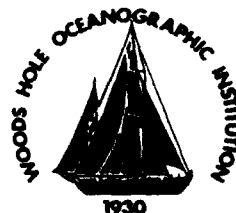


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Woods Hole Oceanographic Institution
Woods Hole, MA 02543
Phone: (508) 548-1400
Telex: 951679



16 December 1993

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Dr. Manuel E. Fiadeiro
Office of Naval Research Code 322PO
Ballston Towers One
800 North Quincy Street
Arlington
Virginia 22217-5660

Dear Manuel:

I am writing to report the termination of my ONR grant N00014-89-J-1076, the period of which was 10 October 1988 - 12 December 1990. This grant derived from two cruises of the R.R.S. Charles Darwin, which occupied a hydrographic section along the axis of the Arabian Sea in December 1986 - January 1987, during the northeast monsoon, and approximately repeated the section in July - August 1987, during the southwest monsoon. The station work included some sampling for chlorofluorocarbons and tritium-helium, as well as the standard CTD work. The grant provided support for analysis and interpretation of data from these two cruises: to Gregory Johnson, as part of his doctoral dissertation, and to me as well. Our studies concentrated on the deep water, as the upper-ocean data were handled mainly by Miami participants in the cruise, led by Donald Olson.

Major accomplishments of this grant were (1) discovery and description of a broad but thin near-bottom boundary current on the Kenyan continental rise; (2) detection of a deep western-boundary current along the Carlsberg Ridge in the Arabian Basin; (3) some new ideas about the pattern of deep-water circulation in the Arabian Sea; and (4) quantification of property budgets and renewal time in the oxygen-minimum layer of the Arabian Sea.

Publications prepared with full or partial support from this grant are:

Johnson G. C., B. A. Warren, and D. B. Olson (1991) Flow of bottom water in the Somali Basin. Deep-Sea Research, 38, 637-652.

Johnson G. C., B. A. Warren, and D. B. Olson (1991) A deep boundary current in the Arabian Basin. Deep-Sea Research, 38, 653-661.

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Warren B. A. and G. C. Johnson (1992) Deep currents in the Arabian Sea in 1987. Marine Geology, 104, 279-288.

Olson D. B., G. L. Hitchcock, R. A. Fine, and B. A. Warren (1993) Maintenance of the low-oxygen layer in the central Arabian Sea. Deep-Sea Research II, 40, 673-685.

Unpublished documents prepared with partial support from this grant are:

Kearns E. J., S. R. Emmerson, D. B. Olson, G. Johnson, and J. Morrison (1989) CTD and Bottle Data from R.R.S. Darwin MASAI86-87. Data Report, Rosenstiel School of Marine and Atmospheric Science, University of Miami, and Woods Hole Oceanographic Institution.

Johnson G. C. (1990) Near-equatorial deep circulation in the Indian and Pacific Oceans. Doctoral Dissertation, Woods Hole Oceanographic Institution and The Massachusetts Institute of Technology, WHOI-90-50, 157 pp.

Sincerely yours,

Bruce A. Warren

Bruce A. Warren

BAW/bpg

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