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and atmosphere, and of related current modeling efforts. Furthermore, they illustrate nicely how a multifaceted research approach combining field observations with scaling analysis, model laboratory experiments, and numerical simulations has been successful in advancing our understanding of a wide range of natural phenomena. Perhaps the only topics that I would have liked to see covered in more depth, even by separate chapters, concern double-diffusive processes and internal/surface waves. While the chapters themselves represent treasure troves of fascinating research problems in the field of geophysical fluid mechanics, the accompanying lists of references will prove helpful to investigators aiming to familiarize themselves more deeply with specific research areas.

Finally, the accumulated body of knowledge presented so accessibly in this book provides a reminder of the complexity of the processes at hand, and it impressively demonstrates the long-term progress that can been achieved through sustained fundamental research. Given the importance of understanding the dynamics of our ocean and atmosphere, and of being able to develop predictive models for their behavior, it is essential that these lines of research be sustained and expanded upon well into the future.

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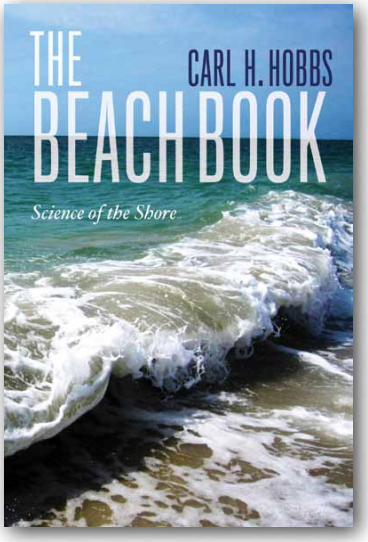
The Beach Book: Science of the Shore

By Carl H. Hobbs, Columbia University Press, 2012, 192 pages, ISBN 978-0-23-1160551, Softcover, $19.50 US

REVIEWED BY ANDREW D. SHORT



The Beach Book is about beaches—but also much more. An alternative title could be "The East Coast of the USA." In addition to beaches, the book covers dunes, barriers, tidal inlets and jetties, marshes, sea level, and human occupation of a stretch of barrier island coast experiencing ongoing sea level rise, shoreline erosion, and the occasional hurricane or nor'easter and their accompanying waves and surges. If you want to know how the US East and Gulf Coasts work, then this book is for you, as most of the examples, photographs, and illustrations are drawn from this region.

Though the title suggests a scientific approach, the brief introduction to the book indicates that it is aimed at the general public. Here, Hobbs states that it "will give readers a better appreciation of beaches," and "appreciation" is the key word. Reading *The Beach Book* is rather like strolling along the shore with the author, who points out and discusses some of its most interesting features. Hobbs prefers to have a conversation with the reader, covering the facts as well as anecdotes about his experiences from a lifetime of working on the shore.

The first chapter, "Beaches," begins this conversation. With no internal heading, it starts off by defining a beach and associated nomenclature, then goes on to describe beach profiles, which then leads to a discussion of closure depth. Next come the topics of alongshore sand transport, edge waves, and beach cusps, and finally beach mineralogy and ecology.

Chapter 2, "Wind," takes the reader through solar heating, albedo, atmospheric pressure, and wind, the impact of wind speed, damaging winds, and hurricane ratings. It also covers air density, duration, and direction, sea breeze, wind-driven circulation including the Ekman spiral, and upwelling.

Chapter 3, titled "Wave Processes," begins with a discussion of wave generation. It is followed by wave motion, deep- to shallow-water waves, and then wave characteristics, including speed, shoaling, and refraction, all accompanied by many helpful diagrams. It finishes with a discussion of sea swell, wave decay, wave

breaking, and finally tsunamis.

The next chapter, "Tides," provides an excellent explanation of the roles that the Moon and Sun play in tides. After describing the attributes of a perfect water Earth, it then moves to a discussion about the real world and the impact of shallow oceans and tidal systems. This is followed by a conversation about tidal range and tidal prisms. Here, Hobbs spends some time explaining the tides in the Bay of Fundy—the highest in the world—aiming to debunk tidal resonance theory, proposing instead that the high tides are due to bay constriction. The chapter finishes with a discussion of the effect of tide range on barrier island length.

Chapter 5 covers sediments, including their various types, their classification and sizes, and how to measure them using sieves and settling tubes. A discussion of the role of sediment size in sediment transport, mixed sediment, sand shape, and frosting follows. Hobbs then talks about grain packing, porosity, and density, which controls groundwater and permeability, though it is not related back to its role in beach morphology. The chapter finishes with questions like "How many sand grains are there on a beach?" and "Where does sand come from?"

With the completion of the beach components, Hobbs then starts a tour of coastal systems, beginning with the chapter called "Barrier Islands and Tidal Inlets," describing features that are ubiquitous on the East and Gulf Coasts. This chapter covers barrier processes, including dunes, overwash, and washover fans, before taking on tidal inlets in a section that also covers human impacts through the construction of jetties intended to stabilize the inlets and often resulting in severe updrift erosion.

Chapter 7 treats what lies on and behind barriers. It focuses on topics in the chapter's title—"Sand Dunes and Salt Marshes"—perhaps a strange combination, but they are both intimately linked to their vegetation. On the topic of dunes, the author covers the nature and transport of wind-blown sand, dune types, and vegetation. The tidal marsh section covers marsh relationship to tides and the role of vegetation in the marshes' nature and evolution.

Chapter 8 introduces the important topic of sea level and sea level rise, of interest to anyone who lives near the coast, especially on a beach or barrier, and surely relevant in the weeks following the US East Coast's "Superstorm Sandy." The chapter begins by reviewing the types and range of sea level rise, including eustatic and isostatic, and glacial cycles, and how they are dated. It then moves on to potential "greenhouse impacts," which are predicted to raise sea level between 1 to 1.6 m by 2100, with attendant major environmental and social impacts.

Chapter 9, titled "Storms and Storm Surges," is a short chapter that could be named Hurricane Impacts on the American East and Gulf Coasts. It first defines storm surges and then addresses their causes, especially those generated by hurricanes and nor'easters. The chapter also provides several well-known examples of past and recent hurricanes, their storm surges, and associated damage.

The final Chapter 10, "Erosion and Shore Protection," begins with the politics of shore protection, including the cost-benefit of protection—is it economically justified? The chapter mentions various approaches to shore protection, both hard (seawalls, groins, and breakwaters) and soft (beach nourishment, accommodation, and setback).

The *Beach Book* is illustrated with many excellent diagrams, most by the author, and also with grainy black and white photographs, together with several boxes and two appendices. It finishes with a glossary that, interestingly, does not contain the terms *beach* or *shore* or *sand* but does include *syzygy* (the Sun-Moon-Earth alignment that gives rise to spring tides), a bibliography arranged by chapter, and an index.

This book is written for a lay audience and would only be suitable in a university course as additional reading. It is an easy read for those who live by the shore and want a good, simple understanding of why it's there, what is going on now, and what might happen in the future, particularly for those living on the US East and Gulf Coasts.

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