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Coastline evolution analysis of an Adriatic coastal area: late historical trend and future scenarios

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Main purpose of the study is the planform analysis of the recent historical coastline evolution of the coastal tract between Vomano and Pescara river outlets (middle Adriatic sea, Abruzzo, Italy). A time series of multiple shoreline positions covering the last two centuries was reconstructed, and some hypothesis were made with the aim to relate the deltas progradation or erosion both to climatic (annual rainfall) and social-economic aspects. Coastline variations in time has been reconstructed by georeferencing historical maps and aerial photographs in order to compute both partial and total sedimentary budgets under time in different coastal sectors. Once the graphical representation of total coastal area vs. time was obtained, its derivation vs. time gave the course of total sedimentary budget, which has been extrapolated forward, with the aim to get future scenarios. In the first part of XIX century the coastline appear quite rectified with small delta cusps protrusion, though it was characterized by a clear advancing trend. The second half of the XIX century reveals high delta protrusion and high sedimentary budgets. This trend became to change at the beginnings of XX century with the increment of human activities in the river basins: the sedimentary budget has been about zero from 1920 till 1940 and it tends to become quite constant negative beginning from 1940, with strong erosion of river deltas. Such long-term trend allowed to implement a simplified "large scale" one-dimensional model, with the aim to identify a general coastal behaviour related to river inputs and seaward sedimentary losses. Sedimentary budget and the time series of multiple shoreline positions were chosen as the input calibrating informations. The model used is based on a numerical solution of the diffusivity differential equation, describing the shoreline variations vs. time, where the first derivative of shoreline position in time is equal to the second

derivative in alongshore distance axis multiplied to a shoreline diffusivity factor 'e'. The diffusivity factor depends on wave motion characteristics, beach profile geometry and sediment properties. Though some tracts still show a quite advancing or stable trend, due to different deltaic and intra-deltaic behaviours, a future scenario reveals that coastal erosion will involve every sectors progressively. Sedimentary budget and coastline shape at different time steps have been revealed the main informations involved in the definition of a general coastal dynamics behavior. Though, in case of time-dependence of the parameter 'e', the historical wave climate reconstruction and its forward prediction are also basically in order to determine unique outputs in the simulation process. Such results reveal a conceptual model which should lead to further studies, though it can be considered a contribution to the comprehension of low sandy coasts behaviours, whose dynamics are strongly related to river sediment transport.