

## Estuarine and Coastal Hydrography and Sediment Transport

A practical guide to the latest remote and in situ techniques used to measure sediments, quantify seabed characteristics, and understand physical properties of water and sediments and transport mechanisms in estuaries and coastal waters. Covering a broad range of topics from global reference frames and bathymetric surveying methods to the use of remote sensing for determining surface-water variables, enough background is included to explain how each technology functions. The advantages and disadvantages of each technology are explained, and a review of recent fieldwork experiments demonstrates how modern methods apply in real-life estuarine and coastal campaigns. Clear explanations of physical processes show the links between different disciplines, making the book ideal for students and researchers in the environmental sciences, marine biology, chemistry and geology, whose work relies on an understanding of the physical environment and the way it is changing as a result of climate change, engineering and other influences.

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## Preface

Some aspects of estuarine and coastal hydrography and sediment transport have experienced revolutionary change since the publication of the original Estuarine and Coastal Sciences Association (ECSA) Handbook in 1979, much of which is still inevitably in progress. The dedicated and deep-thinking scientists researching estuaries and coastal systems in the 1970s would have been well aware of the possibilities of advanced measurement and logging – humans had, after all, reached the surface of the moon – but they might not have foreseen the challenges in terms of data requirements for high resolution, three-dimensional modelling, data management and interpretation. They understood, as Professor Keith Dyer did in the original preface written in 1978, that the most important progress lies in adopting a multidisciplinary approach, and that handbooks of this type are a necessary means of softening the divide between the traditions that separately accompany the biology, the water quality and the physics.

As an example of the scope and ambition of the changes, the advent during the early 1970s – and subsequent refinement of – acoustic methods to collect data on water motion, and related efforts similarly using advances in marine acoustic technologies to improve subsea positioning accuracy and underwater communications, produced a sea change in marine measurement capabilities. This ECSA handbook considers estuarine and coastal physical processes research, focusing on many of the same areas considered in the 1979 volume, as well as some entirely new ones. Clearly, there have been considerable advances in the ability to record and log data at high temporal and spatial resolutions, leading in turn to challenges in assimilating and synthesising large amounts of data prior to its subsequent storage and archiving.

Of course, all technological developments have a tendency to be driven by research needs, which in turn are driven by the needs of society to understand the world, develop and grow economically. To take one example, an ability to predict sediment transport paths, rates and processes in estuaries is fundamental to their management, whether this be from an ecological or an engineering viewpoint. The major expansion in port activity since 1979 has meant that dredging technologies and their related impacts have come to the fore as a key area of interest in scientific policy making. European and other directives related to ecosystem management also clearly drive all port development and determine the need to provide new and sustainable habitats. The threat of sea-level rise implies a critical importance

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associated with understanding the response of all coastal systems to a variety of rates and types of environmental change. There is thus no doubt of the continuing need of dredging programs and other estuarine and coastal management activities to be properly informed by good scientific understanding and the availability of the best and most modern measurement techniques and technology, and it is hoped that this handbook will furnish a guide to these activities.