

Article

Sea-Level Rise and Shoreline Changes Along an Open Sandy Coast: Case Study of Gulf of Taranto, Italy

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Abstract: The dynamics of the sandy coast between Castellaneta and Taranto (Southern Italy) has been influenced by many natural and anthropogenic factors, resulting in significant changes in the coastal system over the last century. The interactions between vertical components of sea-level changes and horizontal components of the sedimentary budget, in combination with anthropogenic impact, have resulted in different erosion and accretion phases in the past years. Local isostatic, eustatic, and vertical tectonic movements, together with sedimentary budget changes, must be considered in order to predict the shoreline evolution and future marine submersion. In this study, all morpho-topographic data available for the Gulf of Taranto, in combination with Vertical Land Movements and sea-level rise trends, were considered by assessing the local evolution of the coastal trend as well as the future marine submersion. Based on the predicted spatial and temporal coastal changes, a new predictive model of submersion was developed to support coastal management in sea-level rise conditions over the next decades. After that, a multi-temporal mathematical model of coastal submersion was implemented in a Matlab environment. Finally, the effects of the relative sea-level rise on the coastal surface prone to submersion, according to the Intergovernmental Panel on Climate Change Assessment Reports (AR) 5 Representative Concentration Pathways (RCP) 2.6 and RCP 8.5 scenarios, were evaluated up to 2100.

Keywords: sea-level rise; coastal dynamics; erosion; accretion; submersion

1. Introduction

In recent years, the behavior of the Mediterranean coasts in relation to shoreline migration, as a consequence of the changes in the local sedimentary budget (e.g., [1–5]), and to the sea-level rise (e.g., [6–10]), has been of great interest. Currently, the sea-level change observed along the coasts depends on the sum of eustatic, steric, isostatic, and tectonic factors [11,12]. These factors, which