Book Review

Rogue Waves in the Ocean. Advances in Geophysical and Environmental Mechanics and Mathematics,
by Christian Kharif, Efim Pelinovsky and Alexey Slunyaev, Springer, 2009;
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Rogue Waves in the Ocean (2009) is a follow-on text to *Extreme Ocean Waves* (2008) edited by Pelinovsky and Kharif, both published by Springer. Unlike the earlier text, which is a compilation of papers on a variety of extreme waves that was the subject of a scientific conference in 2007, *Rogues Waves in the Ocean* is written, rather than edited, by Kharif, Pelinovsky, and Slunyaev and is focused on rogue waves in particular. The book consists of six chapters covering 216 pages. As the subject matter of each chapter is distinct, references appear at the end of each chapter rather than at the end of the book. The preface shows how each of the chapters relates to the larger study of rogue waves. The result is a book with a nice mix of eyewitness observations, physical theory, and statistics.

The overall structure of the book is such that Chap. 1 relates to the observation of rogues waves, whereas Chap. 2 provides the necessary deterministic and statistical background of ocean waves for the focused theoretical discussion presented in Chaps. 3, 4, and 5. (Chap. 6 is a two-page conclusion of the book.) In addition to providing astounding instances of rogue wave occurrence in the Introduction, the authors also provide a convenient definition of rogue waves. They define rogue waves (or freak waves as used interchangeably throughout the book) as being at least twice the significant wave height of a ~ 10 – 30 min time series. This definition turns out to be fairly broad in terms of the number of physical mechanisms that can generate rogue waves. As the authors indicate in

Chap. 2, there are five by mechanisms that can be considered: (1) wave-current interactions; (2) geometrical or spatial focusing; (3) focusing due to dispersion (spatio-temporal focusing); (4) modulation instabilities; and (5) soliton collisions. The first three mechanisms are essentially discussed in Chap. 3. The fourth and fifth mechanisms are products of nonlinear wave theory that is the subject of Chaps. 4 and 5. Chapter 4 is focused on deep-water wave theory and is by far the largest chapter in the book. Here the reader encounters the Benjamin–Feir instability and the nonlinear Schrödinger wave equation. The authors describe various methods used to solve this and related equations using the inverse scattering transform and numerical approaches such as higher-order spectral and boundary integral methods. Chapter 5 is focused on shallow-water wave theory and the Korteweg–de Vries and Kadomtsev–Petviashvili equations. The discussion of three-dimensional rogue waves in shallow water includes an interesting point on soliton collisions and the Mach stem phenomenon. Within Chaps. 4 and 5, the authors importantly include insight on how statistical distributions of wave height are affected by nonlinear processes, providing a link to observational studies of rogue waves.

This book is sure to appeal to those interested in rogue waves from a variety of disciplines. The authors have provided a thorough overview of observations of rogue waves, ranging from frightening experiences at sea to laboratory experiments. Those interested in the physics of nonlinear water waves will also find a nice overview of the topic as it relates to the generation of deep and shallow-water rogue waves. Overall, this book should satisfy any scientist's or student's curiosity of this interesting phenomenon.

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