

Preface

This Springer Briefs volume on the morphodynamics of Mediterranean mixed sand and gravel coasts aims to present the latest achievements in this field for people who are interested to learn more how this type of environment responds to maritime agents. It is intended for engineers and researchers in the areas of Coastal Engineering, Geomorphology and Physical Oceanography who are concerned with the evolution and sustainable management of the coast and for postgraduate students. Coastal environments are some of the most dynamic and complex systems on the earth's surface, and their study involves many different disciplines. Research efforts over the last several decades in the fields of theoretical description, numerical modeling, measuring techniques and data analysis of physical processes have resulted in significant incremental advances in the coastal disciplines. Despite these improvements, such complex environments require much more research.

The book focuses on the main coastal processes driving the morphodynamics of Mediterranean mixed sand and gravel coasts: nearshore waves, littoral drift and the response of both the coastline and the beach profile. It begins with an introduction to the Mediterranean environment, the importance of its coasts and the challenges that should be faced during upcoming decades due to the intensification of coastal retreat (Chap. 1). Then, Chap. 2 presents two study zones in southern Spain that have been intensively studied and provide the major results presented in subsequent chapters. Although the role played by waves arriving at the coast has been intensively studied in the past, significant differences appear when comparing wide sandy shelves with narrow complex ones. Chapter 3 is devoted to illustrating this complexity, which is even more enhanced when the coastline is curvilinear or has rhythmic-type features. Since the pioneering works of the last century, it has been well known that littoral drift drives the major changes in the plan shape of the coastline. Nonetheless, much remains unknown about the dynamics of longshore sediment transport when the settings are far from those commonly found on sandy beaches, as in the case of mixed sand and gravel coasts. Chapter 4 introduces these differences and shows how some of these restrictions could be treated. Moreover, the longshore sediment transport patterns and the plan shape evolution of the two study zones selected are analyzed and linked.

The beach's responses to varying wave, wind and water level conditions are of major importance to proper coast management. Swash processes and the evolution of the beach profile on sandy beaches have been intensively studied over the past several decades; however, similar studies on mixed sand and gravel coasts are still necessary. In Chap. 5, we present relevant results that explain the different behaviors of mixed sand and gravel beaches and open a new vision of how to manage global coastal erosion and sea level rise. Although this book is mainly focused on these results and the corresponding publications, a large list of some of the most relevant and up-to-date references is provided in each chapter. We apologize for any errors that may be found in the book, despite our efforts to eliminate them.

Finally, we would like to highlight that the study of these Mediterranean mixed sand and gravel coasts began with the European Research Project "Human interaction with large scale coastal morphological evolution", led by the last author, Prof. Miguel A. Losada, who also founded the Environmental Fluid Dynamics Group of the University of Granada. His conception of coastal morphodynamics has always been a breakthrough in the state of the art. Within this book, we have tried to enhance some of his main lessons, particularly the importance of understanding basic physical mechanisms as a necessary step to provide new research insights and develop advanced techniques. This is of special interest to those who are beginning work in the discipline, and transmitting it throughout the book was one of the authors aims. The authors are grateful to the members of the Environmental Fluid Dynamics Group of the University of Granada, particularly to Pedro J. Magaña for his assistance in processing the text and figures. We are indebted to Asunción Baquerizo, Francisco J. Lobo and Gerd Masselink for their valuable contributions to the book.

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