Mechanics of Coastal Sediment Transport, J. Fredsoe, and R. Diegaard, 1992. World Scientific Publishing Co, Pte. Ltd., Singapore, New Jersey, London, Hong Kong, 369p., ISBN 981-02-0840-5 and 981-02-0841-3 (paperback).

The coupling between hydrodynamics and the resulting sediment transport has proven to be an extremely resistant problem for the case of uniform flow. The subject of this book *Mechanics of Coastal Sediment Transport* is more difficult, due to the highly complicated hydrodynamics within the surf zone, the difficulties of carrying out measurements during the most active transport periods, and the variable profiles that can occur. The stated objective of the authors is "to describe the physical processes of sediment transport and how to represent them in mathematical models", a challenging goal which this reviewer believes has been well-achieved.

The first six chapters of the twelve are devoted to the elucidation of the hydrodynamics of the nearshore zone. With this background on the forces affecting the sediment, the remaining six chapters address sediment transport. A general structure for each of the chapters is an initial introduction to the basic physics and most simple of models of the phenomena under consideration, thus preparing the reader for the more complex analyses and review of current research level material which follows. The first chapter is a very brief review of relevant water wave theory, presented without derivation. The second and third chapters provide a welcome and coherent treatment of the near-bed hydrodynamics with a focus on the methods available to address boundary layers and bed friction and the results obtained from their application. Starting with the most simple of the methods for which analytical solutions are available, more complex and numerical solutions are explored. Comparisons are presented between measurements and the results of various predictive approaches. The reader is left with the comforting conclusion that the simple models for predicting wave friction factors are almost as good as the most complicated. Bed streaming, the forward drift of fluid within the bottom boundary layers, in laminar and turbulent flows is reviewed. The complicated subject of wave-current interaction is examined along with various approximations that have been employed. The fourth chapter presents approaches for predicting the gross hydrodynamics of the surf zone, including wave set-up and set-down, three of the models that have been proposed for representing wave transformation within the surf zone, and the resulting distribution of turbulence near the bed. The forces and mechanisms developed in the first four chapters are applied in Chapters 5 and 6 to determine the currents within the surf zone. Specifically, the radiation stresses and stress relationships are combined over simple and barred topography to predict the longshore and cross-shore velocity distributions. Chapter 5 emphasizes the mean currents, whereas a focus on the distributions with depth is presented in Chapter 6 with the physics of undertow and three-dimensional flows, including a highlighting of rip-currents.

The remaining six chapters on sediment transport mechanics commence with an introduction to the subject (Chapter 7) which gives approaches for describing sediment characteristics and the various modes of sediment transport (wash load, sediment load and bed load). Concepts of initiation of motion, sheet flow and various transport theories are reviewed including the role of dispersive stresses. Chapter 8 provides a thorough review of the vertical distributions of suspended sediment in waves and currents over a plane bed, including comparisons of measurements and various prediction methodologies. Chapters 9 and 10 examine the problems of bed forms generated by the action of currents and waves respectively. Of particular interest is the good agreement obtained by the authors in developing reasonably simple models to predict the characteristics of wave-generated ripples. Finally, Chapters 11 and 12 address, respectively, cross-shore and longshore sediment transport problems at the engineering scale. The manner in which the material developed in earlier chapters should be incorporated into models for transport is described, as are limited comparisons of such efforts. Cross-shore model results are compared with two laboratory data sets whereas no comparisons are presented for longshore sediment transport. There are three appendices: the first includes useful formulae and wave tables for sinusoidal waves, the second a derivation of the turbulent energy equation, and the third a useful list of "Additional References".

In summary, the book presents an integrated and valuable work on the advanced mechanics of coastal hydrodynamics and sediment transport, well worth the attention of graduate students and professionals specializing in the field. With the

exception of somewhat of a European bias in the references cited and models examined, a thorough treatment is presented. Much of the material is based on the significant contributions of the authors which lends a distinctive flavor. Missing is an exhaustive evaluation of present capabilities to represent coastal sediment transport at engineering length and time scales, and structural complexities of interest. Perhaps this lack is a testimony of the nascent stage of development and understanding at the applications level and of the need for more thorough field documentation to provide a basis for such an evaluation. Indeed, at a later more appropriate stage, a treatise on this subject would be welcome.

Robert G. Dean
University of Florida
Gainesville, Florida

Dynamics and Exchanges in Estuaries and the Coastal Zone, edited by David Prandle, 1992. Coastal and Estuary Studies, American Geophysical Union, Washington, D.C., 647p., ISBN 0-87590-254-5.

This book contains the results of the fifth in a series of conferences convened to encourage collaboration between coastal engineers and coastal oceanographers. In addition to the introductory chapter (Part I) by the editor, this book contains thirty chapters, each written by one or more authors describing individual research programs. These thirty chapters are grouped into five subareas: Part II. Baroclinic Dynamics, Part III. Circulation, Part IV. Sedimentation, Part V. Modelling (Sedimentation), and Part VI. Applied Studies. Rather than attempting to provide comprehensive coverage of one or more research areas, the chapters represent individual advanced research contributions on a wide range of research topics. Because of its relatively short nature, this review will be conducted by subarea rather than by the individual chapters.

Four of the five papers on Baroclinic Dynamics (Part II) investigate particular problems in which field measurements are compared with the results of theory or numerical modelling. The problems encompass the range of bay excitation by external subinertial forcing, to mixing processes in lochs and estuaries, and to internal waves in deepened areas in rivers. The fifth paper addresses the use of numerical models to represent the process of stratification with and without the effect of the earth's rotation.

The seven papers on Circulation (Part III) likewise cover wide ranges of geographic and research areas. The commonality among these are efforts to interpret and understand field measurements of different response characteristics of interior water bodies connected to tidally active waters. Phenomena of interest range from subtidal oscillations to salinity variations to flushing characteristics of water bodies.

Five of the six papers on Sedimentation (Part IV) address field situations in which measurements were conducted on cohesive or non-cohesive sediment behavior. The sixth paper compares, for laboratory and field data, calculated coefficients of wave reflection due to bathymetric features. Three of the sediment-related chapters present theories or hypotheses of sediment transport under the action of tidal flows and then compare these with field data sets. Topics include: near bottom sediment concentration maximum sediment due to tidal flows, the effects of tidal basin characteristics on tidal asymmetry and effects of sea level rise on muddy coasts. One paper utilizes acoustic techniques to measure suspended granular sediment concentration over sand waves. The final chapter deals with wave motions in mud layers under the action of relatively short wind generated waves.

The six papers on Modelling (Part V) utilize theoretical and/or numerical modelling approaches to investigate transport processes of cohesive and sand-sized sediments. Data are presented for comparison purposes in only two of the chapters. Subjects include development of dispersion coefficients through numerical modelling, the effects of channel bends on dilution rates, three dimensional modelling of suspended sediment transport, effects of wave-current interaction and sediment transport models, both within estuaries and on the outer coast.

The final group of chapters is titled Applied Studies (Part VI) and addresses long term monitoring results and, in one case, a summary of studies that have been carried out to evaluate the effects and effectiveness of constructing a large tidal-generating facility on the Severn estuary. Two studies deal with the density and suspended sediment distribution off the Netherlands coast where a concentration minimum is found some