

*Muddy Coasts of the World: Processes, Deposits and Function*, by T. Healy, Y. Wang & J.-A. Healy, 2002. Proceedings in Marine Science 4. Elsevier Science, P.O. Box 211, 1000 AE Amsterdam, The Netherlands; 556 pages, hardbound; Euros195.00, US\$ 195.00; ISBN 0-444-510192.

Sedimentary environments that are composed mainly of mud or clay occupy a major part of the world's coastlines. Mud-rich sediments associated with tropical mangrove systems fringe 75% of the present-day continents between the latitudes of 25°N and 25°S, but also temperate saltmarshes, tidal flats and lagoons store significant quantities of fine-grained sediment. In spite of the wealth of muddy coasts, past scientific research has focused predominantly on sandy depositional systems, and, to a lesser degree, on rocky coasts. Consequently, many fundamental processes of muddy-coast formation, function, ecosystems and evolution are poorly understood, particularly with reference to relative sea-level change.

In the second half of the 1990s, the Scientific Committee on Ocean Research (SCOR) Working Group 106 (WG106) of the ICSU (International Council for Science; previously International Council of Scientific Unions) set out to investigate the dynamics of muddy coasts in a global context. The many research issues identified by WG106, and documented in the first chapter of the book (*Muddy Coasts of the World: Processes, Deposits and Function*), seem to encompass about every problem imaginable in the sedimentology, geomorphology, ecology, oceanography and management of muddy coasts. The many unknowns specific to muddy coasts render it impossible to catch up with knowledge of sandy coasts within a reasonable time frame. WG106 has not tried this, but rightly decided to review the dynamics of muddy coasts before selecting specific research themes of broad interest. The themes are: (1) the impact of sea-level rise on the sedimentary evolution of muddy coasts; (2) the impact of sea-level rise on mangrove forests and saltmarshes; and (3) recommendation of required research, data collection and monitoring for the future management of muddy coastal zones. WG106's working approach is reflected in the book, which contains chapters on fundamental and specific aspects of muddy coasts in a range of climatic, oceanographic and continental settings.

The book contains 21 chapters. About 40% of the text discusses fundamental aspects of muddy coasts. The remaining 60% is devoted to case studies of muddy coasts in various parts of the world. The quality of photographs (black and white only) and drawings is mostly good. However, the figures in chapter 12 and part of chapter 3 resemble mediocre Xerox copies, which is disappointing for a high-priced book. Technical editing is overall of a good standard. I found some typographic errors and incorrect figure references, but none of these inhibit understanding of the material presented.

Chapter 2 introduces the term 'muddy coast', summarizes the sedimentological and rheological properties of mud, and defines 11 physiographic types of muddy coasts, including tidal flats, enclosed sheltered bays, estuaries, barrier-enclosed lagoons, supra-tidal (storm-surge) flats, swamp marshes and mangrove forests. The same chapter defines abundant fine-grained sediment supply, high tidal range and low wave energy as favorable for the formation of muddy coasts. Chapter 3 summarizes the present knowledge of mudshore response to short- and long-term oceanic forcing by waves, tides and sea level. An interesting difference with sandy coasts is that water with high turbidity (e.g., fluid mud) may dampen water surface waves on muddy coasts. Another important difference between sandy and muddy coasts is discussed in Chapter 4. Cross-sectional profiles of sandy shores are concave-upward only, whereas profiles of muddy shores tend to be concave-upward when eroding and convex-upward when accreting. This has

considerable implications for coastal management strategies. The next chapter reviews sea-level changes since the Last Glacial Maximum, and speculates on the impact of future sea-level rise on muddy coasts.

Chapter 6 can be characterized as an atlas of muddy coasts. It comprises an exhaustive overview of, I dare say, 99% of muddy deposits along the world's shorelines. Each description includes physiography and areal extent of the muddy deposit as well as tidal range. Apart from being a mandatory first stop for any student of muddy coasts, this chapter also contains invaluable information on the geographic distribution of rocky and sandy coasts. The only negative aspect of Chapter 6 is its position between chapters unrelated to the geographical distribution of muddy coasts. The information would be more appropriate immediately before Chapter 13, the first in the series of case studies of muddy coasts.

Chapter 7 returns to the fundamentals of muddy coasts with a review of biochemical processes influencing deposition and erosion of fine-grained sediment. Key subjects are flocculation processes, pellet production by benthic organisms and zooplankton, and the effects of bed fauna and flora on the strength of bed material. In a related chapter, M.D. Fortes focuses on the natural biological components and processes of muddy coasts, and the mechanisms that control them. Chapter 9 proposes an improved model on how mangrove forests can be used as indicators of sea-level change in muddy environments. Chapter 10 aims to review the effect of storm surge on muddy coasts. Unfortunately, too much emphasis is given to economic loss by past storms in and around China. A mere two pages inform about storm-induced redistribution of sediment on muddy coasts in general. The next chapter should succeed chapter 9, because it discusses the highly efficient way in which biological detritus acts as a coagulant for fine cohesive suspension load in mangrove-fringed, muddy coastal waters. The final 'fundamental' chapter by M. Han reviews the (mostly negative) effects of human utilization of muddy coasts, with examples from the Netherlands, China and the U.S.A.

The remaining chapters comprise case studies of muddy coasts in several parts of the world, relating closely to chapter 6. Subjects include muddy coasts of China (chapter 13), New Zealand (chapter 14), and India (chapter 15), fine-grained tidal deposits in western Korea (chapter 16), saltmarshes in the West Solent, southern England (chapter 17), tidal dynamics in muddy environments of The Wash, England and Jiangsu, China (chapter 18), the role of ice in muddy tidal areas of the St. Lawrence estuary, Canada (chapter 19), muddy coasts of the Atlantic coasts of the Americas (chapter 20), and the potential threat of coastal mud on the Great Barrier Reef in Australia (chapter 21).

Chapters 17, 18 and 20 reach beyond a readership with mere interest in regional processes. Ke & Collins (chapter 18) describe saltmarsh profiles from estuaries around the British Isles with characteristic intertidal flat-facing near-vertical cliffs that contrast with sloped transitional zones between saltmarshes and intertidal flats in other geographic areas. In the West Solent, the saltmarshes exhibit simultaneous erosion along the edges and accretion over the surface, thus complicating sediment budget calculations in coastal-management studies. In chapter 19, Ke presents a useful overview of the effects of tidal wave type, tidal asymmetry, tidal range, tidal currents, tidal bores, storm surge, settling lag and scour lag on sedimentation patterns on intertidal flats and saltmarshes. As part of chapter 20, Kjerfve et al. provide a concise, but highly stimulating, review of geological and geochemical characteristics of mud; flocculation, deposition and resuspension of mud; types of muddy coasts; oceanographic characteristics of muddy coasts; and the effect of relative sea level change on muddy coastal dynamics. This

fundamental information should appear in the introductory chapters of the book instead of in the penultimate chapter.

The exorbitant price (US\$ 195) renders WG106's book affordable for libraries only. Even without the high price tag, I would hesitate finding a prominent slot for 'Muddy Coasts of the World' on the bookshelf. The contents of the book are certainly valuable for students and researchers that want to familiarize themselves with the basic dynamics (and problems) of muddy coasts as a function of tides, waves, river discharge, sea-level change, ecology and human activity. The information is too superficial, however, to entice researchers bred and buttered in coastal science. Sedimentologists working with ancient fine-grained coastal sequences may nonetheless find some ideas useful to incorporate into geological models. Particularly the ideas related to relative sea-level rise (or fall) due to the interplay of eustatic sea-level rise, sediment supply from continents, and sediment supply and erosion by oceanographic currents may be worthwhile to pursue.

With the notable exception of the chapter on the geographic distribution of muddy coasts, the book lacks sufficient depth to become widely appreciated as review of muddy-coastal processes and products. There is surely more literature out there on, for example, tidal processes, flocculation, fluid mud and estuarine circulation, than cited in WG106's book. The authors are more successful in outlining the expected impact of sea-level rise on the sedimentary and ecological evolution of muddy coasts, but recommendations for monitoring of coastal evolution are underrepresented. There is no index, a major omission for a book that presents itself as *review* of muddy coasts. Sadly, the lack of an index is not compensated by logical grouping of data. As mentioned above, there is no consistent organization of chapters, and some text is unnecessarily repeated in a number of chapters. All this renders it difficult to find information without having to browse the entire book.

In summary, 'Muddy Coasts of the World' has definite strengths, but also considerable weaknesses. This is not a book that every researcher working in muddy-coastal systems should possess, primarily because the price is too high for the amount of information given. Make sure, however, that your library buys a copy, because you will want to browse it if you are looking for a quick reference to the basic dynamics of muddy coasts, or if you are on the lookout for a new nearby or remote muddy area to work in.

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