AN INTRODUCTION TO TIDES

This textbook is a self-contained introduction to tides that will be useful for courses on tides in oceans and coastal seas at an advanced undergraduate and postgraduate level, and will also serve as the go-to book for researchers and coastal engineers needing information about tides. The material covered includes: a derivation of the tide-generating potential; a systematic overview of the main lunar periodicities; an intuitive explanation of the origin of the main tidal constituents; basic wave models for tidal propagation (e.g., Kelvin waves, the Taylor problem); shallow-water constituents; co-oscillation and resonance; frictional and radiation damping; the vertical structure of tidal currents; and a separate chapter on internal tides, which deals with ocean stratification, propagation of internal tides (vertical modes and characteristics) and their generation. Exercises are provided in each chapter.

THEO GERKEMA is a senior researcher in the Department of Estuarine and Delta Systems at the Royal Netherlands Institute for Sea Research (NIOZ), Yerseke. He graduated as a theoretical physicist from the University of Groningen and studied the generation of internal solitons for his PhD at NIOZ. The early part of his career was devoted to studying internal tides and Coriolis effects. In recent years, his work has centered on coastal dynamics, tides, sediment transport and sea-level variability, involving sea-going observational work and modeling.

"Theo Gerkema connects his expertise in internal wave dynamics and shallow-water processes in one consistent and inspiring presentation of tides in the ocean. The outcome is an excellent textbook, which I will certainly use for my own teaching. And I will consult the book for my own research, as a backup for all things about tides which I should know better."

Hans Burchard,
Leibniz Institute for Baltic Sea Research

"In this book, Professor Gerkema presents one of the most comprehensive treatises on tides currently available. Starting with the fundamental concepts of the tide, we get an extensive introduction to its generation and properties, and why it acts the way it does. The book also contains a chapter on the important internal tide, acting as an energy sink in the deep ocean, away from the tidal influence at coastlines. All of this is presented with a minimum of equations, which makes the book all the more accessible. The book draws extensively on the scientific literature, but presents it in an understandable way that should suit readers from diverse backgrounds and levels. The exercises throughout the chapters really challenge the understanding of the reader and make for excellent additions to the book. More specialized concepts are presented in boxes in the text – a nice feature that allows a reader to focus (or not) on what is being presented. The book has the potential to become the go-to reference for students and scientists alike when it comes to tidal dynamics, because it fills a gap by focusing only on tides and covering all aspects of them."

Mattias Green,
Bangor University

"A nicely balanced physical and mathematical account of the tide-generating forces and their multiple periodicities, followed by an insightful presentation of the resulting tidal currents and some of their effects in coastal seas and in the deep ocean, where internal tides are a major cause of climatically important mixing."

Chris Garrett,
University of Victoria

"Professor Gerkema's book offers a comprehensive review of tides, an ancient subject that still inspires a great deal of modern research. Professor Gerkema outlines the basics of astronomical tidal forcing, tidal analysis, and tidal dynamics in the open and coastal oceans. I appreciate his efforts because it is hard to find all of these fundamentals in one place. Gerkema also includes a nice chapter on the subject of internal tides, a topic of much current research now. I will certainly add Professor Gerkema's text to my office bookshelf."

Brian Arbic,
University of Michigan

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