

Review of *Mechanics of Coastal Sediment Transport* by Jorgen Fredsoe and Rolf Deigaard

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Sedimentation processes in coastal areas are fascinating. The analysis of sediment transport under steady flow seems complex enough that one can only welcome this analytical treatment of sediment transport under wind and tidal waves in coastal areas.

The book is the third volume of a set of four titles published by World Scientific in the broad area of Advanced Series on Ocean Engineering. The first volume is entitled *The Applied Dynamics of Ocean Surface Waves* by C.C. Mei. The second volume is *Water Wave Mechanics for Engineers and Scientists* by R.G. Dean and R.A. Dalrymple. The fourth volume is entitled *Coastal Bottom Boundary Layers* by P. Nielsen. This third volume is divided into 12 chapters: (1) "Basic concepts and potential wave theory"; (2) "Wave boundary layers"; (3) "Bed friction and turbulence in wave-current motion"; (4) "Waves in the surf zone"; (5) "Wave-driven currents"; (6) "Current velocity distribution in the surf zone"; (7) "Basic concepts of sediment transport"; (8) "Vertical distribution of suspended sediment waves and current over a plane bed"; (9) "Current-generated bed waves"; (10) "Wave-generated bed forms"; (11) "Cross-shore sediment transport and coastal profile development"; and (12) "Long-shore sediment transport and coastline development".

The title of this text is very appropriate. The book is intended for graduate students and describes the processes of sediment transport and how to represent them in mathematical models. The book is divided into two main parts. The first relates to hydrodynamic theory and the second to sediment transport and morphological development. The hydrodynamic part first reviews the elementary theory of water waves, followed with chapters on the turbulent wave boundary layer and turbulent interaction between waves and currents, and finally covers surf zone hydrodynamics and wave-driven currents. The part on sediment transport introduces the basic concepts (critical bed shear stress, bed load, suspended load and sheet layer, near-bed concentration and sloping bed); it treats suspended sediment in waves and current and in the

surf zone, and also deals with current and wave generated bed forms. The modeling of cross-shore and long-shore sediment transport is described together with the development of coastal profiles and coastlines.

This is the kind of textbook engineering graduate students are likely to enjoy. The authors use an analytical approach to explain the developments of each topic. They also provide numbers of useful illustrations and examples throughout the text. It is acknowledged by the authors that the text does not present a large number of different formulas for transport rates under different conditions. The first couple of chapters get quickly in the thick of the subject with a treatment of waves, boundary layers, and turbulence. The surf zone and breaking waves are covered in Chapter 4, followed with wave-induced currents in Chapter 5. The second part of the book seems a lot easier to those familiar with fluvial sediment transport under steady flow. To some extent, perhaps the second half of the text could have been covered prior to the first 6 chapters. The methods and approach are sound and amenable to computer modeling, which is the intent of the authors. The numerous examples throughout the text are likely to help students learn this material.

The paperback edition is nicely presented with numerous drawings and useful diagrams. The equations are easy to read and the typesetting and font selection are very appropriate. At a price of \$32, the paperback copy I reviewed is affordable to all coastal engineering students in all countries.

Overall, this is a very interesting text that will assist a number of young scientists dealing with sediment transport. Although the first half is focused on coastal problems, the second half of the text should be useful to many readers interested in sediment transport under steady flow. The material is explained quite clearly and the approach is quite analytical, making this text most valuable to coastal engineers and scientists.

It is difficult to point out deficiencies in this text. Perhaps the second half could have been presented before the analytical treatment of surface waves, turbulence, and boundary layers. The first few chapters may intimidate some readers, but the calm seems to set after the storm. Also, since the analytical presentation is very strong, perhaps more practical case studies could have been presented to show applications of the methods discussed in the text. Again, these are very minor and subjective issues.

This book is perfectly suited to all graduate students and scientists interested in coastal engineering. It is the kind of digest that will bring readers back to the book long after graduation.