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Regional landslide occurrences and possible
post-glacial earthquake activity in northwest
Western Norway: Cruise 0103 with R/V Seisma
to fjords in Sogn og Fjordane and Møre og
Romsdal - cruise report (Phase B1)

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Summary:			
<p>This report summarises the work carried out during cruise 0103 to fjords in Sogn og Fjordane and Møre og Romsdal in June and July 2001 in the project "Regional landslide occurrences and possible post-glacial earthquake activity in northwest Western Norway" (Phase B1). This project is a collaboration between NGU, Norsk Hydro ASA, the University of Bergen and the Sogn og Fjordane College, aiming to identify regional slide events and interpret triggering factors for such slides.</p> <p>The cruise was a multipurpose cruise that involved testing of a newly developed vibrocorer (HYBAV) as well as sampling both for stratigraphical and environmental (heavy metals and dinocysts) purposes. Stratigraphical cores were retrieved at 31 locations during the cruise. In addition, 2 two box cores and several stratigraphical cores, that were subsampled for environmental analyses, were retrieved. The cruise also involved four days of high resolution (Topas) seismic profiling.</p> <p>A number of technical challenges with the vibrocorer arose throughout the cruise. The experiences with the corer will be reported elsewhere.</p>			
Keywords: Marine geology	Cruise Report	Sampling	
Coring	Reflection seismic	Topas	

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1. INTRODUCTION

High resolution seismic reflection profiles from fjords along the coast between Sognefjorden and Kristiansund show seismic reflectors that apparently can be recognized and correlated from fjord to fjord (Longva et al. 2001). In some cases, submarine slides or avalanches/rock fall deposits from the surrounding land areas are related to these regional reflectors. The appearances of regional reflectors could be a result of sedimentary/environmental changes caused by climatic changes, earthquakes, or tsunamis generated by large submarine slides.

An 8.5 m long core of fjord sediments from Voldafjorden shows distinct turbidite beds (Sejrup et al. 2001). The uppermost 3 turbidites have been dated to approximately 2000, 7000 and 9000 radiocarbon years BP. The two youngest of these have been correlated to seismic reflectors that occur at the same stratigraphic level as massive debris-flow deposits along the slopes of the fjord basin. The 7000 years BP event is interpreted to be related to the Storegga Slide tsunami (Bondevik et al. 1998, Grøsfjeld et al. 1999, Sejrup et al. 2001), suggesting that the 2000 years BP event possibly could be related to another large tsunami caused by an offshore mega-slide. In fjords in Nordmøre, also the reflectors interpreted to occur at 9000 years BP are probably related to slides along the fjord slopes (Longva et al. 2001).

There are strong indications that major earthquakes may have triggered slides on a regional scale at several occasions during late-glacial and Holocene times. To confirm this, and to understand the origin of the 2000 years BP layer, NGU, together with Norsk Hydro ASA, the University of Bergen and Sogn og Fjordane College run a project with the following aims:

- Regional compilation of slide occurrences, avalanches and gravitational faults that may have resulted from earthquakes or tsunamis in northwest Western Norway.
- Date single events and periods of instability in fjord- and lake sediments.

This cruise report summarises the work carried out during Phase B1 (sea bed sediment sampling/coring and collection of complementary seismic data). The cruise was a multipurpose cruise with testing of a newly developed battery assisted hydraulically driven vibrocorer (HYBAV), sampling for project 293100, and environmental sampling for other projects. During the cruise, we also collected high resolution seismic data for this project and a related project managed by Dr. Stein Bondevik at the University of Tromsø.

2. CRUISE PLANNING

The coring programme as planned for this project was presented in Longva et al. (2001). Coring sites have been chosen where seismic data from NGU and Norsk Hydro ASA (Fig. 1) indicate the presence of slide/mass-movement deposits (Fig. 2B). The near-coast stations outside Ålesund were delegated to the Geological Institute at the University of Bergen on a cruise with R/V "Håkon Mosby" in June. Two of the sites were sampled.

The plan was to do seismic profiling in several fjords in addition to the coring. However, technical problems with the vibrocorer led to one week break in the middle of the cruise and hence modification of the program. Most effort was put into getting as many of the planned stratigraphical cores as possible. A complete cruise log is given in Appendix 1.

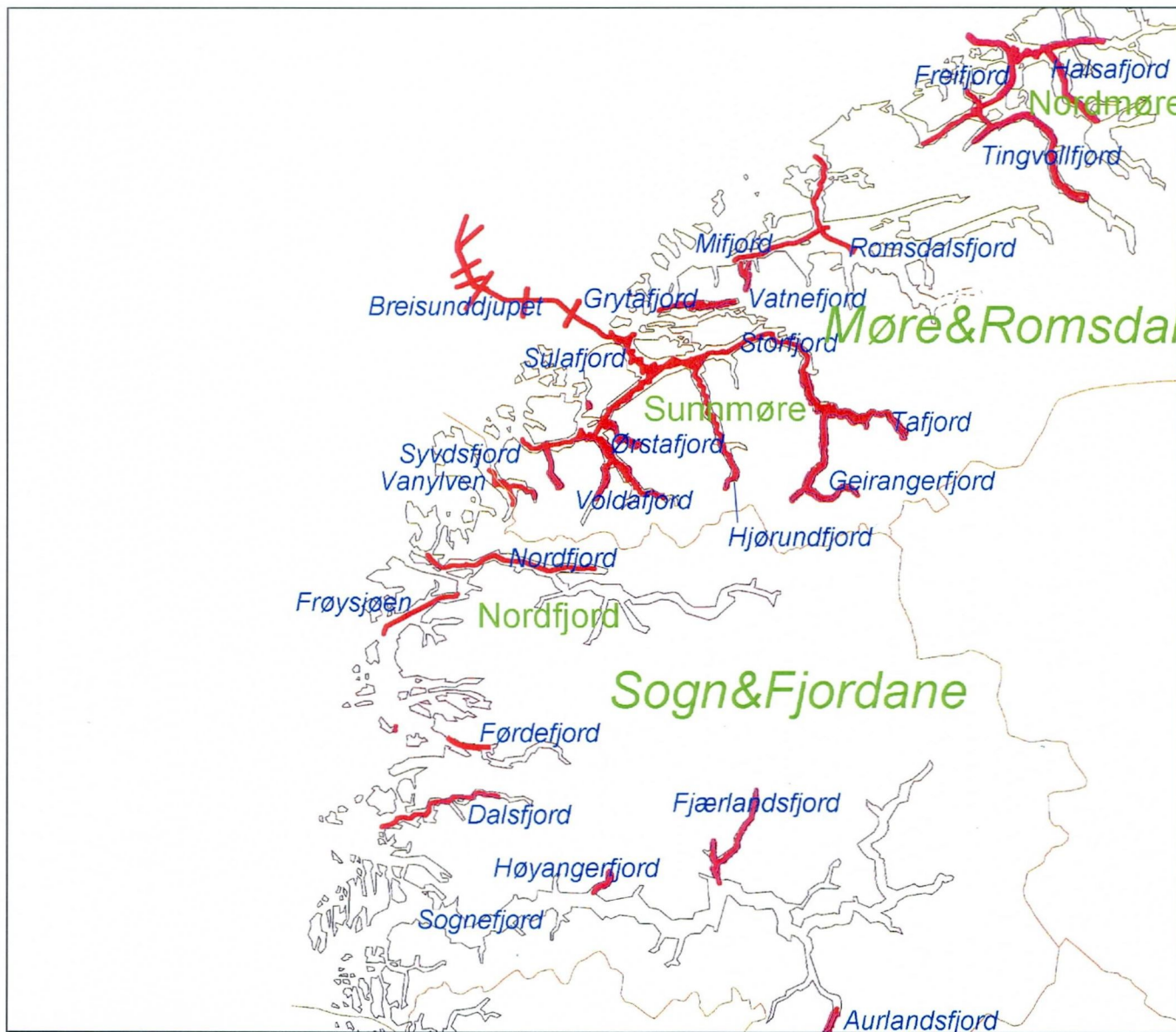


Fig. 1. Index map of investigated area. Red lines show the coverage of seismic lines.

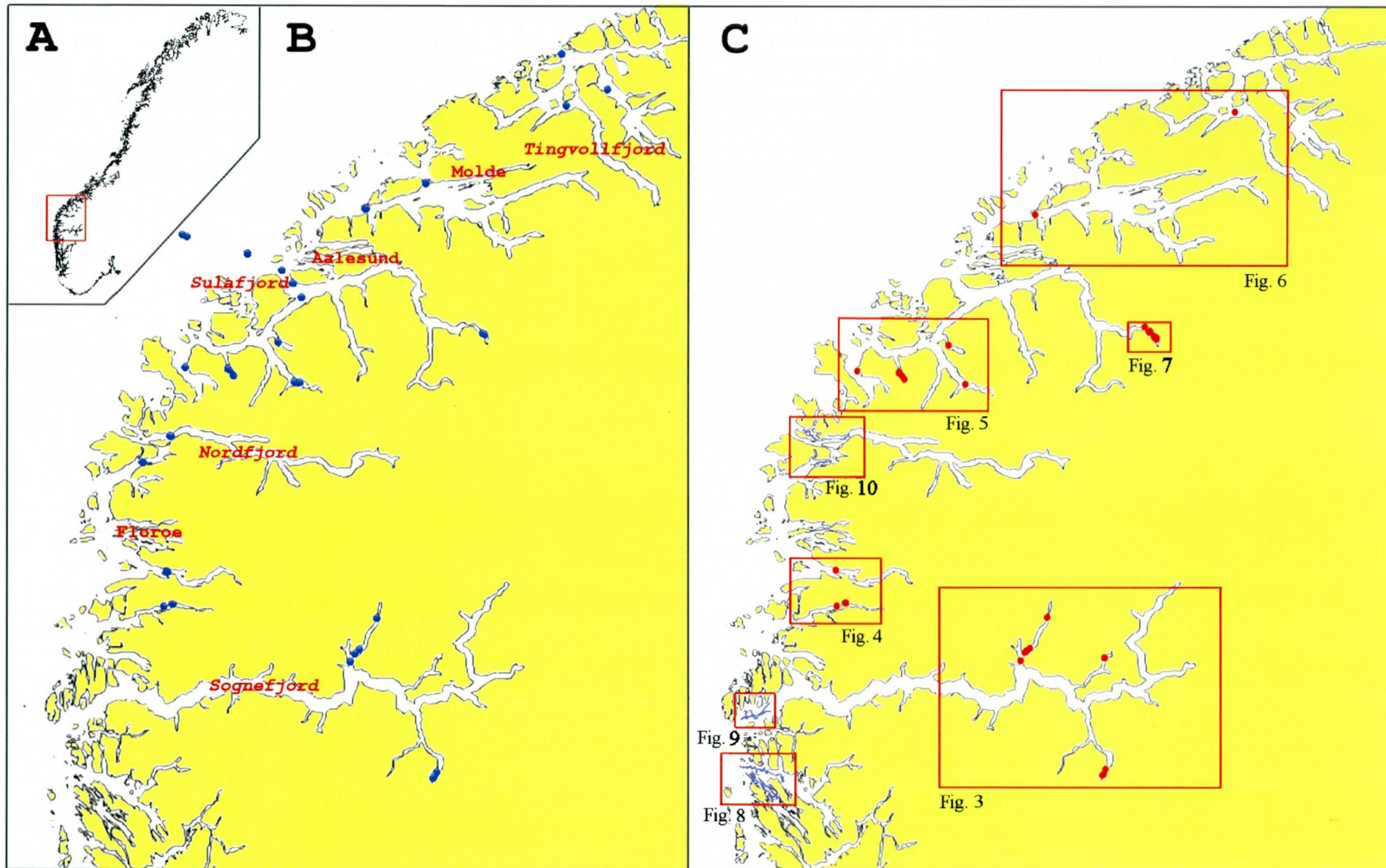


Fig. 2: A: Index map B: Planned core stations - blue circles. Stations offshore Aalsund were planned taken at a cruise with R/V "Haakon Mosby" by UiB.
 C: Retrieved cores - red circles. Red frames gives location of enlarged maps and their Fig. no.

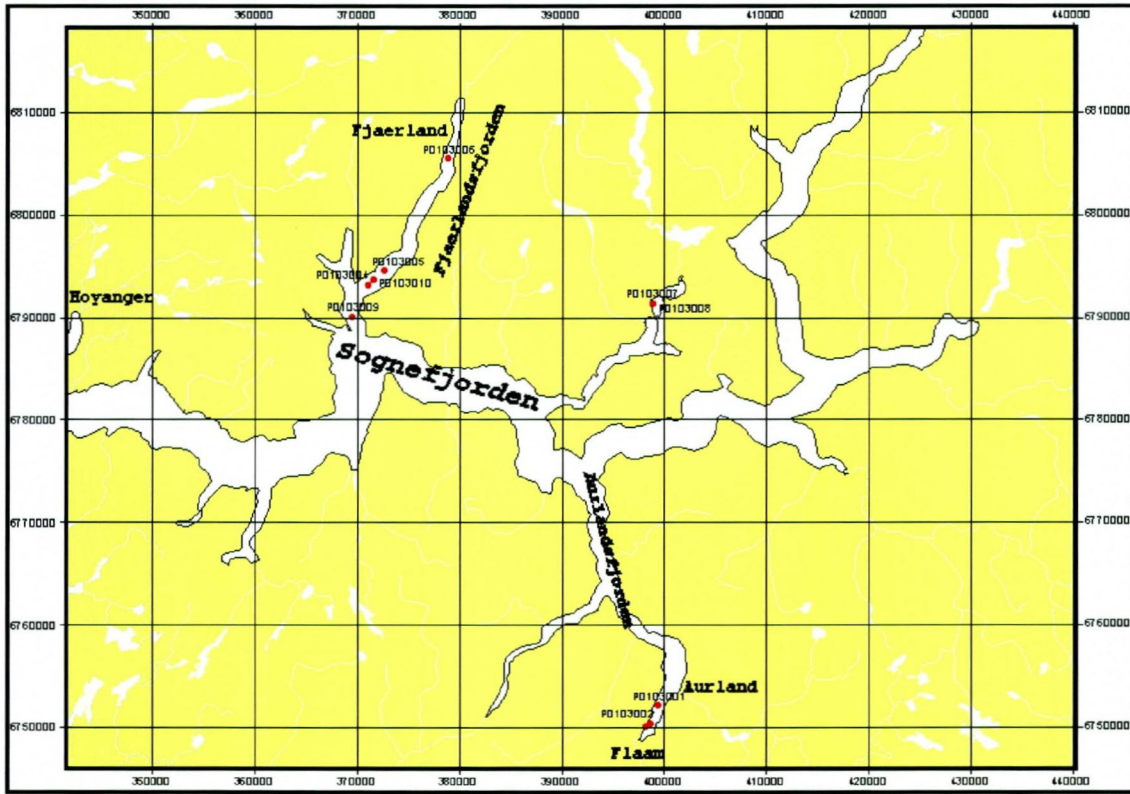


Fig. 3. Cores in the inner part of Sognefjorden. The grid is 10x10 km.

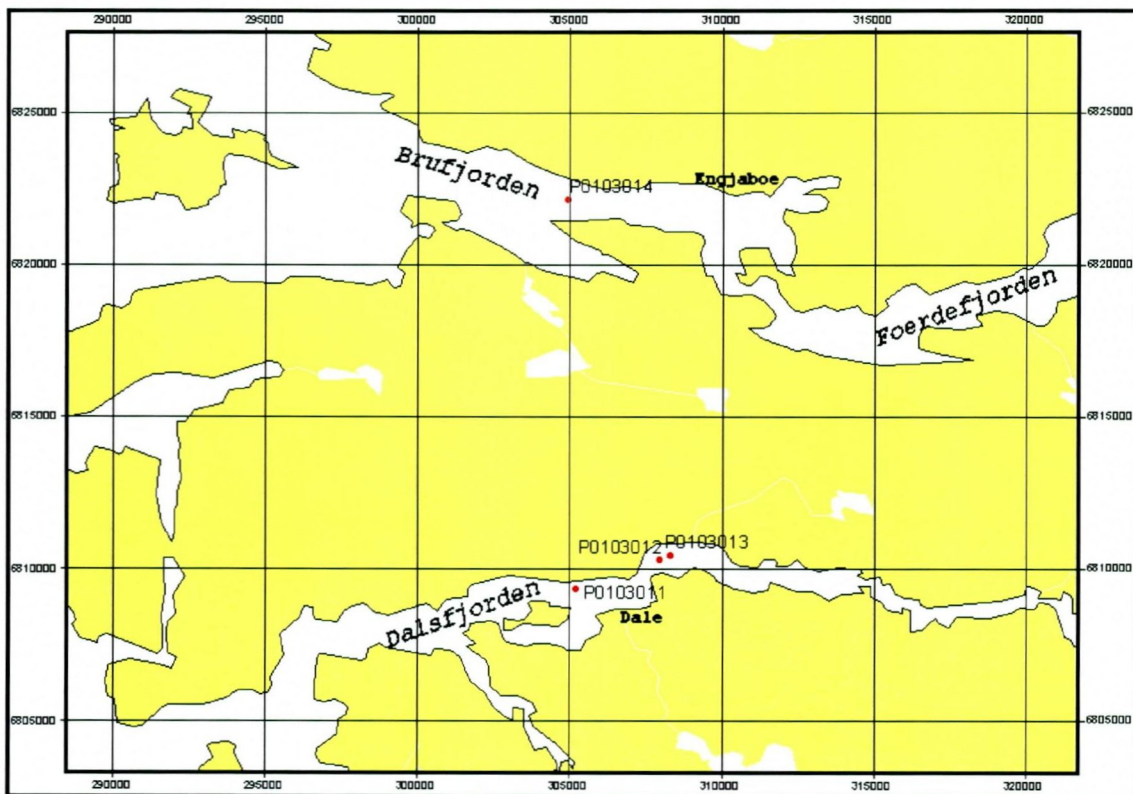


Fig. 4. Cores in Dalsfjorden and Bruffjorden. The grid is 5x5 km.

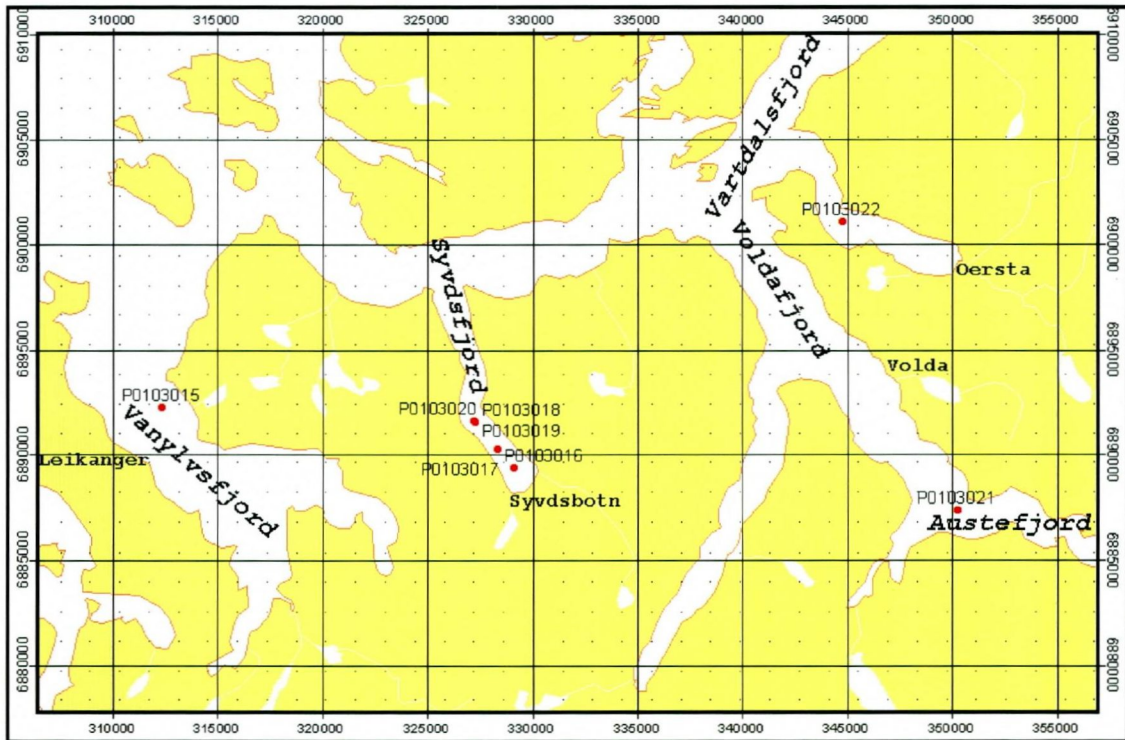


Fig. 5. Cores in Vanylvsfjorden, Syvdsfjorden and Austefjorden. The grid is 5x5 km.

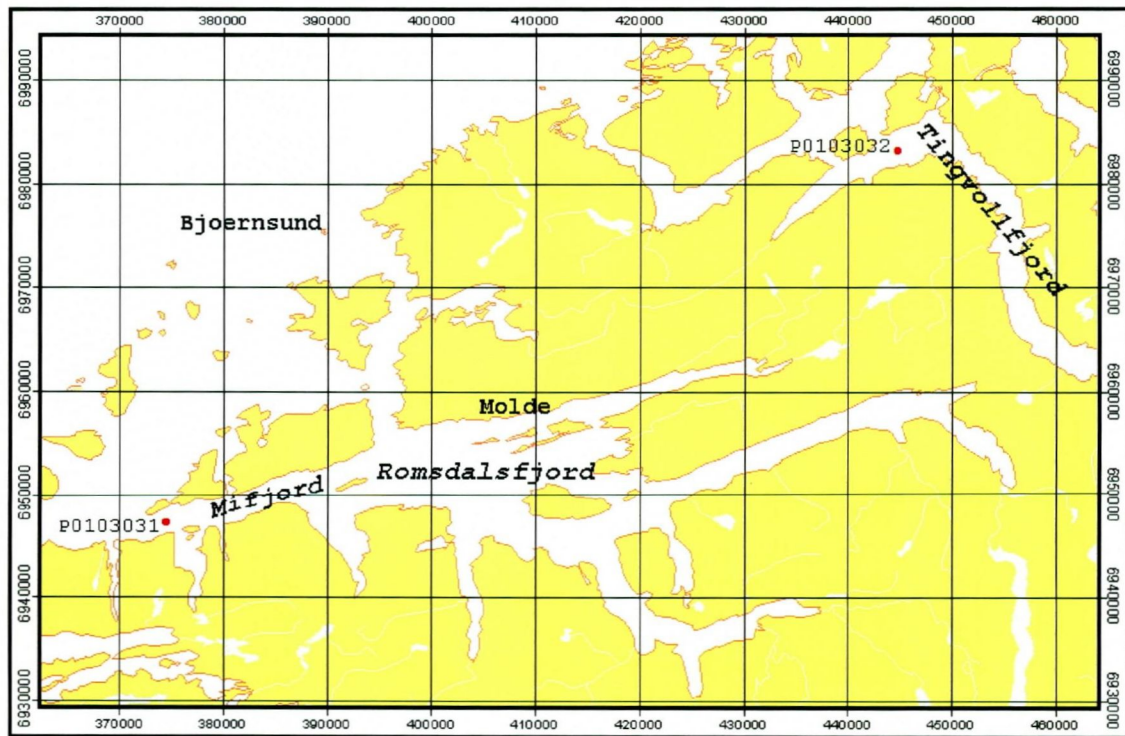


Fig. 6. Cores in Mifjorden and Tingvollfjorden. The grid is 10x10 km.

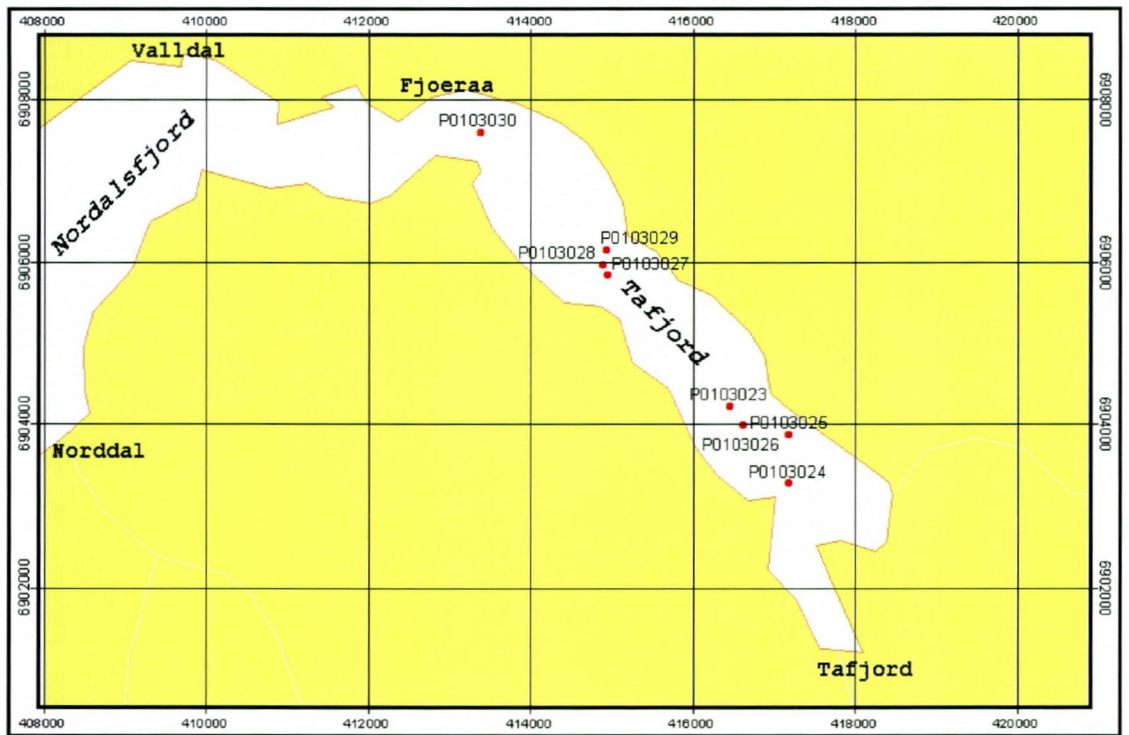


Fig. 7. Cores in Tafjord. The grid is 2x2 km.

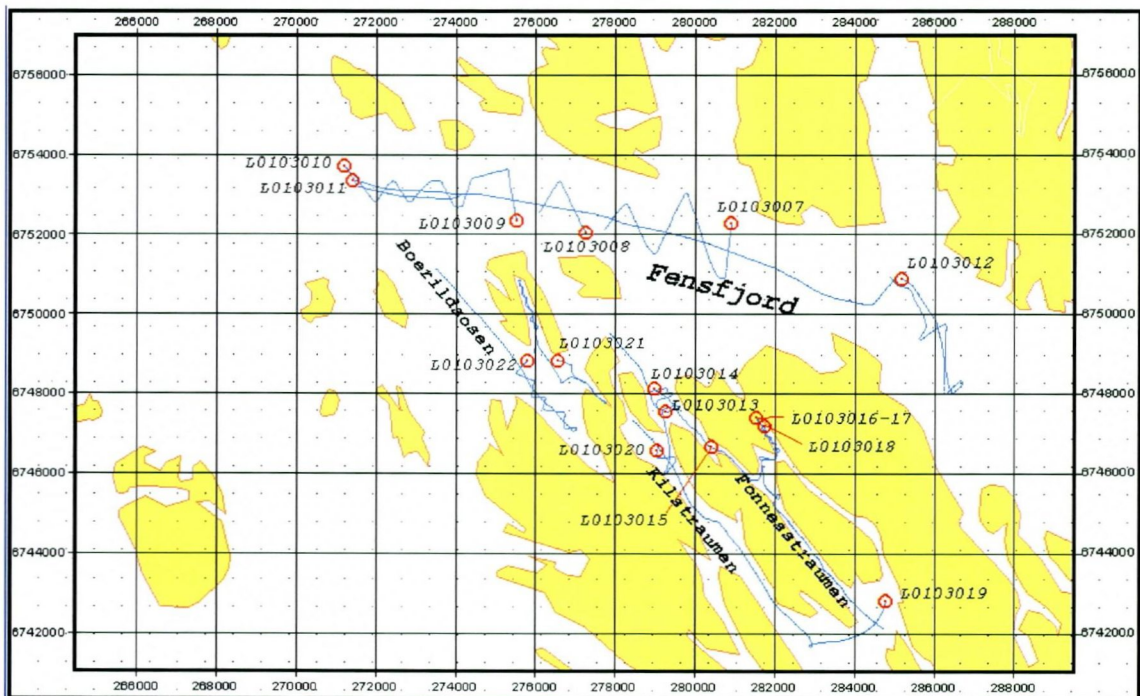


Fig. 8. Reflection seismic lines 0103007-0103022 in the Fensfjord area. The grid is 2x2 km. The starting point of each line is marked by a circle.

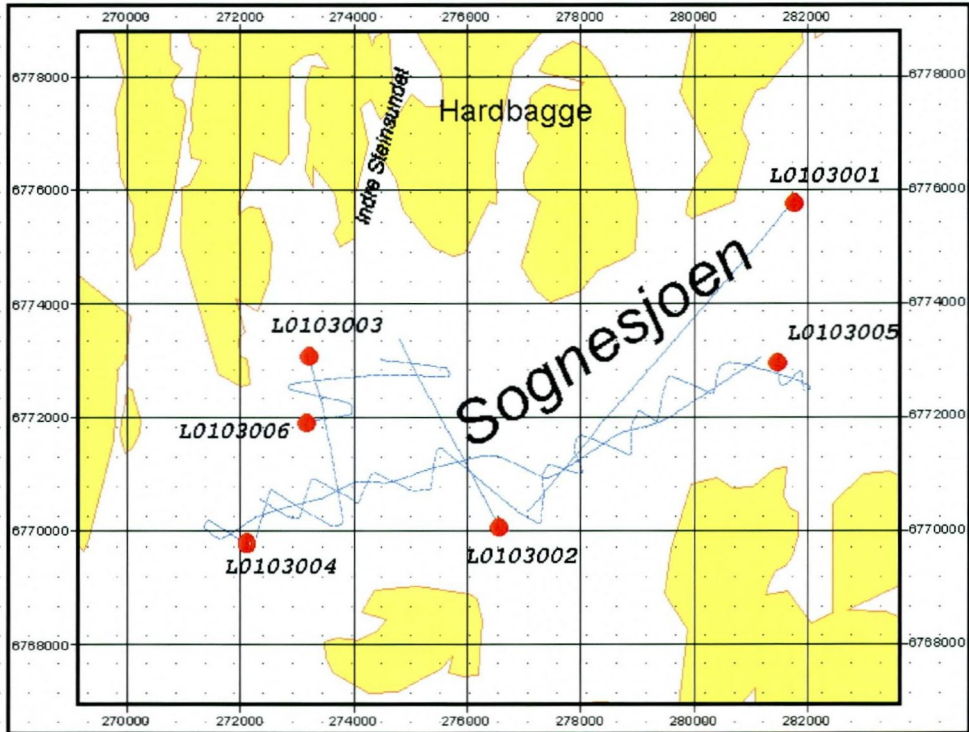


Fig. 9. Reflection seismic lines 0103001-0103006 in Sognesjøen. The grid is 2x2 km. The starting point of each line is marked by a circle.

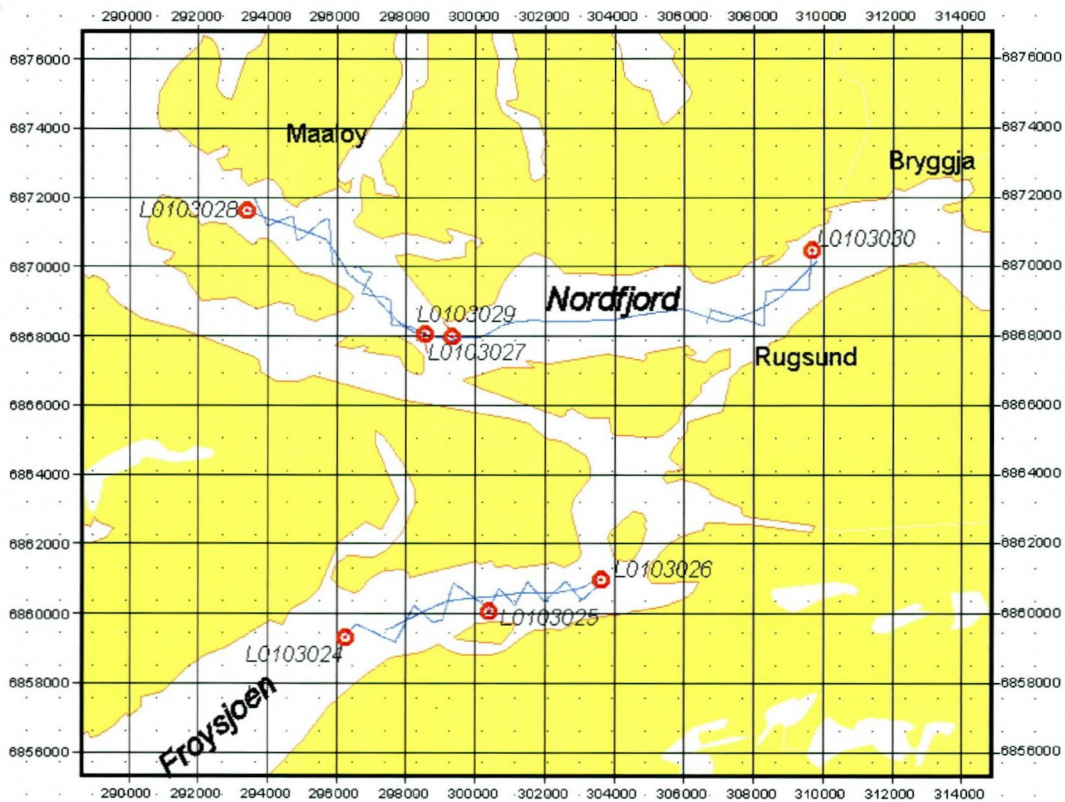


Fig. 10. Reflection seismic lines in Frøysjøen and the outer part of Nordfjord. The grid is 2x2 km. The starting point of each line is marked by a circle.



Fig. 11. The vibrocorer HYBAV operated from RV Seisma.

3. CORING

31 stratigraphic cores were acquired during the cruise (Table 1). The locations of these are shown in Figs. 2C and 3-7.

The stratigraphic coring was done with a battery assisted, hydraulically driven vibrocorer (HYBAV), that has recently been developed at NGU. The corer is powered by two 12V, 60 Ah lead accumulators assembled to give 24 V. The batteries are kept in an aluminum container designed to endure depths of more than 600 m. In a similar container sits a DC/AC inverter which transforms the electrical field to 220V, a 3-phase frequency modifier, a 3-phase electric motor and a hydraulic pump with cables from the container to the vibrators on top of the core head. The corer is fitted with 3 m long plastic liners. The corer sits on a frame that stabilizes the equipment on the sea bottom. A picture of the corer is presented in Fig. 11. The vibrators start when the corer hits the bottom and run for a predestined time or until the barrel has penetrated the bottom in full length. The experiences with the design and performance of the corer will be reported elsewhere.

The samples intended for environmental purposes – heavy metals and dinoflagellates – were either collected with a small, 30 x 30 x 70 cm box corer or subsampled from cores taken by the vibrocorer.

Stratigraphic cores were preserved by cutting off empty barrel and capping with plastic caps that were secured with hose clamps. The top caps and the barrels were marked with exclusive core numbers. The cores were stored upright onboard. When they were taken off the ship they were re-opened and extra paper was inserted to compensate for shrinkage during the storage. Some cores had shrunk more than 5 cm.

4. SEISMIC PROFILING

Seismic data was collected with the Topas system (Appendix 2). After filtering and gain control, the seismic profiles were printed on an EPC 9800 digital termic printer with a sweep of 62.5 milliseconds two-way travel time. The location of the 30 seismic lines run during the cruise are shown in Figs. 8, 9 and 10 (except for line 23 that was run in Dalsfjorden in connection with the coring).

5. DIGITAL DATA LOGGING

The positions of cores and seismic lines were logged digitally in datum WGS 84 and UTM zone 32. After the cruise, these data were transferred to the NGU databases. The seismic data were logged digitally on the TOPAS system and stored in SEG-Y-format on exabyte tapes. Depth measurements along seismic lines were logged on an OLEX-system and stored on CD. All these data are stored at NGU.

6. REFERENCES

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Table 1. Cores collected during cruise 0103 with R/V Seisma

Core number	X (UTM32)	Y (UTM32)	Longitude WGS84	Latitude WGS84	Core length
P0103001	399620	6752240	7° 9.008474'	60° 53.5556'	1.98 m
P0103002	398844	6750453	7° 8.206415'	60° 52.58125'	1.68 m
P0103003	398423	6750180	7° 7.750053'	60° 52.42767'	0.78 m
P0103004	371204	6793299	6° 35.95284'	61° 15.16045'	2.25 m
P0103005	372763	6794625	6° 37.64045'	61° 15.90477'	1.86 m
P0103006	379027	6805562	6° 44.21854'	61° 21.91132'	1.60 m
P0103007	399035	6791482	7° 7.115135'	61° 14.67339'	1.90 m
P0103008	399052	6791462	7° 7.134504'	61° 14.66240'	1.5 m
P0103009	369695	6790158	6° 34.39725'	61° 13.43994'	1.9 m
P0103010	371763	6793739	6° 36.55846'	61° 15.40787'	0.3 m
P0103011	305266	6809367	5° 21.35081'	61° 22.15027'	1.0 m
P0103012	308008	6810303	5° 24.36410'	61° 22.74605'	1.6 m
P0103013	308358	6810457	5° 24.74616'	61° 22.83897'	1.8 m
P0103014	304986	6822163	5° 20.23141'	61° 29.03091'	1.0 m
P0103015	312358	6892247	5° 24.15304'	62° 6.924362'	1.77 m
P0103016	329141	6889338	5° 43.58826'	62° 5.839233'	1.5 m
P0103017	328359	6890251	5° 42.63805'	62° 6.308899'	1.6 m
P0103018	327293	6891540	5° 41.33909'	62° 6.972885'	1.7 m
P0103019	327293	6891555	5° 41.33869'	62° 6.980896'	1.9 m
P0103020	327258	6891591	5° 41.29626'	62° 6.998978'	1.4 m
P0103021	350294	6887354	6° 7.967291'	62° 5.311890'	0.5 m
P0103022	344780	6901079	6° 9.148121'	62° 12.56035'	0.8 m
P0103023	416461	6904222	7° 23.47089'	62° 15.62073'	0.7 m
P0103024	417194	6903270	7° 24.34542'	62° 15.11787'	0.95 m
P0103025	417187	6903867	7° 24.31981'	62° 15.43922'	0.47 m
P0103026	416628	6903998	7° 23.67059'	62° 15.50217'	1.35 m
P0103027	414959	6905842	7° 21.68919'	62° 16.47217'	1.05 m
P0103028	414892	6905970	7° 21.60833'	62° 16.54015'	0.3 m
P0103029	414932	6906158	7° 21.64836'	62° 16.64246'	1.25 m
P0103030	413383	6907603	7° 19.81605'	62° 17.39845'	0.91 m
P0103031	374839	6947337	6° 33.54000'	62° 38.12500'	0.65 m
P0103032	444906	6983247	7° 54.79268'	62° 58.48755'	0.84 m

Appendix 1. Cruise log.

Date	Time	Station	Longitude (WGS84)	Latitude (WGS84)	Water depth (m)	Coring device	Core number	Core length (m)	Remarks
06.06.2001	15.00								Crew embark "Seisma" in Kaupanger. Repairs.
	19.00								Transport to Flåm.
	20.50								Arrival Flåm for overnight.
07.06.2001									<i>Overcast - calm weather.</i>
	08.00								Rigging and testing vibracorer – HYBAV.
	12.05								Departure from Flåm.
	13.00	1	7° 9.01'	60° 53.56'	178	HYBAV	P0103001	1.98	Start coring station 1.
	17.25	2	7° 8.21'	60° 52.58'	73	HYBAV	P0103002	1.68	Finish coring station 2.
	18.10								Arrival to Flåm for overnight.
08.03.2001									<i>Overcast - calm weather.</i>
	07.55								Departure.
	08.30	3	7° 7.75'	60° 52.43'	43	HYBAV	P0103003	0.78	
	09.35								
	09.40								Departure for Fjærlandsfjord.
	12.00	4	6° 44.22'	61° 21.91'	172	HYBAV	P0103006	1.6	Arrival at Location. Start coring.
		5	6° 37.64'	61° 15.90'	238	HYBAV	P0103005	1.86	
									Arrival at Fjærland for overnight.
09.06.2001									<i>Overcast - calm weather.</i>
	08.15								Departure.
									Run TOPAS profile to optimize core location. Possible rock-avalanche into the fjord.
			6° 35.95'	61° 15.16'	247	HYBAV	P0103004	2.25	Two attempts, retrieve 2.25m long core. The penetration is deeper than the length of core. Decide to try the corer with piston.
									Departure for Sogndal
	13.30								Arrival at Sogndal. Modifies HYBAV so that piston can be used in core barrel. Borrows piston from S&F College.
	17.30								Departure for Barsnesfjord for test of modifications.
			7° 7.12'	61° 14.67'	82	HYBAV	P0103007	1.9	HYBAV using piston in core barrel.
	19.10								Arrive to Sogndal for overnight.
10.06.2001									<i>Sunny - calm weather. Wind picking up to SW-breeze, force 4, through the day.</i>
	09.00								Departure for Barsnesfjord.
	09.20		7° 7.13'	61° 14.66'	82	HYBAV	P0103008	1.5	Core same locality without piston.
	10.20								Transport to Fjærlandsfjord.
	13.00	6	6° 34.40'	61° 13.44'	305	HYBAV	P0103009	1.9	Corer with piston in outer part of Fjærlandsfjord.
	14.30		6° 36.60'	61° 15.33'	243	Box corer	P0103010 A,B,C		Grab sub-samples for analyses of dinoflaegelates.
	16.00								Departure Fjærlandsfjord.
	18.10								Arrive to Høyanger for overnight.
11.06.2001									<i>Overcast – SW breeze shifting to north and picking up a bit through the day.</i>
	08.00								Depart for Sognesjøen.
	10.30								Mount the Topas-bulb and start profiling in Sognesjøen.
	17.00								End of profiling.
	17.50								Arrival to Hardbagge.
12.06.2001									<i>Sun – N-breeze.</i>
	08.30								Departs for Fensfjord.
	10.05								Start profiling in Fensfjord. Employ TOPAS - high resolution seismic source. NE-ly fresh breeze and waves. Some impact on quality of

	18.25								registrations. Survey Fensfjord and into Fennesstraumen. Stop profiling.
	18.30								Arrival at Fennesvågen.
13.06.2001									<i>Overcast - calm weather.</i>
	08.00								Departure.
	08.05								Starts profile in Fennesvågen and continues into Fennesstraumen, Kilstraumen, Makrellvågen and Børildsen. En route to Dalsfjorden.
	13.00								Arrival to Dale.
	18.05								<i>Calm weather, showers.</i>
14.06.2001									Rigs the vibracorer and depart. Run TOPAS profile to optimize core location.
	08.00								
	08.50	7	5° 21.35'	61° 22.16'	260	HYBAV	P0103011	1.0	Starts coring, station 7, in Dalsfjord. Corer stopped in stone? Scar in tube wall indicates that corer vibrated in same position for a while. On deck, water was emerging from the bottom of barrel. Washing out the sample?
	10.50								
	11.30	8	5° 24.36'	61° 22.75'	173	HYBAV	P0103012	1.6	Corer tipped over on seabottom first and second attempts. Third attempt gave good sample, possibly with penetration into slide deposits. Several tries at station 9, no success.
	15.45								
	16.05								Arrives at Dale, bunkers and provisions. Charging of corer batteries.
15.06.2001									<i>Calm and sunny weather</i>
	08.00								Departure from Dale.
	08.15	9	5° 24.75'	61° 22.84'	173	HYBAV	P0103013	1.8	First attempt gave good sample.
	08.50								Depart for Førdefjord.
	14.05								Arrive to Førde. Repairs of main engine.
	16.00								Departure.
	17.30								Start TOPAS-profile to optimize core location
	18.00								End of profile. Start coring. First attempt, retrieved short core that was discarded.
	19.30								Arrival Engjabø for overnight.
16.06.2001									<i>Calm and sunny weather.</i>
	08.00								Departure.
	09.00	11	5° 20.23'	61° 29.03'	340	HYBAV	P0103014	1.0	Core on top of moraine ridge with drape of sediments including supposed red and green reflectors. Technical problems with HYBAV motor.
	11.30								
	11.50								Depart for Florø.
	13.10								Arrival at Florø. Check motor of HYBAV. Severe technical problem that cannot be fixed in Florø.
17.06.2001									<i>Calm and sunny weather.</i>
	10.00								Departure Florø.
	11.45								Frøysjøen, start TOPAS – profiling.
	14.00								End of line.
	14.55								Start of line north of Skatestraumen. Survey outer part of Nordfjord from south of Måløy towards Bryggja.
	19.15								End of line.
	19.25								Tied up in Rugsund for overnight.
18.06.2001									<i>Nice weather south of Stad, NE</i>

									<i>gale north of Stad.</i>
	08.10								Departure Rugsund.
	09.50								Arrival Måløy. Send cores to Trondheim by boat.
	10.30								Depart Måløy.
	11.40								NE gale at Stad, reduced speed.
	16.05								Arrival to Alesund. The boat is left at Kystverket. Crew to Trondheim.
25.06.2001									<i>Overcast, calm weather.</i>
	11.30								Crew embarked. Leave for Vigra to pick up Dr. John Howe, Dunstaffnage Marine Laboratories, Scotland, and then for Haramsøy for repairs of vibracorer.
	16.30								Arrival at Haramsøy, corer brought to Åkre Mekaniske verksted for repairs.
26.06.2001	08.00								Work on corer.
	14.35								Departure from Haramsøy en route to Ålesund.
	15.45								Arrival Ålesund, continued work on corer.
27.01.2001	08.00								Continued work on corer.
	16.40								Corer working.
	19.00								Depart Ålesund.
									Arrival Haugsholmen for overnight.
28.06.2001									<i>SW-breeze, overcast.</i>
	08.10								Departure Haugsholmen.
	09.10								Deploys the TOPAS system to optimize core location in Vanylvsfjorden.
	09.45	15	5° 24.15'	62° 6.92'	297	HYBAV	P0103015	1.77	Start coring at station 15. First attempt, applying piston. Core, 72 cm, subsampled for environmental analyses and residual discarded. Second attempt successful and core saved. On top dark greenish – grey (10Y4/1) sandy mud.
	11.25								Arrival to Leikanger for provisions.
	11.35								Depart en route to Syvdsfjorden
	11.50								TOPAS system activated in Syvdsfjord.
	13.40								
	13.45	16 - 18				HYBAV			Start coring. First attempt, corer fell over on seafloor. Second attempt, corer inverted under recovery, sample washed out. Third to seventh attempts failed, no core recovery.
	18.15								
	18.30								Arrive at Syvdsbotn for overnight.
29.06.2001									<i>Calm weather.</i>
	08.00								Modifications on corer.
	09.30								Departure.
	09.50					HYBAV			On location. First attempt failed. Reassemble the corer with piston.
	13.00	21	5° 43.59'	62° 5.84'			P0103016	1.50	Success at last! Dark greenish grey (5GY 4/1) sandy muds in core catcher.
	13.30	20	5° 42.64'	62° 6.31'	99	HYBAV	P0103017	1.60	First attempt. Dark greenish grey (10Y 3/1) fine sandy muds in cc.
	14.30								
	14.45	18	5° 41.34'	62° 6.97'	99	HYBAV	P0103018	1.70	First attempt. Dark greenish grey (10Y 3/1) sandy muds in cc.
	15.20								
	15.35	17	5° 41.34'	62° 6.98'	100	HYBAV	P0103019	1.9	First attempt. Greenish black (10Y 2-5/1) fine sandy muds in cc.
	16.15								
	16.30	16	5° 41.30'	62° 6.99'	99	HYBAV	P0103020	1.4	First attempt. Dark greenish

	17.00								(10Y 3/1) muddy sand in cc. Slide deposit?
	17.10								Leave Syvdsfjord, destination Volda.
	19.30								Arrival to Volda for overnight.
30.06.2001									<i>Calm weather.</i>
	08.40								Depart Volda.
	09.30	26	6° 7.97'	62° 5.31'	317	HYBAV	P0103021	0.5	Arrive at station 26 in Austefjord. Five attempts (1 without – four with piston) (corer fell over, sample lost, corer entangled in wire, short core -discarded) before short core is retrieved. Dark greenish grey (10Y 4/1) mud in cc. Some coarse sand layers noticed in core top.
	14.30								
	15.00	25			318	HYBAV			No piston. Short – 30 cm – core discarded. Two attempts no core saved. Site abandoned.
	16.05								
	16.35	24			318	HYBAV			2 attempts, no recovery. Site abandoned.
	18.15								
	19.15								Arrival at Volda for overnight.
01.07.2001									<i>Calm, overcast, showers.</i>
	08.25								Depart Volda.
	10.15								Arrive at location 27 Ørstafjord. Test shows failure in control circuit in vibracorer. Unable to fix onboard.
	11.05								Head for Ålesund for repair.
	13.30								Arrive to Ålesund
02.07.2001									<i>SW-breeze, overcast.</i>
	08.00								Repair of electronics at workshop.
	10.30								Circuit repaired. Depart Ålesund.
	12.00	31	5° 46.56'	62° 28.90'	438	HYBAV			Arrive at location in Sulafjord. Breeze force 4, some waves. One attempt, no core. Abandon location. Heads for Vartdalsfjord.
	13.00								
	13.40	28	6° 9.05'	62° 21.11'	302	HYBAV			Arrive at locality 28, Vartdalsfjord. One attempt, no core. Location abandoned.
	14.30								
	16.40	27	6° 0.91'	62° 12.56'	172	HYBAV	P0103022	0.8	Arrive at locality 27, Ørstafjord. First attempt, corer fell over on seafloor. Second attempt short core. 10Y 2.5/1 greenish, black organic rich mud with shells in cc. Took box corer sample for other purposes at same locality. Depart location.
	18.35					Boxcorer			
	20.40								Arrival to Vegsund Slip.
03.07.2001									<i>Calm, showers.</i>
	08.00								Change motor in vibracorer to original, repaired motor. Motor burns on test, refit other motor. Depart Vegsundet heading for Tafjord.
	15.55								
	20.00		7° 24.35'	62° 15.12'	150	HYBAV			Arrive on station in Tafjord. No core, corer possibly fell over on seafloor. Site abandoned.
	21.30		7° 23.47'	62° 15.62'	200	HYBAV	P0103023	0.7	First attempt, short core retrieved. 5G 2.5/1 greenish black stiff mud with medium coarse sand layers visible in core catcher.
	22.10								
	22.30								Arrival at Tafjord for overnight.

04.07.2001									<i>Calm and sunny weather.</i>
	08.30								Departure.
	08.45		7° 24.35'	62° 15.12'	150	HYBAV	P0103024	0.95	First attempt, short core. 10Y 4/1 dark greenish grey stiff clay in cc.
	09.30								
	09.40	34	7° 24.32'	62° 15.44'	190	HYBAV	P0103025	0.47	Four attempts before success. Last attempt with piston, added lead weight on top of corer and extended running time for corer from 10 to 15 minutes. Short core with 5G 2.5/1 greenish black sandy muds, coarse sand layer noted in cc.
	13.30								
		35	7° 23.37'	62° 15.63'		HYBAV			Station 35 is close to core P0103023 and decided skipped.
	14.00		7° 23.67'	62° 15.50'	197	HYBAV	P0103026	1.35	First attempt, no piston, extra weight, extended running. 5G 2.5/1 greenish black sandy muds.
	14.50								
	15.00		7° 21.69'	62° 16.47'	205	HYBAV	P0103027	1.05	One attempt. Core retrieved. 5G 2.5/1 greenish black sandy muds in cc.
	15.45								
	16.00		7° 21.61'	62° 16.54'	207	HYBAV	P0103028	0.30	One attempt, short core retrieved. 5Y 2.5/1 greenish black sandy muds – coarse well sorted sands noted in core base and cc.
	16.50								
	17.00		7° 21.65'	62° 16.64'	207	HYBAV	P0103029	1.25	One attempt. 5Y 2.5/1 greenish black sandy muds – coarse sandy layers in core base and cc.
	17.40								
	18.00		7° 19.82'	62° 17.40'	217	HYBAV	P0103030	0.91	One attempt. 5Y 2.5/1 greenish black sandy muds. Depart Tafjord en route to Vardalsfjorden
	18.30								
	21.10	28	6° 9.05'	62° 21.11'	302	HYBAV			Arrive at station 28, Vardalsfjord (site visited earlier 02.07.2001). Two attempts, core catcher failed and sample lost.
	23.05								
	23.25								Arrival Hjørungavåg for overnight.
05.07.2001									<i>NE-breeze, overcast. Calm and sunny in the evening.</i>
	08.25								Departure Hjørungavåg
	08.45	28	6° 9.05'	62° 21.11'		HYBAV			At station 28. Two tries, same problem as yesterday. Site abandoned
	10.55								
	11.40								Arrival to Alesund for bunkers.
	12.10								Departure en route to Midfjord.
	13.50	36	5° 46.48'	62° 37.08'	245	HYBAV			Arrive at station 36 in Midfjord. Two attempts, core lost on recovery. Site abandoned
	16.00								
	16.10	37	6° 33.54'	62° 38.13'	253	HYBAV	P0103031	0.65	One attempt, short core. 10Y 3/1 dark greenish grey muddy shell rich sand in cc. Leave location en route to Molde to look for synthetic hydraulic oil for vibracorer.
	17.30								
	18.40								Arrival to Molde. Synthetic oil has to be ordered and can not be delivered before late next day. Decide to skip the stations in Romsdalsfjord as they are very deep and our experience is that the effect of the corer is small in deep water with the existing hydraulic oil. Depart for Bjørnsund.
	20.30								

	21.50								Arrival Bjørnsund
06.07.2001									<i>Calm and sunny weather.</i>
	08.10								Departure Bjørnsund
	10.45	40	7° 54.79'	62° 58.49'	302	HYBAV	P0103032	0.84	Arrival station 40 in Tingvollfjord. Two attempts. Short core. 10Y 4/1 dark greenish grey soft mud in cc. Sampling ended Leave site en route to Trondheim.
	13.20								
	20.50								Arrival to Trondheim.

APPENDIKS 2



ORIENTERING OM NGUs FORSKNINGSFARTØY F/F "SEISMA"

Hovedspesifikasjoner:

Byggeår:	1985
Verft:	West Products A/S, 6718 Deknepollen
Materiale skrog/overbygg:	Sandwich/Divinycell
Lengde oa.:	16,8 m (55 fot)
Dypgang maks:	Ca. 1,5 m
Tonnasje:	34 brt.
Kallesignal:	JWOG
Hastighet under transport:	Ca. 16 knop
Hastighet under profilering:	4-6 knop
Aksjonsradius:	450-500 n.mil

Innredning:

Styrehus:	Arbeidsplass for føring av fartøy, automatisk navigasjon og kjøring av seismikk. Fri sikt 360 grader.
Arbeidsrom:	I plan med akterdekk, ca. 8 m ² .
Innkvartering:	3 stk. lugarer á 1 person, messe, pantry, WC, dusj (besetning 3 personer).
Akterdekk:	Ca. 24 m ² .

MASKINER, STRØMFORSYNING M.M.

2 stk. Scania DSI 11 á 350 HK/2100 RPM, hver tilkoblet hydraulisk vridbare propeller.
Stamford Isuzu diesellaggregat, 18 kw 3-fase, 220 V/AC
Transformator for 380 V, 3-fase uttak
Frekvensomformer for variable turtall for el.motorer (380 V, 3-fase)
35 amp. generator, 24 V/DC (start)
35 amp. generator, 24 V/DC (forbruk)

Hydraulisk system for drift av:

Bauer høytrykkskompressor 600 l/min. 200 bar (luftkanon)
Tallmek baugpropell, 30 HK
Effer dekkskran 2.6 t/m med winch, 400 kg
Prøvetakingswinch m/spoleapparat og fri-fall, 5 tonn
Prøvetakingswinch, 1 tonn
Ankerwinch
Bunkers: Diesel 3.500 l
Ferskvann 1.000 l

NAVIGASJONSINSTRUMENTER

Simrad CP40 kartplotter
Anshütz gyrokompass m/AD converter for radar
Robertson AP9 autopilot
Furuno FCR 1411, fargeradar m/dagslysskjerm og 2 variable avstandsringer
Furuno FR 240, radar med en variabel avstandsring
Furuno fargeekkolodd
Hocom Famita Good VHF-radio m/sel.call. nr. 90144.
Stornomatic NMT. Tlf. nr. 947 27052

SURVEY-INSTRUMENTER

Posisjonering:

Ashtech GPS12
Trimble Navbeacon radio med standard RTCM utgang, for mottak av referansedata fra Kartverkets SATREF-system sendt over Kystverkets radiofyr.
RDS -radio med RTCM utgang, for referansedata sendt over NRK P2.
PC m/software fra tidligere Kongsberg Diffstar

Vanddypsmåling:

Simrad EA 400, 2 kanaler; 200 kHz / 7°, 38 kHz / 13°
Olex kartplotter med dybderegistrering

Magnetometer:

GSM-19M overhauser protonmagnetometer med 100m kabel

Seismikk:

"Boomer"-kilde "High Resolution Sound Source", modell 5813 B, 280 Joule
Topas (Topographic Parametric Sonar), høyoppløselig skroffestet kilde og hydrofon.
Sleevegun, 15-40 kubikktommer
Benthos hydrofonslanger, 7,5 m
4-kanals hydrofonslange, Fjord Instruments, 24 m
Analogt prosesserings-system m/int.trigg, bandpass-filter 20-2400 Hz. TVG og TVF funksjoner og lineær forsterkning 0-80 dB
Analogt bandpass filter, 1-9999 Hz, lineær forsterkning 10-70 dB
Digital logging av seismikk med posisjon og tid, i tillegg kontroller for Topas:
 SUN Sparc 20 arbeidsstasjon m/ analog og digital filterenhet 4-kanaler.
 DAT- tape stasjon for lagring av data på Topasformat eller S-SEG Y format
EPC 3200, grafisk skriver
EPC 9800, termisk skriver
IBM kompatible 486-PC'er for logging av posisjoner, ekkolodd og magnetometer

Prøvetakingsutstyr:

Gravitasjonsprøvetaker, 63 mm, vekt maks. 300 kg.
Modifisert Niemistöe prøvetaker, 63 mm
Vibrasjonsprøvetaker, 63 mm, 75 mm og 110 mm
Grabb, 70 kg