
Estuarine and coastal fine sediment dynamics deals with resuspension, erosion, reentrainment, flocculation, deflocculation, transport, and settling, deposition, and consolidation of fine (cohesive) sediment under various forces. Those physical processes occur (i) on the bed; (ii) within the bed; (iii) at the bed–water column interface; and (iv) within the water column. Fine sediment transport processes in estuarine and coastal waters are difficult subjects but fascinating. Albert Einstein (1879–1955) is said to have warned his son, Hans Albert Einstein (May 14, 1904–July 26, 1973), professor of hydraulic engineering at the University of California, Berkeley, strongly of the difficulties in dealing with sediment transport processes. Fortunately indeed, the origin of fine-grained sediment transport as a component of hydraulic engineering at the University of California, Berkeley, has been credited to the work of Hans Albert Einstein and his students (Mehta and McAnally, 2007).

The general concept of “turbidity maximum” was first used for the Gironde estuary (Glangeaud 1938). Postma and Kalle (1955) provided a summing up of more early classical research on “estuarine fine sediment behavior” in the list of their cited references. The term “fluid mud” was first used in the Thames Estuary (Inglis and Allen, 1957). More recently, an updated complete overview of fine-grained sediment transport processes is given by Mehta and McAnally (2007). A comprehensive updated outline of engineering properties and hydraulic behavior of cohesive sediments is provided by Partheniades (2007).

This book is the eighth volume of a set of Proceedings in Marine Science published by Elsevier. This volume is the product of the 7th International Conference on Cohesive Sediment Transport (INTERCOH 2003) held at the Virginia Institute of Marine Science, U.S.A., during October 1–4, 2003. The topics in this book strongly highlight a comprehensive study of fine sediment dynamics with a multidisciplinary approach.

This book starts with preliminary findings of field study in the Tamar Estuary, UK. Bass et al. first focus on the relationship between the evolving suspension characteristics and physical mechanisms through one tidal cycle. It is interesting to see turbulent kinetic energy estimates of shear stress from the 2 Acoustic Doppler Velocimeters and the Electromagnetic Current Meter. Manning et al. then continue their preliminary findings of a study of the upper reaches of the Tamar Estuary, UK, throughout a complete tidal cycle: Part II: In-situ floc spectra observations. Figures 8 and 9 present nice views of settling flocs in the Tamar Estuary.

Neumann and Howes present a population balance model used with experimental data to quantify the influence of shear and salinity on aggregation and breakage rates in the flocculation of estuarine cohesive sediments. The model has been generally within the framework of Smoluchowski (1917)’s classic works. Maggi and Winterwerp report on an experimental study into the evolution of the size distribution of kaolinite flocs. It is based on laboratory measurements with the aim to highlight the fundamental dynamic behavior of mud flocs. They conclude that a flocculating system is marked by organization and complexity.

Ganjú et al. discuss constancy of the relation between floc size and density in San Francisco Bay. They argue that the constancy of this relation might create a uniform primary particle size throughout San Francisco Bay, as well as uniform aggregation–disaggregation mechanisms. Sills et al. report the results of laboratory experiments and discuss effects of different erosion techniques on sediment beds. They find that density changes occur in the bed to depths that are significantly greater than those corresponding to the level of erosion, and that these changes can be either an increase or a decrease. Lick et al. simply illustrate approximate equations for sediment erosion rates and compare their calculated results with those published experimental data. Maa and Chadwick attempt to estimate annual average propeller erosion rate in San Diego Bay, California.

Kirby presents an overview of organic-rich fine sediments in Florida, Part 1: Sources & nature. Gowland et al. further summarize their studies of organic-rich fine sediments in Florida, Part 2: Resuspension in a lake. Keen and Furukawa attempt to describe a modular entrainment model for cohesive sediment. Winterwerp reports on the sedimentation rate of cohesive sediment. His contribution in writing this article may well be in reminding hydraulic and coastal engineers that little is known of the sedimentation rate of cohesive sediment. It is noteworthy that Winterwerp has constrained his discussion to open channel flow. More discussions would be helpful for his proposed deposition formula’s potential application in tidal estuaries and coastal waters. Dankers et al. present a preliminary study on the hindered settling of kaolinite flocs in settling columns. By using Gibson’s one dimensional theory rather than Biot (1941)’s classical three dimensional theory, de Boer et al. develop a parameterized consolidation model for cohesive sediments.

Zhao et al. (2006) have presented an overview of the rheological model of mud. On the basis of a linear viscoelastic rheological model of mud, Zhang et al. propose a simple method to estimate mud rheological parameters using a genetic algorithm for a two-layer wave–mud system. Wang and He