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Sea level change impacts on the coastal infrastructures of the Basque Coast

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Analyses of coastal tide gauges have revealed a sea level rise between 1954 and 2004 in the Bay of Biscay (Northeast Atlantic) (Chust et al., 2009). The impact a sustained sea level rise will have over the Basque coast (north-eastern corner of the Bay of Biscay) must be evaluated since the 60% of the population and the 30% of the industry of the Basque Country is concentrated in the coast (Cearreta et al., 2004).
The objective of this study is to evaluate the impact a possible sea level rise within the Bay of Biscay, will have over the coastal infrastructures of the Basque Country along the 21st century. To do that, sea level projections have been computed for the region of study, from temperature projections under three climate scenarios (Committed, SRES A1B and SRES A2). The temperature projections have been extracted for the study area from different Atmosphere-Ocean Coupled General Climate Models (AOGCM) and then the thermosteric sea level has been computed. The results show that at the end of the century, in the studied region, sea level will increase on average near 50 cm, due to thermal expansion and ice melting. With the aim of knowing the future shoreline evolution, the projected sea level rise has been introduced into a high-resolution Digital Terrain Model (DTM), extracted from airborne laser altimetry data (LIDAR).
The results indicate that for the end of the 21st century, some industrial and residential areas will be below the Highest Astronomical Tide levels associated with the projected mean sea level; as well as transport infrastructures, such as roads and an airport. Nowadays, some of these areas are protected by flood retaining walls that will be not overtopped. Nevertheless, these structures will support highest hydrostatic pressure and they probably should be reinforced. Furthermore, the drainage systems of many impacted areas should be recalculated. The distance among the levels of the Highest Astronomical Tide and of the piers inside the main ports will decrease (in some cases the distance will be less than 30 cm); with the subsequent diminish of these piers functionality. In order to evaluate the impact on external dikes, besides sea level rise, predicted wave height change has been taken into account. The estimations of the overtopping over a model dike, under the oceanographic conditions affecting the main real external dikes, suggest an increasing overtopping of these model dikes for the end of this century.

Keywords: sea level rise, climate change, coast, impacts, infrastructures
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