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2012. *Oceanography* 25(4):79–81, http://dx.doi.org/10.5670/oceanog.2012.112

BOOK REVIEW | *Buoyancy-Driven Flows*

Book Information | Reviewer | First Paragraph | Full Review | Citation

Book Information

Buoyancy-Driven Flows
Edited by Eric Chassignet, Claudia Cenedese, and Jacques Verron, Cambridge University Press, 2012, 444 pages, ISBN 978-1-107-00887-8, Hardcover, $120 US

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Reviewer

Eckart Meiburg | Department of Mechanical Engineering, and Center for Interdisciplinary Research in Fluids, University of California at Santa Barbara, Santa Barbara, CA, USA.

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First Paragraph

Buoyancy forces, and their interplay with pressure, inertia, and rotation, represent a key ingredient in a wide range of oceanic and atmospheric flow processes. They strongly influence global ocean circulation, and hence the variability of Earth's climate, by driving the formation of deep water. On a smaller scale, buoyancy forces play a significant role in maintaining the health of local ecosystems by affecting the transport of nutrients, sediment, pollutants, and heat. The book *Buoyancy-Driven Flows*, with 10 chapters contributed by distinguished authors, reviews and analyzes many of the flow phenomena that result from buoyancy forces, with a primary focus on the ocean. It introduces the reader to the fundamental fluid mechanical principles behind such varied mechanisms as surface buoyancy or wind forcing, overflow and exchange flows, the role of Earth's rotation, and the influence of local seafloor topography. Furthermore, the book reviews efforts to account for these effects in global and regional climate models, and it extends the discussion to related subaerial flows such as dust storms, volcanic eruptions, snow avalanches, and debris flows. The individual chapters are based on lectures given at the 2010 Alpine Summer School on Buoyancy-Driven Flow directed by the book's three editors; the authors and editors are to be commended for following a unified didactic approach and similar presentation styles. Throughout the book, individual themes are based on environmental observations. There is a clear focus on formulating fundamental scaling relationships, on deriving similarity laws, and on establishing the governing dimensionless parameters. These theoretical considerations are frequently illustrated by conceptually simple laboratory experiments and/or numerical simulations. This approach renders the book accessible to advanced students who have taken an introductory graduate level class in fluid mechanics and have been exposed to the fundamentals of stratified and rotating flows.

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Full Review

788 KB pdf

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Oceanography Magazine, The Oceanography Society, P.O. Box 1931, Rockville, MD 20849-1931, USA
Tel: (1) 301-251-7708, Fax: (1) 301-251-7709, E-mail: magazine@tos.org
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