banken north of Bjørnøya, it has to rise from the 100-120 isobath to a depth less than 50 m.

The observations between Edgeøya and Storbanken showed that warm Atlantic water from the south was present at the sill. This indicates that at least intermittently the Atlantic layer in the northern Barents is renewed from the south and not solely from the north and the Atlantic layer in the Polar Ocean, as its low temperature and salinity might suggest.

On the shelf area north of Nordaustlandet no locally formed water was found, which was dense enough to penetrate deeper into the Polar Ocean water column than down to the halocline and the upper parts of the Atlantic layer. If these observations are representative for the northern shelf area, then the thermodynamic processes occuring there are not strong enough to create the differences observed between the deep and bottom waters in the Sofia Deep and in the Fram Strait. The important transformations must occur further east, perhaps in the eastern Barents Sea.

The work in the Fram Strait had to be broken off prematurely, but hopefully it will be possible, when the data become available, to combine the observations from LANCE with those taken from R/V VALDIVIA in the eastern part to form a complete section across the Fram Strait and to obtain a coverage of the ice free parts of the northern Norwegian and Greenland Seas.

ACKNOWLEDGEMENT

I will again take the opportunity to thank the crews for their assistance and for their know-how shown in repairing the CTD winch, which made observations possible throughout the cruises.

Bert Rudels

7. Cruise report for the Chemical Oceanography Programme

by

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The objective for the Chemical Oceanography Programme was twofold. First, to investigate the buildup of chemical constituents in the cold heavy bottom waters of Barents Sea which is formed as a result of brine drainage from sea ice. Second, to identify the chemical signature of the Arctic Ocean bottom water in the Eurasian basin.

The ideal site to study the dense bottom wasters would be the eastern Barents Sea, but due to political reasons the cruise was restricted to west of about 35^0E. However, a nice section into Storfjorden of southern Spitsbergen was sampled. The salinity was nearly 35.5 in the bottom water with temperature close to freezing. The chemical signals indicate decay of organic matter at the sediment surface with subsequent flux of the resulting inorganic constituents into the bottom water. Earlier investigations in the same area might make it possible to do some rate calculations. At this point the only conclusion we can draw is that it seems that silica is released to the overlaying water from the sediment to a relatively larger extent than the other nutrients. Storfjorden is not a quantitatively important source for these high density bottom waters as are the depressions in the eastern Barents Sea. However, the area can be used to investigate the processes and to get a grip of the rates of the transports of chemical constituents across the sediment water interface during these special conditions.

The second goal, to identify the chemical signatures of the Arctic Ocean bottom water was hampered due to time and ice sailing restrictions of M/S LANCE. Instead of getting north of 30^0E we sampled a section over the shelf break into the Sofia deep and reached over 2200 metres at $81^0$18'N, $13^0$56'E. The signature of the bottom water (below 2000 metres) at this position is most likely affected by the topography and can not be taken as typical of the Eurasian basin. However, this is the second time that chemical analysis is performed on these waters (the first one was YMER-80) so it is our hope that the result will give us better information on how much the high density bottom waters of Barents Sea is affecting the deep waters of the Eurasian basin.

All in all we analysed 150 samples from 28 stations. On the ship we analysed the samples for phosphate, nitrate, silicate, oxygen, pH, total alkalinity and total carbonate. Furthermore we took samples for later determination of freons, nutrients and salinity (Bedford Institute of Oceanography, Canada), cesium-137 / Strontium-90 (Woods Hole, USA) and calcium (by ourselves).

8. SEA ICE INVESTIGATIONS

a) Morphology and distribution

PARTICIPANTS

Torgny Vinje (responsible), Niels Nergaard, Bjørn Erlingsson, Ånund Sigurd Johnsen and Mattew Colony (Norwegian Polar Research Institute). Seymour Laxon from Mullard Space Science Laboratory and Sveinung Løset from the Norwegian Hydrotechnical Laboratory performed special investigations which will be reported separately.

OBJECTIVES

1) Investigation of the relationship between bottom and top topography of ice floes using scanning sonar.
2) Characterizing the ice fields at regular intervals using the WMO ICEOB-code.
3) Measuring ice thickness on a large scale by drilling and by measuring the fractures of ice floes.

FIELD WORK

Ice floe topography

The bottom topography of altogether 11 ice floes were measured with a Mesotech 971 colour imaging sonar. The sonar was lowered through a hole in the ice and steered by a 15 m long pole. The scanning mode could be remotely controlled from a sonar processor onboard the ship which would be anchored to the floe during the measurements. The profile of the underside of the ice was scanned for every 20^0 asimuth. The surface was photographed from helicopter for detailed mapping. Two or three sections were also leveled with the aid of a theodolite and drillings were made along these sections for control. The sonar gave interesting information on the subsurface topography, displaying profiles of domes and ice-keels (see Fig.1).

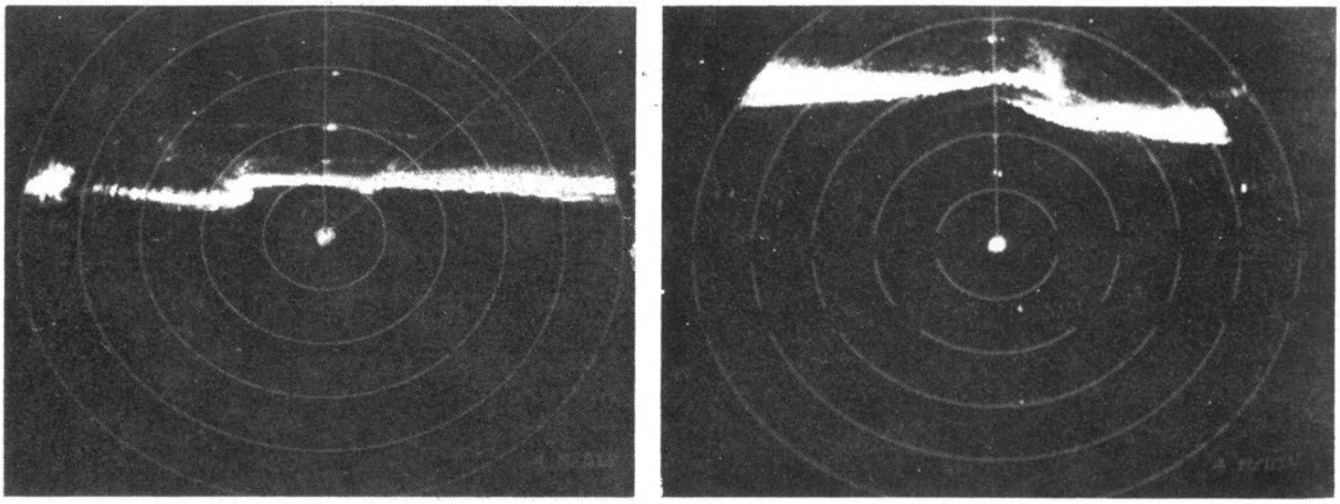

Fig. 1

Samples of bottom profiles of ice floes as obtained by the scanning sonar, Mesotech 971. Scale: 4 m per division.

Most of the observations were stored on video tapes. A computer program for digitized storing was develloped and tested for some of the series. A computerized control of the measurements simplified the evaluations considerably and this method will be refined for later use. The tilt of the sonar head will also then be registered. This will in addition simplify the corrections which have to be made for the effect of currents on the 10 m long steering pole.

Ice field morphology

The ice fields were charactertized according to the WMO ICEOB-code which gives a detailed discription of percentage distribution of sizes and ages of the ice floes as well as melting and ridging conditions. Altogether 50 observations were made along the route.

We observed mainly second year and first year ice east of about 07^0E on the first leg while multiyear ice was the most frequent type west of this longitude as well as during the second leg. Apart from the marginal areas where the floe size varied between 20 and 100 metres we found very large areas with big and vast floes, covered with numerous melt ponds. In some areas they covered as much as 30-40% of the ice floes (Fig.2).

Fig. 2

Typical melt pond areas was quite extencive this year in the cruise area.

The ICEOB-code has been applied on the annual expeditions in the Barents Sea and the Fram Strait since 1981 and on the meteorological land stations Hopen, Bjørnøya and Jan Mayen since 1970.

The number of ridges was counted from the helicopters over four periods of five or ten minutes between 81^0-82^{0}N and 7^0-14^{0}E. The average number of ridges varied between 7.1 and 8 km^{-1}, the ice coverage being 80-90%. The observed frequency is in accordance with previous measurements in this area.

Altogether 30 icebergs were observed on the first leg. Five of these icebergs, observed at 81^{0}06'N and 16^{0}50'E, we assume to be pieces of a larger ice island (Fig. 3). The freeboard was measured to be between 5 and 10 metres and the largest piece had a length of 520 metres. Another accumulation of 4-5 icebergs was observed at 82^{0}25'N and 14^{0}E and at 80^{0}06'N and 02^{0}E. One of these bergs was as high as the bridge, i.e. about 15 metres.

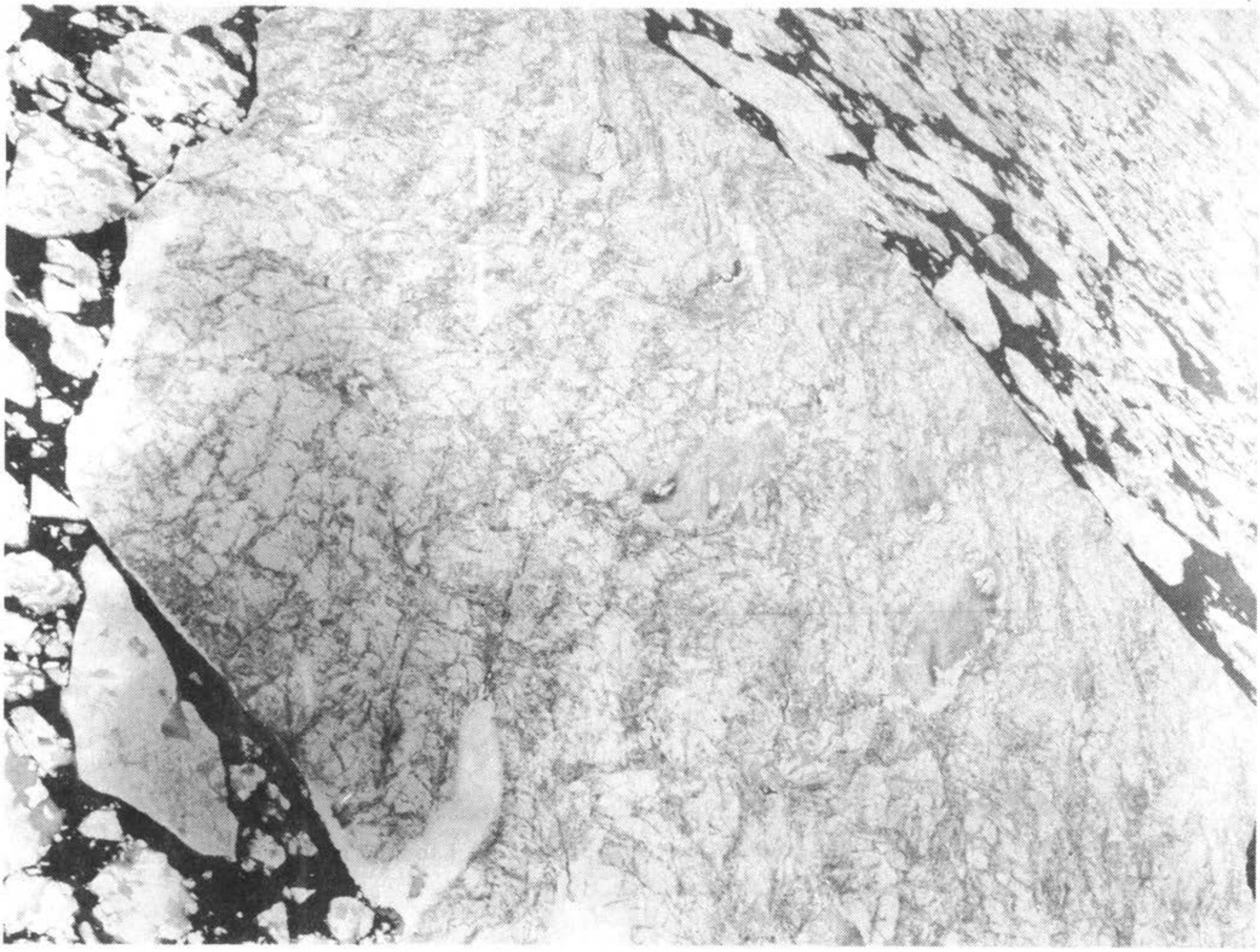

Fig. 3

Ice island observed near 81^{0}06'N and 16^{0}15'E. The maximum length was 520 m and the highest freeboard 9.5 m. Altogether five pieces of the same origin was observed in the vicinity og the largest island.

Drillings

Altogether 80 drillings were made on level ice along the route. The Markov-Wittman model of a ridge was used as a guideline. This model suggest that the subsurface extension of a ridge is one order of magnitude wider than the surface extension. The freeboard was measured after having removed the cruched ice from the drilled hole.

Pronounced deviations from point to point isostatic equilibrium seem to be common in an ice field (Fig. 4). It is assumed that the melting process plays an important role in this connection and that a maximum deviation is observed when the melt ponds are drained.

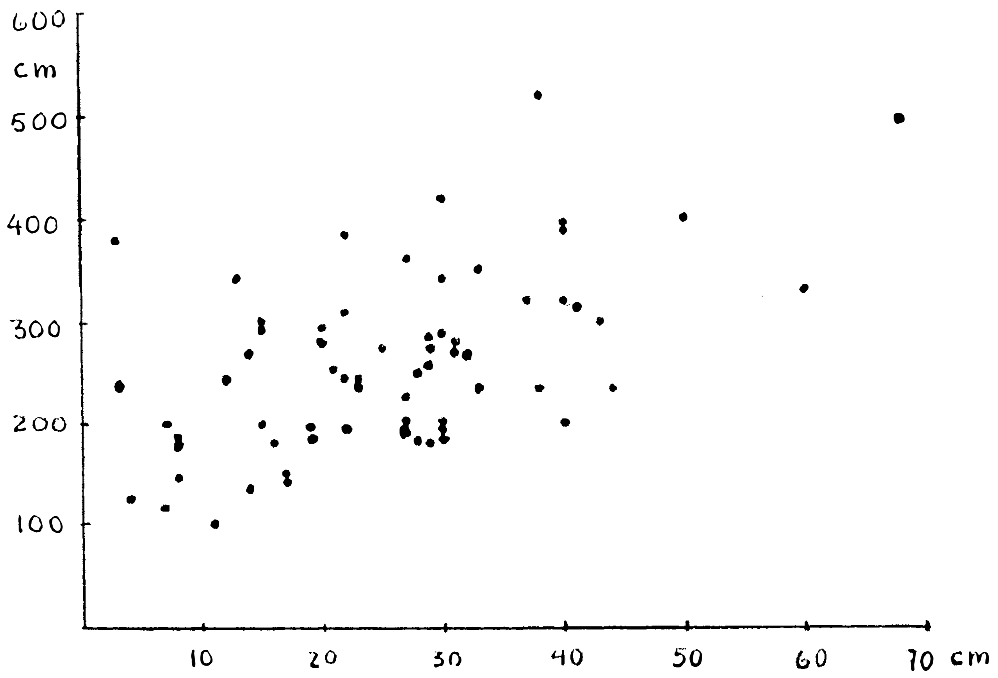

Fig. 4

The measured ice thickness versus the freeboard. There was 5-10 cm granular snow on the ice at most locations. Isostatic conditions does not seem to be very well established.

The thickness of the thinner ice at the drilling site was measured either by measuring the fracture against a known length mark on the rail of the ship, or by age determination. The average thickness of level ice for a given location have been obtained by weighting the relative percentage coverage of the various ice types in the area as observed in ICEOBS.

Satellite images

All LANDSAT images with cloud cover less than 40 % have been ordered for the expedition area. These images will be used in a combined study of ice conditions, surface reflectivity of different wave lengths of electromagnetic radiation and distribution of terrigenous or/and biogenous material which is frequently observed in the area.

b) Reflectivity properties (13.5 GHz)

M/S LANCE cruise 17/7 - 13/8/86 Cruise report

Seymor Laxon
University College London, Mullard Space Science Laboratory
Holmbury St. Mary, Dorking, Surrey RH56NT, U.K.

The aim of the work on this cruise was to measure the Fresnel reflection co-efficient, at a radar wavelength, on summer ice in the Barents Sea. The purpose on this work is to gain a better understanding of the return signals from a satellite borne radar altimeter show that unusually high power returns are observed over such areas and we believe that the altimeter may provide unique information on the nature of sea ice. Such an instrument will be flown on the European Space Agency ERS-1 satellite to be launched in late 1989 which will reach latitudes up to 82 degrees.

The instrument used for the measurements consisted of a 13.5 Ghz Gunn diode oscillator with two detectors. One measuring incident radiation and the other measuring reflected radiation. The ratio of these two values, after instrument corrections, yields the Fresnel reflection co-efficient. The design of the instrument requires the surface to be flat, to 6 mm, and also homogeneous radiation to be minimal, i.e. less than 6 mm. The instrument has been used on land ice at very low temperatures but never previously on sea ice.

Measurements using the instrument were made on several ice floes and measurements of snow density, temperature and surface roughness were also carried out. Most of the ice floes visited had a covering of wet snow or large ice crystals. Measurements of the reflection co-efficient made over small areas showed an unacceptable large variation in the reflected power. This was certainly due to the nature of the surface and not some fault with the instrument, since measurements over the meltponds showed very steady readings. The conclusion of this is that the instrument is unsuitable for measurements of the Fresnel reflection co-efficient of snow on first year ice.

Although the measurements of radar reflection were not successful, measurements of the ice floe surface roughness, observations of the size, elevation and roughness of meltponds and also the water between floes proved extremely interesting. It is my feeling that radar altimeter returns in sea ice areas will be dominated by reflections from meltponds and other areas of water. I therefore think that in future, studies of radar altimeter returns over sea ice should focus attention on these characteristics.

Last of all I would like to thank the crew and everyone else onboard the Lance for a very interesting and enjoyable cruise. I sincerely hope that we will be able to work with NP in the future as I think there is much to be gained from our cooperation.

c) Physical properties

86-08-12

Norwegian Hydrotechnical Laboratory (NHL)
The SINTEF-GROUP
Klæbuveien 153
N-7034 TRONDHEIM-NTH

RESEARCH CARRIED OUT BY NHL ON
CRUISE WITH M/S LANCE 86.07.16 - 86.08.13

1. OBJECTIVES

The main objectives for this project were to:

i) Collect ice core samples of winter and multiyear sea ice,

ii) register drift and melting of growters,

iii) detect growters by means of scanning sonar (acoustics),

iv) measure sea ice spray distribution on M/S LANCE.

2. ACTIVITIES CARRIED OUT ON THE CRUISE

i) Nine different ice floes were examined during this cruise. Core samples were collected from 7 of these ice floes.

Ice floe #	Position	# cores
2	N 81^{0}05' E 16^{0}51'	2
3	N 81^{0}04' E 23^{0}58'	1
6	N 81^{0}04' E 13^{0}47'	1

7	N 80^{0}52' E 07^{0}30'	1
8	N 80^{0}12' E 02^{0}03'	1
9	N 80^{0}09' E 01^{0}59'	1

We measured the density of the ice cores.
NHL participated in the supplementary ice research and especially in the topological mapping of ice floes' and schrewridges' underside by means of a sonar (mesotech 971).
Scope and size of some melt ponds were registered.
The temperatures in the ponds, ice and surrounding sea were partly observed.

ii) Drift of growlers were not measured. We observed and registered the melting of 2 ice floes for a 24 hrs. time period.

iii) The reflecting properties of acoustic waves by the ice at a frequency of 675 kHz are superb. We tasted this on winter ice and multiyear ice.
In a pilot study growlers and ice floes were detected at a distance of 70 m from M/S LANCE while the sonar (Mesotech 971/675 kHz) was submerged 0.8 m into the seas and directed against the ice floes. The maximum ranges for the sonar of this frequency is 100 m.

iv) We performed 15 sea spray measurements on M/S LANCE for wind velocities varying from 0 to 23 m/s (rel.).
Vessel speed: 0 - 11.8 knots.

Sveinung Løset
Head, Section of Ice Engineering

9. MS LANCE 1986

Contribution to the cruise report

RADIATION MEASUREMENTS ON ICE FLOES

PARTICIPANTS

Vidar Hisdal (responsible), Norw. Polar Res. Inst.
Hege Hisdal (assistant)

BACKGROUND AND OBJECTIVES

The net radiation is generally the most important as well as the most variable term in the energy budget of the earth's surface. In ice-covered ocean areas a fundamental reason for this variability during the "light seasons" is the large changes with time and location of the areal average surface albedo. This is to some extent due to varying properties of the ice or snow cover. However, still more significant is the changeing portion of melt ponds and leads in the ice, which have considerably lower albedo values.

The objective of the field programme was to obtain information about the albedo of characteristic surfaces in ice-covered waters near the Svalbard archipelago. Together with knowledge of the fractional coverage of the different types of surfaces, for instance from aerial photographs, this should give a sufficient basis for the forming useful estimates of areal average albedos.

In addition to incoming and reflected solar radiation, also the total radiation balance (including radiation at "terrestrial temperatures") was measured.

FIELD WORK

Incoming and outgoing solar radiation were read separately, using a Schenk albedometer, while the radiation balance was measured by means of an Ersking net pyrradiometer. The two instruments were mounted on each end of a 2 m long horizontal bar, which was attached in the middle to a tripod. Observations were carried out on seven relatively large floes in close drift ice during the period 28 July to 8 August, the position ranging westwards from $80^0 52'$N, $28^0 12'$E to $80^0 08'$N, $02^0 00'$E. Three main types of surface were studied: melting snow, melt ponds, and open water (leads). In the majority of cases the sky was totally covered by relatively dense Stratocumulus.

PRELIMINARY RESULTS

Albedo of snow-covered ice varied from 0.43 ("contaminated", brownish snow) to 0.74 (new, wet snow fallen during the last couple of days). For "pure", old snow with coarse-grained surface, values around 0.65 were typical. Melt ponds with a light, milky bottom showed values about 0.30, decreasing to a far more frequent value of about 0.20 for those with a blue-ice bottom. As would be expected, the lowest albedos, 0.07 - 0.10, were measured over calm leads.

In one case the albedometer was mounted on a horizontal bar pointing out from a helicopter, and measurements were made from an altitude of 500 m. The albedo obtained in this way was in good agreement with that calculated on the basis of ground observations over the different types of surfaces and the fractional coverage of these surface types estimated from simultaneous aerial photographs.

Except for a few cases with clear, or almost clear sky, the total radiation balance was somewhat larger than the net solar radiation, indicating a heat gain of the surface by longwave radiation from atmosphere and clouds.

10. MS LANCE 1986

Contribution to the cruise report

ESTABLISHMENT AND REHABILITATION OF AUTOMATIC METEOROLOGICAL STATIONS

PHIPPSØYA

The station was visited on 30 July for about 20 hours.

Participants: Niels Nergaard (responsible), Vidar Hisdal and Thomas Martinsen (assistance).

Transport: Helicopter from MS LANCE.

The station had ceased to operate in February. After having exchanged the electronic unit and the batteries, erected a new wind vane mast, and looked over the sensors, tests of the observations transmitted gave satisfactory results.

KVITØYA (Andréeneset)

The station was visited on 2 August for about 15 hours.

Participants: Niels Nergaard (responsible), Bjørn Erlingsson, Øyvind Finnekåsa, Rasmus Gulbrandsen, Hege Hisdal, Vidar Hisdal and Bjørn Lytskjold (assistance).

Transport: Helicopter from MS LANCE.

A temporary station, which had been in operation since August last year, was dismounted, and a new, more sophisticated station was established about 3 km farther north ($80^0 06'$N, $31^0 28'$E), approximately 14 m a.s.l. and 300 m from the northern end of the ice-free area. With the exception of the wind speed, tests of the transmitted values gave good results. The old station was taken back to MS LANCE.

05.09.86

Niels Nergaard

11. Report LANCE 1986

Biological investigations

PROJECT

Ice in the Arctic section (Pro Mare)

Participants: Bjørn Gulliksen (responsible), Ole J. Lønne, Håkon Dalen (assistance)

FIELD WORK AND AIMS

A. Studies of the fauna associated with the bottom of sea-ice (ice-fauna). Increase the knowledge of species compositions, abundance, and distribution pattern and development. Study how these factors vary with age and history at the ice, and study of autecology of the different species.

B. Investigate the importance of ice-fauna as food for seabirds and fishes. This part of project includes studies of feeding ecology of the predators by stomack analyses, and is conducted in co-operation with other Pro Mare projects (seabirds, Arctic cod). We wish to emphasize on the importance of ice-fauna as prey in the ecosystem of ice-filled waters.

STATION LIST

I = ice-fauna, B = bird, P = photo station, A = Arctic cod

Station number	Date	Position	Locality	Activity
MB 30/86	220786	N 78°10' E 26°00'		I
MB 31/86	240786	N 77°15' E 23°00'	HALVMÅNEØYA	I, B
MB 32/86	250786	N 77°41' E 19°06'	STORFJORDEN	I, B
MB 33/86	260786	N 76°23' E 16°15'	SØRKAPP	I
MB 34/86	270786	N 80°00' E 18°07'	KINNVIKA	I, B
MB 35/86	280786	N 81°06' E 16°00'		I, P
MB 36/86	300786	N 81°04' E 23°50'		I, P, B
MB 37/86	310786	N 80°52' E 28°11'		I, A

MB 38/86	010886	N 80°11'	E 30°07'	KVITØYA V	I
MB 39/86	010886	N 80°13'	E 28°50'	"	I
MB 40/86	020886	N 80°17'	E 31°51'	KVITØYA N	I, B, A
MB 41/86	020886	N 80°25'	E 31°10'	"	I, P
MB 42/86	030886	N 80°01'	E 18°03'	KINNVIKA	I, B
MB 43/86	040886	N 81°19'	E 14°00'		A, P, I
MB 44/86	040886	N 82°19'	E 14°00'		I
MB 45/86	040886	N 81°59'	E 14°00'		I
MB 46/86	050886	N 81°39'	E 14°00'		I, B
MB 47/86	050886	N 81°20'	E 07°36'		I, P
MB 48/86	050886	N 80°53'	E 07°36'		I, P
	060886	N 80°06'	E 02°30'		B
MB 49/86	070886	N 80°13'	E 01°57'		I
MB 50/86	070886	N 81°30'	E 01°57'		I, P
MB 51/86	070886	N 81°00'	E 01°57'		P, A, I
MB 52/86	080886	N 80°09'	E 02°07'		/
MB 53/86	190886	N 78°58'	E 05°18'		I, P
MB 54/86	190886	N 78°59'	E 06°07'		I, P
MB 55/86	190886	N 79°00'	E 05°06'		I, P
MB 56/86	200886	N 78°58'	E 02°18'		I, P
MB 57/86	200886				I, P

12. TIDAL MEASUREMENTS ON SVALBARD

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Introduction

Norsk Polarinstitutt (NP) is responsible for all tidal measurements carried out on Svalbard. The measurements serve two purposes: They form the basis for calculation of the mean sea level and the harmonic constants for the tide wave.

Planning

Last year two automatic tidal stations were put out for recording; one at Halvmåneøya, southeast of Edgeøya, and the other in Kinnvika, in Murchisonfjorden northwest on Nordaustlandet (consult "Norsk Polarinstitutt rapportserie nr.25", page 34). During the cruise with the expedition vessel LANCE this year, the plan was to pick up these two stations. One of the recorders would then be reloaded and put out for a new registration period at Kongsøya. The tidal stations are put into position by LANCE's pickup boat.

Participants

The topographic/geodetic section at NP is responsible for the tidal measurements. This year the work was carried out by this team:

Bjørn Lytskjold - topographer
Rasmus Gulbrandsen - assistant

Instrument

Since 1976 NP has used intruments made by Aanderaa Instruments to record the water level. This year two WLR 5 registrators were operative. Each recorder is set with a sampling interval on 60 minutes. When sampling, the hydrostatic pressure is measured during a short period, integrated, and then recorded on tape together with the sea temperature. Tape capasity is about 600 days. The WLR 5 is fixed to a steel platform that weighs approx. 100 kg - consult illustration on next page. To each platform it is tied on two 100 m floating ropes with weights on. These are stretched out on the seafloor to ease the work dredging up the platform at the end of the recording period.

To enable a connection between the mean sea level calculated from the recorded hydrostatic pressure and a terristric point it is necessary to registrate the water level at the closest shoreline on a meter. This registration must be done at the beginning and end of every recording period, with the same intervals as for the sea level recorder. Estimated time spent on each station will normally be 2 - 3 days.

Results

* Tide station Halvmåneøya - position 77⁰15'N 23⁰02'E

The registrations on the tide meter was carried out southwest on the island from 22 to 24 July, all together 43 registrations. Weather conditions were exellent. The tide gauge was brought up with LANCE's pickup boat at July 24 - usefully assisted by a diver. Apparently the recorder functioned well.

* Tide station Kinnvika - position 80⁰02'N 18⁰15'E

The registrations on the tide meter was completed 28 to 29 July,all together 36 readings. In spite of much sea ice the work was carried out continiously. The tide gauge was lifted up 1 August, using the pickup boat and diver. During the recording period there must have been a water leakage or condensation problem (?); some wires were coated with verdigris and caused a short-circuit. The tape contains tide data for only 40 days.

* Tide station Kongsøya

Due to difficult sea ice conditions the planned tide station at Kongsøya was cancelled. Alternative locations were discussed and turned down because of the ice conditions and a tight time schedule.