ature and salinity data—a most valuable contribution to the Ice Patrol.

Fae Korsmo's chapter on U.S. Arctic research early in the Cold War, along with Jacob Hamblin's chapter on the 1957–1958 International Geophysical Year, seem off topic to the oceanography theme. Peter Neushul's chapter on Antarctic marine botany is more topical, but its focus on Michael Neushul is limiting. Walter Lenz's description of the marginal ice zone experiments (POLEX, AIDJEX, MISEX) seems oddly bureaucratic. Zuoyue Wang provides a unique description on China's involvement in going to the poles, albeit with little discussion on oceanography. China wanted to use its visibility for a combination of nationalism and place in international science, along with romanticizing its polar heroes.

Mott Greene brings the book back to its oceanography theme with a discussion on "toy" models developed by individuals to produce and run cheaply, with their emphasis on "simplicity, elegance, transparency, and excellence in classical physics." The large climate models, he suggests, are "complex, diffuse, dense, technologically committed, expensive, and are the work of very large teams of collaborators of different ranks, exemplifying the criteria of excellence of modern industrial-scale earth science." In Mott's theme, the toy models led to the inclusion of Arctic ice albedo feedbacks as a necessary feature of global climate models with their important implications for paleo and global-warming research.

The last chapter by Deborah Day is a list of articles on the history of marine science in the Arctic for the twentieth and twenty-first centuries. It covers, at best, 1% of the known scientific literature on Arctic marine research, and I am not convinced it provides much value to the scientific community, although it may provide added value to polar historical research.

Extremes is, therefore, a mixed-bag survey of polar research. I am glad to have read the book, despite its unevenness.

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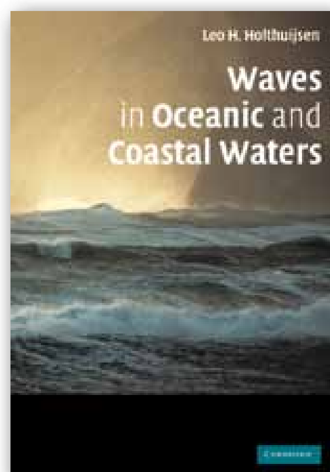
Waves in Oceanic and Coastal Waters



By Leo H. Holthuijsen, Cambridge University Press, 2007, 404 pages, ISBN 0521860288, Hardcover, $80 US

REVIEWED BY STEVE ELGAR

Although few modern applications are as important as Walter Munk's wave predictions used to guide the Allied landing at Normandy, models for wind-generated ocean waves have evolved significantly since June 1944. Along with the obvious military and engineering interests, the ability to simulate waves has become a crucial component of models for coastal and nearshore circulation, and the corresponding transport of materials, including pollutants, biota, and sediments. Oceanographers, sailors, and beachgoers have observed ocean-surface gravity waves for centuries, and mathematicians and physicists have developed exquisite theories for their generation, propagation, and dissipation for a wide range of situations. In this nicely illustrated book, Leo Holthuijsen (Delft University of Technology) reviews the observations and theories and presents the state of the art in models that simulate the generation and propagation of wind waves, especially in coastal areas.

Holthuijsen is well qualified to teach us about ocean waves. My friend and colleague Tom Herbers colorfully describes going to sea two decades ago as Leo's student during intense storms in the North Sea to observe white caps, which are an important, but little understood, component of the momentum balance describing wave propagation.

UPCOMING BOOK REVIEWS

Exploring the World Ocean
by W.S. Chamberlain and T.D. Dickey, McGraw-Hill Higher Education, 394 pages

Fundamentals of Geophysical Fluid Dynamics
by James C. McWilliams, Cambridge University Press, 249 pages

Lagrangian Analysis and Prediction of Coastal and Ocean Dynamics
by A. Griffa, A.D. Kirwan, Jr., A.J. Mariano, T. Özgökmen, and T. Rossby, Cambridge University Press, 487 pages

Numerical Modeling of Ocean Circulation
by Robert N. Miller, Cambridge University Press, 252 pages

The Silent Deep: The Discovery, Ecology, and Conservation of the Deep Sea
by Tony Koslow, University of Chicago Press, 270 pages

Solitary Waves in Fluids
edited by R.H.J. Grimshaw, WIT Press, 208 pages

The Unnatural History of the Sea
by Callum Roberts, Island Press, 435 pages

More recently, Holthuijsen has led the development of one of the most popular models for wind waves propagating in shallow water (SWAN). *Waves in Oceanic and Coastal Waters* guides the reader from observational techniques (although Herbers' stories are more picturesque!) through statistical descriptions of the sea surface and deep- and shallow-water wave theory, and on to development of models for the generation of waves by wind and their subsequent propagation across ocean basins, the continental shelf, and the surfzone.

The shallow-water wave model SWAN is used widely, and recently has been incorporated into numerical models for coastal waves, currents, sediment transport, and morphological change. This book is an excellent resource for modelers interested in understanding, using, and improving SWAN. The concepts are not restricted to any particular numerical model, and thus this book will be of use to engineers developing operational wave models and to scientists researching physical processes related to waves. Although it is not written solely as a textbook, *Waves in Oceanic and Coastal Waters* would complement a first-year graduate course on ocean waves, as well as be a useful tool for practicing engineers and scientists.

The mathematical developments are clear; additional information contained in appendices, footnotes, and extensive citations will allow graduate students to obtain details of theory; and there also is practical information of use to engineers and modelers. Numerous figures, graphs, and plots compare laboratory and field observations with theoretical results and with approximations necessary for modeling. Other illustrations provide definitions, explanations, and examples of the concepts discussed in the text. The graphics are comprehensive, yet not overly complicated, and, along with the text, are presented in easy-to-read fonts.

Most of the sections are enhanced with sidebars containing supplementary information without distracting from the flow of the main text. Topics within the sidebars include descriptions of spectral shapes and width parameters, long- and short-term statistics of wave heights, rogue waves, growth of wind waves, and details of numerical integration schemes used in models. In addition, there are numerous footnotes with technical details, as well as interesting historical tidbits. For example, it appears that I have long misspelled the formula that describes refraction of waves propagating in shallow water, which was named for the Dutch scientist Willebrod Snel (one 'l') van Royen. The historical notes (and the references) have a northern European (especially Dutch) slant, providing a somewhat different perspective than commonly found in books by American authors.

Each chapter begins with a summary of key concepts, followed by an introduction before the mathematics are presented. Although the focus is on concepts of interest to the development of numerical wave propagation models, adequate references to additional information are provided for readers desiring more detail. Approximations are described fully, allowing the reader to understand possible sources of errors in model predictions. For example, despite sending students to spend days in rough waters in the North Sea, Holthuijsen makes no pretense that the physics of whitecapping-induced dissipation is understood well. Similarly, although nonlinearities can have an important effect on the propagation of different components of the wave field, computational limitations restrict most operational models to highly simplified approximations of nonlinear wave-wave interactions. These simplifications, and the resulting errors introduced into wave model predictions are described accurately.

Holthuijsen discusses both deep- and shallow-water wind waves. Subjects covered include the statistical description of the sea surface (e.g., the energy density spectrum, the probability density of wave heights, and the directional distribution of sea-surface elevation fluctuations), linear wave theory, nonlinear wave interactions, generation of waves by wind, dissipation (by white capping, bottom friction, and breaking), topographic effects (reflection, shoaling, refraction, and diffraction), and wave-current interaction. The chapters (and corresponding sidebars) describing theories and models for waves propagating in oceanic and coastal water depths are structured similarly, facilitating comparisons. Short appendices provide details about random variables, linear wave theory, spectral analysis, tides and currents, and the shallow-water equations.

Waves in Oceanic and Coastal Waters by Leo Holthuijsen is an excellent source of information about wind-generated, ocean-surface gravity waves, especially as used in state-of-the-art numerical wave models, in particular those that simulate waves in shallow coastal waters, such as SWAN. The book is nicely illustrated, well written, contains many references, and will be of interest to scientists and engineers.

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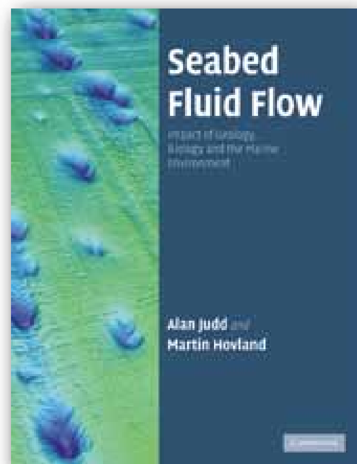
Seabed Fluid Flow

The Impact on Geology, Biology and the Marine Environment



By Allen Judd and Martin Hovland, Cambridge University Press, 2007, 475 pages, ISBN 9780521819503, Hardcover, $160 US, also available in eBook format

REVIEWED BY GUNTER WEGENER AND ANTJE BOETIUS

When their previous book *Seabed Pockmarks and Seepages* was published in 1988, Martin Hovland and Alan Judd were the first authors to illustrate and discuss global geological, geophysical, chemical, and biological patterns in seafloor structures related to fluid flow, especially those caused by eruption of gas. For many years, this book was the only comprehensive reference in the field of seepage structures. Only slowly would journal publications become available that connected fluid flow, seabed deformation, carbonate crust precipitation, gas emission, and methane-fueled benthic communities—just as proposed in a highly visionary manner by Hovland and Judd in 1988, based on seafloor surveys by the oil industry and governmental institutions.

Today, after the discovery of vast methane reservoirs in the seafloor and their relevance not only for exploitation by the energy industry but also as a major factor in continental-slope stability, as a potential greenhouse gas affecting Earth's climate, and as a source of energy for a still unknown diversity of marine life, an ever-increasing number of scientists from all marine disciplines study seabed fluid flow. Thanks to major innovations in marine technologies that allow high-resolution acoustic and visual surveys of the ocean floor, as well as targeted sampling, we now know that fluid flow contributes significantly to the structure and variation of the seabed worldwide—but many of the underlying processes and consequences are still enigmatic. Alan Judd and Martin Hovlands have been at the forefront of research on seepage for decades, and have worked hard to provide an update to their classic book. (We can testify that they worked on it even at sea!)

Now, almost 20 years after the publication of its predecessor, the newly published *Seabed Fluid Flow* contains an important update of the scientific knowledge regarding many different types of seabed structures, and it represents