



## REVIEW

### *Rising Seas: Past, Present, Future*

by Vivian Gornitz

New York: Columbia University Press, 2013. 360 pages

reviewed by **Kenneth G Miller**

The specter of sea-level rise is one of the most prominent indicators of a warming planet, and Vivian Gornitz has produced an excellent book, *Rising Seas*, that documents past, present, and future sea-level changes. The book is nicely produced. It provides information on oceanic and geological processes (chapter 1), the causes of sea-level change (chapter 2), the geological history of the rises and falls of sea level (chapters 3–6), modern sea-level rise (chapter 7), sea-level rise's impact on shorelines and cities (chapter 8), and finally how to cope with and plan for the future (chapters 9 and 10).

Gornitz answers the fundamental question, “is sea-level rise part of a natural cycle?” by citing recent studies that document the current rise in sea level as unprecedented over the past few thousands of years. The well-referenced book builds on and encapsulates much of the information contained within the massive (1000+ page), pricey (>\$500) *Encyclopedia of Paleoclimatology and Ancient Environments* edited by Gornitz (2009). Many of the illustrations are from that volume and almost all are simple distillations of scientific figures; though all in black and white, they are generally clear and well-produced. It is a suitable update to Anthony Hallam's *Phanerozoic Sea-Level Changes* (1992). The main difference is that this book is less geological and focuses on sea-level changes since the dinosaurs, whereas Hallam took us on the full geologic tour.

Each chapter is quite readable on its own and starts with interesting quotes, though I confess that the book overall reads slowly. I also found that there is a good deal of redundancy, with items discussed several times in subsequent chapters. In dealing with complex scientific issues, however, such redundancy is not necessarily a drawback, since each chapter can almost be read standing alone. In general, I found few scientific flaws—which is remarkable in a book on a rapidly evolving topic of this complexity—though some critical tables (for example, distribution of water) are dated. Most of the complex issues were discussed clearly, but a few could have been simplified further.

The first chapter provides a succinct introduction to the oceans, including currents, waves, tides, storms, El Niño, and the North Atlantic Oscillation. The second chapter describes the causes and measure of sea-level change; its whirlwind tour from plate tectonics to satellite altimetry is only marred by attributing the Vine-Matthews-Morely hypothesis, that seafloor spreading acts as a magnetic tape recorder, to Hess and Dietz, who first posited the movement of ocean crust. The third chapter takes us from the impact that killed the dinosaurs 66 million years ago (Ma), through the great warming at the Paleocene-Eocene boundary 55 Ma and the development of the Antarctic ice sheet 34 Ma, to the beginning of the great northern hemisphere ice ages at about 2.5 Ma. The chapter covers much ground and is

marred by sections of too much detail, but is overall a nice overview. Chapter 4 provides background on the causes of the ice ages, whereas chapter 5 does an excellent job of covering the great meltdown and sea level rise that began at the end of the last ice age, 20 thousand years ago. It does a particularly nice job of placing human civilization in the context of the warm world of the Holocene, the last 10 000 years, including the possible source of flood legends in various civilizations, from Gilgamesh to Noah.

Chapter 6 is an excellent and balanced coverage of the modern increase in the rates of sea level rise, and chapter 7 provides an assessment of where sea level is going on a warming planet. This assessment demonstrates the book's great strength in summarizing complex datasets, with the only weakness that it fails to explain emission scenarios. The subsequent chapter on coping with the rising waters provides succinct yet global summary of how we can fight back. The final chapter, on charting a future course, nicely focuses on Robert Socolow's energy wedges (Pacala and Socolow 2004); these illustrate that to stabilize carbon emissions, we must do it all (conservation, sequestration, renewables, nuclear, and so on), though an illustration of the concept with a figure would have been helpful.

One disappointment is that despite the 2013 publication date, there is no mention of Hurricane Sandy and its effects on the mid-Atlantic region, even though the impacts of previous storms on this and other regions are discussed in detail. Also, the book just missed major updates with the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report, recent advances in our understanding of sea level rise, and changes in FEMA flood rules.

Discussion of climate change has been politicized in recent years and this book does an excellent job of explaining how CO<sub>2</sub> is helping to warm the planet and how this is affecting sea levels. In addition to temperature records, Gornitz outlines thirteen other lines of evidence for human influence on our changing climates. She takes a middle-of-the-road view on the impact of storm frequency (holding that the jury is still out) and intensity (where some increase appears likely to her). Gornitz formerly worked at NASA's Goddard Institute of Space Studies, and she presents her former boss James Hansen's view of impending doom and gloom (4.5 m of rise by 2100), but concludes that the best estimate for sea level rise 2100 is 1 m, with a worse case scenario of 2 m. It is interesting that these are similar to other projections coming from the scientific community, including the IPCC, the National Oceanic and Atmospheric Administration, and the work of my team.

Who should read this book? Technically minded students and readers of popular science would surely enjoy it, though as noted, it could have been streamlined. Personally, I am thinking of adopting it for my introductory class "Sea Change: The Rise and Fall of Sea Level." Finally, I can give the book the highest praise: I wish that I had written it.

## REFERENCES

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- Pacala S, Socolow R. 2004. Stabilization wedges: Solving the climate problem for the next 50 years with current technologies. *Science* 305(5686):968–972.

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