Acknowledgments and Permissions

Acknowledgments

Bruce A. Warren, Deep Circulation of the World Ocean. Chapter 1.

Bruce A. Warren, Deep Circulation of the World Ocean. Chapter 1.

Preparation of this chapter was supported by the U.S. Office of Naval Research under contract N00014-79-C0071, NR083-004. I am grateful to R. B. Montgomery and A. B. Arons for helpful criticism of an early draft.

L. V. Worthington. The Water Masses of the World Ocean: Some Results of a Fine-Scale Census. Chapter 2.

The painstaking tasks of data reduction, quality control, and the assignment of world water masses to their myriad fine-scale bivariate classes were carried out by C. G. Day and R. L. Barbour; their work is gratefully acknowledged. This research was sponsored by the Office of Naval Research under contracts N00014-74-C-0262, NR083-004 and N00014-79-C-0071, NR083-004. Contribution 4442 from the Woods Hole Oceanographic Institution.

Joseph L. Reid. On the Mid-Depth Circulation of the World Ocean. Chapter 3.

This paper represents one of the results of research supported by the Office of Naval Research, the National Science Foundation, and the Marine Life Research Program of the Scripps Institution of Oceanography.

N. P. Fofonoff. The Gulf Stream System. Chapter 4. Supported by the Office of Naval Research under contract N00014-76-C-0197, NR083-400.

George Veronis. Dynamics of Large-Scale Ocean Circulation. Chapter 5.

Support by the National Science Foundation under grant OCE-7719451 is gratefully acknowledged. Carl Wunsch and Bruce Warren made helpful comments on the original manuscript. Special thanks go to Peter Rhines for a critical review and several discussions about eddy-driven flows.

Ants Leetmaa, Julian P. McCreary, Jr., and Dennis W. Moore. Equatorial Currents: Observations and Theory. Chapter 6.

J. P. M. and D. W. M. wish to acknowledge the Office of Naval Research (contract N00014-75-C-0165) and The National Science Foundation (grant OCE-76-00551) for providing support.

Robert C. Beardsley and William C. Boicourt. On Estuarine and Continental-Shelf Circulation in the Middle Atlantic Bight. Chapter 7.

550 Acknowledgments and Permissions

We gratefully acknowledge the support and help given by the following colleagues. D. Bumpus, G. Csanady, C. Mooers, D. Pritchard, and V. Worthington all provided useful feedback on early drafts of this chapter. Discussions with J. Allen, B. Butman, W. Grant, D. Haidvogel, D. Mayer, J. McCullough, R. Montgomery, M. Noble, G. Philander, P. C. Smith, and C. Winant also proved helpful. B. Butnam, G. Halliwell, and M. Noble supplied the additional unpublished wind-stress data shown in figure 7.12, and H. Ou and W.-S. Chuang made the coherence and monthly-mean current computations shown for site 2 in figures 7.9 and 7.12, respectively. R. Scarlet and New Jersey Public Service allowed us to reproduce the current spectrum and coherence shown for site 1 in figures 7.8 and 7.9. R. Legeckis kindly furnished the satellite infrared photograph of the Middle Atlantic Bight shown in figure 7.15. D. Haight and A. Sullivan helped with the typing of the manuscript and preparation of the bibliography. We also want to acknowledge the support and encouragement given us by our friends and families during the preparation of this review.

This research has been supported through National Science Foundation grants OCE-76-01813 and 78-19513 to R.C.B. and OCE-77-22774 to W.C.B., and a grant to W.C.B. from the State of Maryland Power Plant Siting Research Program.

Walter Munk. Internal Waves and Small-Scale Processes. Chapter 9.

My work is supported by the Office of Naval Research.

Myrl C. Hendershott. Long Waves and Ocean Tides. Chapter 10.

I have profited from discussions on tides with Walter Munk, Michael Parke, and Gerard Stock. Annette Pickens has helped me greatly in the preparation of this manuscript.

Carl Wunsch. Low-Frequency Variability of the Sea. Chapter 11.

Supported by the National Science Foundation under grant OCE-78-19833. MODE contribution 125 (POLY-MODE). I am indebted to D. E. Harrison, M. Hendershott, and W. Munk for many useful comments and suggestions, and to Charmaine King for computing the many spectra.

D. James Baker, Jr. Ocean Instruments and Experiment Design. Chapter 14.

In order to get even a brief overview of this rapidly changing field, I wrote to a number of people involved in the key developments of the instruments discussed above. The response was gratifying and overwhelming; I ended up with a tableful of material and personal reminiscences that proved to be fascinating reading and enough for a book, too much for a chapter. Because I have space only for a limited number of examples, the list of instruments discussed is not complete. I think that it does form an interesting record of the activities of some of the participants in the important developments in oceanographic instrumentation over the past two decades, and I am grateful to those who responded.

Special help was received from J. Dahlen on profilers and TP recorders; J. Garrett, G. Cresswell, J. Stromme, and J. Gillis on drifters; M. Gregg and P. Hacker on microstructure profilers; B. Hamon on the history of the salinometer and STD (including the early reference to Nansen]; R. Heinmiller on moorings and general engineering problems; W. Hill on tape recorders and electronics; P. Niiler on transport floats and instrumentation in general; T. Rossby on SOFAR floats and the inverted echo sounder; T. Sanford on electromagnetic profilers; J. Swallow on the development of neutrally buoyant floats; J. Van Leer on the cyclesonde; R. Wearn on batteries and pressure gauges; D. Webb on electronics, floats, current meters, and engineering in general; R. Weller on current meters; and S. Williams on the optical profiler.

I also received useful information from N. Brown, B. Buck, W. Coburn, R. Davis, V. Derr, T. Ewart, J. Feeney, J. Filloux, C. Gibson, D. Halpern, J. Hannon, S. Hayes, J. Luyten, R. Mesecar, W. Munk, W. Nowlin, T. Osborn, J. Paros, S. Pond, R. Pollard, J. Richardson, W. Schmitz, J. D. Smith, B. Taft, R. Walden, M. Wimbush, and B. Zetler. Carl Wunsch and Bruce Warren read an early version of the chapter and made a number of helpful suggestions.

This work was partially supported by the Pacific Marine Environmental Laboratory of NOAA, and partially by a grant from the Office of the International Decade of Ocean Exploration for the International Southern Ocean Studies Program at the University of Washington.

W. S. Broecker. Geochemical Tracers and Ocean Circulation. Chapter 15.

Many of the data referred to in this paper were obtained as part of the GEOSECS program. The great success of this survey is a tribute to the late Arnold Bainbridge, who directed virtually every aspect of the field program. The excellence of the radioisotope measurements by Stuiver (¹⁴C) and Ostlund (³H and ¹⁴C) permitted the prime objective of this program to be accomplished. Discussions with Weiss, Craig, Stuiver, Shepherd, Jenkins, Brewer, Sarmiento, Quay, Rooth, Needler, Gordon, and many others have improved my perspective on oceanic tracing.

Alan J. Faller. The Origin and Development of Laboratory Models and Analogues of the Ocean Circulation. Chapter 16.

551

Acknowledgments and Permissions

The research reported here has been supported by the National Science Foundation under grant ATM-76-82061.

H. Charnock. Air-Sea Interaction. Chapter 17. Much of this review is based on material assembled during a long and valued collaboration with the late Dr. T. H. Ellison.

Jule G. Charney and Glenn R. Flierl. Oceanic Analogues of Large-Scale Atmospheric Motion. Chapter 18. Supported by National Science Foundation grants ATM-76-20070 to J. G. C. and OCE-77-28350 to G. R. F. The authors thank Sam Ricci for preparing figures, Joel Sloman for typing the manuscript, and Joe Pedlosky for his careful review of the first draft.

Permissions

Permission to reproduce illustrations was received from authors, publishers, and copyright holders of the following figures:

Academic Press 17.16

American Association for the Advancement of Science 11.4, 14.32

American Geophysical Union 3.15, 8.9, 8.10, 8.13, 9.15, 9.26, 9.28, 10.16, 10.23, 10.31A, 10.36, 11.8, 11.10, 15.10

American Meteorological Society 1.10, 1.13, 3.13, 3.14, 4.14, 4.15, 4.17, 5.7, 7.14, 8.8, 9.18, 9.21, 9.22, 10.7, 10.29, 10.39, 11.2, 11.11, 14.33B, 17.1, 17.2, 17.3, 17.12, 17.13

Annual Reviews Inc. 15.2

Deutsches Hydrographische Institut 17.6, 17.8

Elsevier Scientific Publishing Co. 15.6, 15.8

Gordon and Breach Science Publishers 5.17, 8.5, 10.27, 10.31B, 10.32

Her Majesty's Stationery Office (by permission of controller) 17.17

The Johns Hopkins University Press 4.6, 5.10A

John Wiley and Sons 4.12, 5.15, 10.13, 10.14, 10.17, 10.18

MacMillan (Journals) Ltd. 9.2, 12.3, 12.7

Measurement and Data Corp. 14.29

Pergamon Press 1.1, 1.2, 1.4, 1.5, 1.6, 1.7, 1.8, 1.12, 4.4, 4.8, 4.10, 5.5, 5.6, 5.11, 6.5, 8.3, 8.7B, 8.11, 9.23, 10.11, 10.33, 10.34, 14.15, 14.18, 14.22, 14.25, 14.27, 15.12

Prentice-Hall 3.9, 7.5

The Royal Society of London 6.8, 10.12B, 10.30, 10.35, 17.11

Sears Foundation for Marine Research 3.10, 4.9, 4.11, 4.13, 5.4, 5.9, 5.10B, 10.6, 10.28

The Syndics of the Cambridge University Press 8.2, 8.6, 8.14, 9.12, 9.13, 9.15, 10.15, 11.6, 17.4, 17.5, 17.7

United States National Academy of Sciences 1.15

Contributors

Arnold B. Arons Department of Physics University of Washington Seattle, Washington 98195

D. James Baker, Jr. Department of Oceanography University of Washington Seattle, Washington 98195

Robert C. Beardsley Woods Hole Oceanographic Institution Woods Hole, Massachusetts 02543

William C. Boicourt Chesapeake Bay Institute The Johns Hopkins University Baltimore, Maryland 21218

W. S. Broecker Lamont-Doherty Geological Observatory and Department of Geological Sciences Columbia University Palisades, New York 10964

Jule G. Charney Department of Meteorology Massachusetts Institute of Technology Cambridge, Massachusetts 02139

H. Charnock Department of Oceanography University of Southhampton Southhampton, England

G. E. R. Deacon Institute of Oceanographic Sciences Wormley, Surrey, England

Alan J. Faller Institute for Physical Science and Technology University of Maryland College Park, Maryland 20742

Glenn R. Flierl Department of Meteorology Massachusetts Institute of Technology Cambridge, Massachusetts 02139

N. P. Fofonoff Woods Hole Oceanographic Institution Woods Hole, Massachusetts 02543

F. C. Fuglister Woods Hole Oceanographic Institution Woods Hole, Massachusetts 02543

622 Contributors Myrl C. Hendershott Scripps Institution of Oceanography La Jolla, California 92037

Ants Leetmaa Atlantic Oceanographic and Meteorological Laboratories National Oceanographic and Atmospheric Administration Miami, Florida 33149

Julian P. McCreary, Jr. Ocean Sciences Center Nova University Dania, Florida 33004

Willem V. R. Malkus Department of Mathematics Massachusetts Institute of Technology Cambridge, Massachusetts 02139

Raymond B. Montgomery Whitman Road Woods Hole, Massachusetts 02543

Dennis W. Moore Joint Institute for Marine and Atmospheric Research University of Hawaii Honolulu, Hawaii 96822

Walter Munk Scripps Institution of Oceanography La Jolla, California 92037

Joseph L. Reid Scripps Institution of Oceanography La Jolla, California 92037

J. H. Steele Woods Hole Oceanographic Institution Woods Hole, Massachusetts 02543

J. S. Turner Research School of Earth Sciences Australian National University Canberra, Australia

George Veronis Department of Geology and Geophysics Yale University New Haven, Connecticut 06520

Bruce A. Warren Woods Hole Oceanographic Institution Woods Hole, Massachusetts 02543 L. V. Worthington Woods Hole Oceanographic Institution Woods Hole, Massachusetts 02543

Carl Wunsch Department of Earth and Planetary Sciences Massachusetts Institute of Technology Cambridge, Massachusetts 02139