FINAL REPORT

Lamont-Doherty Geological Observatory of Columbia University
Palisades, N.Y. 10964

RE: N00014-90-J-1842

TITLE: "DATA ACQUISITION/REDUCTION, M/V BERNIER: SUPPORT OF SEA MARC II CRUISE SOUTHERN NORWEGIAN SEA SURVEYS PARTS II & II AEGIR RIDGE STUDY AND SEA MARC II CALIBRATION"

Lamont-Doherty Geological Observatory provided ship and geophysical systems support to the study of the Southern Norwegian Sea in collaboration with investigators from Hawaii Institute of Geophysics and the Naval Research Laboratory. The Observatory provided the Research Vessel MAURICE EWING (ex-BERNIER) and technical staff to support geophyscial equipment which included magnetics, gravity, single channel seismics, 3.5 kHz sub-bottom profiler and multi-beam bathymetry for a three-leg survey sequence. In addition, development work on backscatter data collection from the multibeam mapping system was completed during the second and third legs. The L-DGO technical staff assisted in support activities for the HIG-operated SeaMARC II towed side-scan sonar mapping system.

The R/V MAURICE EWING (ex-BERNIER) departed from Newark, New Jersey on July 06, 1990 for the first leg of the program, a SeaMARC II calibration and transit to Reykjavik, Iceland. Following a port call at Reykjavik, Dr. Henry Fleming of NRL, as chief scientist, conducted the first 28 day survey of the Aegir Ridge and adjacent basin and margins. Following a four day port stop in Bergen, Norway, the second 28 day survey leg, with Dan Chayes of NRL as chief scientist, returned to complete the geophysical survey with a final return to Bergen on 23 September, 1990.

The program was succesfully supported by the L-DGO technical staff and research facilities as proposed in the Statement of Work. Total ship use days included 70 days at sea with 9 mobilization/demobilization port days.

Statement A per telecon Joseph Kravitz
ONR/Code 1125
Arlington, VA 22217-5000

NWW 8/6/92

Final Report, N00014-90-J-1834
"Southern Norwegian Sea Surveys"
Principal Investigator:
Alexander Shor
Hawaii Institute of Geophysics
University of Hawaii at Manoa

The research grant N00014-90-J-1834 supported a 75-day geophysical field program on Reykjanes Ridge in the North Atlantic Ocean and Aegir Ridge in the Norway Basin of the Norwegian Sea. The field program took place in summer 1990 on R/V Maurice Ewing of Lamont-Doherty Geological Observatory; the program was carried out jointly by researchers at the Naval Research Laboratory Code 5110, Lamont-Doherty Geological Observatory and University of Hawaii. University of Hawaii responsibility included providing and operating the SeaMARC II seafloor mapping system during the course of the field program, processing the SeaMARC II side-scan sonar and bathymetric data to produce seafloor charts and sonar mosaics, and participating in the geophysical interpretation of the data.

The research cruise was successfully completed in September 1990 in Bergen, Norway. Most SeaMARC II data processing was completed during the cruise, and copies of mosaics and charts were delivered to NRL and Hawaii for analysis and interpretation. Some necessary post-processing was completed over the six months following the field effort, and those results also were distributed among the collaborators for analysis. A copy of the ONR "Geology and Geophysics Program Summary for FY90" report written after field program completion is attached, providing information on objectives and project status at the end of 1990. Publications resulting from this field program include:

Shor, A.N., C.E. Nishimura, M. Czarnecki and P.R. Vogt, 1990. Lava extrusion from the 1989 Reykjanes Ridge seismic swarm? Probably yes (SeaMARC II). Eos, v. 71, p. 1602 (abstract).

Vogt, P.R., D.A. Chayes, H.S. Fleming and A.N. Shor, 1990. SeaMARC II/Hydrosweep/ marine geophysical investigation of the extinct Aegir Ridge, Norway Basin. Eos, v. 71, p. 1408 (abstract).

Appelgate, B., and A. Shor, 1991. The Reykjanes Ridge: Along-axis variation in tectonic and volcanic morphology from SeaMARC II and Hydrosweep. Eos, 1991 Fall Meeting Supplement, p. 467 (abstract).

Jung, W-Y., P.R. Vogt, D. Chayes and H.S. Fleming, 1991. Detailed gravity/magnetic mapping of the extinct Aegir Ridge. Eos, 1991 Fall Meeting Supplement, p. 486 (abstract).

Vogt, P.R., K. Crane, S. Pfirman, E. Sundvor, D. Chayes, N. Cherkis, H. Fleming, C. Nishimura and A. Shor, 1991. SeaMARC II sidescan sonar imagery and swath bathymetry in the Nordic Bsin: Sedimentary processes elucidated by correlation with 3.5 kHz and other data. Eos, 1991 Fall Meeting Supplement, p. 486 (abstract).

Appelgate, B., and A.N. Shor, 1992. Reykjanes Ridges and the northernmost Mid-Atlantic Ridge: Segmentation and tectonic signature of a slow-spreading ridge near the Iceland hot spot, Eos, 1992 Fall Meeting Supplement, p. 538 (abstract).

Appelgate, B., and A.N. Shor (submitted 6/93), The northern Mid-Atlantic and Reykjanes Ridges: Spreading center morphology between 55°50'N and 63°00'N. Journal of Geophysical Research.

GEOLOGY AND GEOPHYSICS PROGRAM SUMMARY FOR FY90

MARCH 1991

ONR CODE 1125GG

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Office of Naval Research
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SOUTHERN NORWEGIAN SEA SURVEYS

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Long Range Scientific Objectives

The study of processes of crustal formation and the structural and morphologic expression of seafloor created at mid-oceanic spreading centers is a focus of research by marine geologists, geophysicists and acousticians, and is of direct relevance as well to studies of physical oceanography, marine chemistry, and marine biology. Until fairly recently, most of the detailed studies using modern swath bathymetry systems and side-scan sonars had been conducted at spreading centers with relatively high spreading rates. The present project on Aegir Ridge, together with related programs on the Knipovich Ridge (Drs. Kathleen Crane, Peter Vogt & Alexander Shor), addresses the detailed morphologic and structural expressions of the extremely slow-spreading ridge systems of the Norwegian Sea. The objective is to improve our understanding of the morphology of these systems, and of the processes responsible for the generation and modification of sea floor in slow-spreading environments.

Project Objectives

The program involved two 30-day research cruises on R/V MAURICE EWING over the Aegir Ridge and adjacent Norway Basin during July - September 1990. Data collected included simultaneously acquired SeaMARC II side-scan sonar and swath bathymetry, Hydrosweep multi-narrow beam bathymetry, digital single-channel watergun seismic reflection data, gravity, magnetics and 3.5 kHz profiles. Specific project objectives included:

Project Objectives (continued)

1. Define the morphologic expression of the extinct Aegir Ridge system. In particular, we plan to examine relief, orientation and spacing of "abyssal hill" fabric as a function of spreading rate, and the relative contribution of tectonics (faulting) and volcanism (seamounts) to seafloor relief. Comparison of Aegir Ridge survey data with other slow spreading rate ridge surveys, including the Knipovich Ridge SeaMARC II surveys carried out in 1989 and 1990, will provide a data set for identifying characteristic morphologies associated with a dying ridge system. Simultaneous gravity data acquisition with detailed bathymetry and sediment thickness will allow modelling of the flexural properties of the ridge and estimates of isostatic readjustment of the ridge to the new thermal regime caused by cessation of spreading. The Hydrosweep bathymetry and SeaMARC II side-scan sonar data will be the principal information used for interpretation of the central basin, augmented by closely spaced seismic reflection lines for exploring buried crust on the Aegir Ridge flanks.

2. Identify and define the tectonic and morphologic character of the northern and southern ends of the Aegir Ridge system. The tectonic signature at both ends of Aegir Ridge is complex (Old Jan Mayen Fracture Zone to the north; Iceland-Faeroes Ridge to the south), and the character of the intersection between spreading segments with both offsets is poorly defined.

3. Define the sediment sources and depositional regime of the Norway Basin. The combined use of full coverage bathymetry and side-scan sonar with closely spaced seismic reflection profiling will provide a powerful data set for interpreting spatial and temporal variations in depositional processes.

Present Status and Progress During the Current Year

The field program was successfully completed in September 1990. On-board processing of Hydrosweep and SeaMARC II data and the preparation of final charts and sonar mosaics at sea allowed preliminary interpretation during the cruise. However, detailed study was just beginning as FY90 ended. Preliminary results will be presented at the Fall 1990 AGU Meeting in San Francisco.

Publications for FY90

Vogt, P.R., Chayes, D.A., Fleming, H.S., Shor, A.N., 1990. SeaMARC II/Hydrosweep/Marine Geophysical Investigation of the Extinct Aegir Ridge, Norway Basin. Eos, 71, 1408 (abstract).

CRUISE REPORT

UNOLS 12/89

Ship Utllization Data

1. Ship Name	2. Operating Institution	3. Cruise (leg) Number
R/V MAURICE EWING	Lamont-Doherty Geological Observatory	MR 90-06

4. Dates of Project:
Begin: 7/23/90
End: 8/23/90

Port Calls

Place	Date	
Reykjavik, Ice	7/22/90	7/25/90
Bergen, Norway	8/23/90	8/27/90

5. Number, Sea Days	6. Number, Port Days
28	4

8a. Area of Operations, Area Index and Geographic Description

NA5 Norwegian Sea 63o-71oN /15ow 10oE

8b. Research in Foreign Waters?_YES___

Country: Norway
Denmark
Iceland

7. Participating Personnel:

Code	Title.Name.Institution		Function on Cruise (Ch.Sci.,Obs.,Tech.,Grad. Student, Undergrad, For.Obsv.)	Dates (If less than entire cruise)
1	Dr. H. Fleming	NRL	Ch. Sci.	
2	Mr. Dan A. Chayes	NRL	Ch. Sci.	
3	Mr. C.B. Arleth	NACOCEANO	Scientist	
4	Mr. J.E. Braud	NACOCEANO	Scientist	
5	Mr. R. Blaes	L-DGO	Technician	
6	Mr. A.O. Breece	NRL	Scientist	
7	Mr. Dale N. Chayes	L-DGO	Technician	
8	Mr. J.S. Corey	NRL	Scientist	
9	Mr. R. DePietro	L-DGO	Technician	
10	Mr. J. DiBernardo	L-DGO	Technician	
11	Mr. J. Ericksen	HIG	Technician	
12	Mr. J. Ferguson	URI	Technician	
13	Mr. M. Gorini	Brazil	Scientist	
14	Mr. J. Greer	L-DGO	Technician	
15	Mr. R. Hagen	NRL	Scientist	
16	Ms. J. Hood	NRL	Scientist	
17	Mr. C. Jones	NRL	Scientist	
18	Mr. B. Lauducci	NRL	Scientist	
19	Mr. S. Lauducci	NRL	Scientist	
20	Mr. S. McCarty	NRL	Scientist	
21	Ms. S. McClintock	HIG	Scientist	
22	Ms. Jill Mahoney	HIG	Scientist	
23	Mr. R. Maiwiriwiri	L-DGO	Technician	
24	Ms. Tina Mueller	HIG	Scientist	
25	Mr. R. Smith	L-DGO	Technician	
26	Mr. Pal Wessel	HIG	Scientist	
27	Mr. Eric Winter	NRL	Scientist	

Use reverse of necessary

9. Primary Project(s)

a. Project Title,Principal Investigator,Institution	b.Sponsoring Agency/	c.Grant or Contract	d.Participating Personnel	ee. Discipline
NORDIC SEAS 90 Dr. A. Shor HIG	ONR	N00014-90-J-1842		GG

10. Ancillary Project(s)

a. Project Title,Principal Investigator,Institution	b.Sponsoring Agency/	c.Grant or Contract	d.Participating Personnel	ee. Discipline

11. Science Party:

Scientists_18___ Grad. Students_____

Undergrads_____ Technicians _9___

Observers_____

Foreign Observers_____

12. Cost Allocation Data

a. Days Charged	b. Agency or Activity Charged	c. Grant or Contract No.
32	ONR (to NRL)	N00014-90-J-1842

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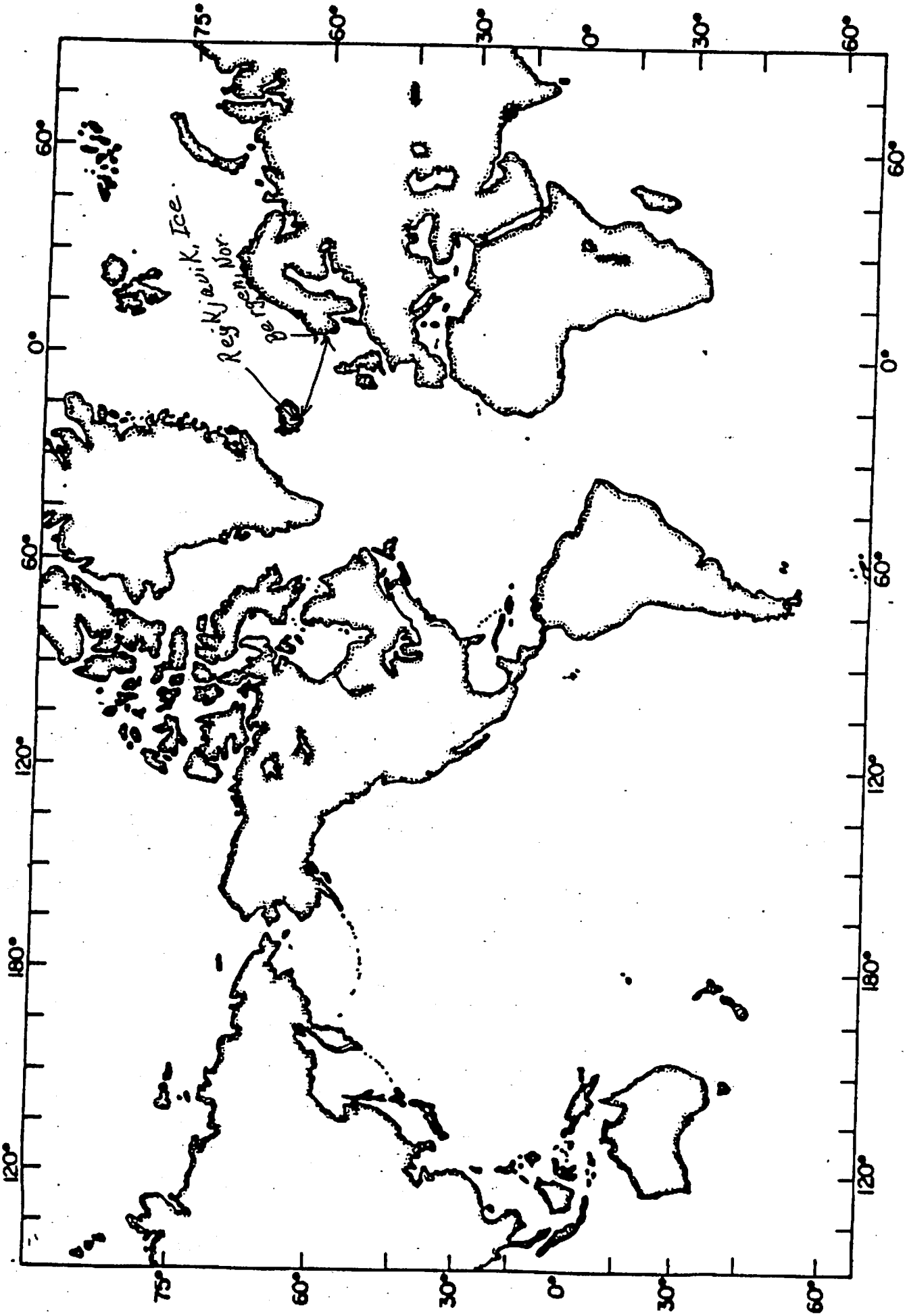
Michael Rawson, Marine Science Coordinator
Lamont-Doherty Geological Observatory
Palisades, NY 10964
Title, Signature, Operating Institution Official

Dec. 7, 1990
Date



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