

Response of Caldeira De Tróia Saltmarsh to Sea Level Rise, Sado Estuary, Portugal

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Abstract : Saltmarshes are essential ecosystems both from an ecological and biological point of view. Furthermore, they constitute an important social niche, providing valuable economic and protection functions. Thus, understanding their rates and patterns of sedimentation is critical for functional management and rehabilitation, especially in an SLR scenario. The Sado estuary is located 40 km south of Lisbon. It is a bar built estuary, separated from the sea by a large sand spit: the Tróia barrier. Caldeira de Tróia is located on the free edge of this barrier, and encompasses a salt marsh with ca. 21,000 m². Sediment cores were collected in the high and low marshes and in the mudflat area of the North bank of Caldeira de Tróia. From the low marsh core, fifteen samples were chosen for ²¹⁰Pb and ¹³⁷Cs determination at University of Geneva. The cores from the high marsh and the mudflat are still being analyzed. A sedimentation rate of 2.96 mm/year was derived from ²¹⁰Pb using the Constant Flux Constant Sedimentation model. The ¹³⁷Cs profile shows a peak in activity (1963) between 15.50 and 18.50 cm, giving a 3.1 mm/year sedimentation rate for the past 53 years. The adopted sea level rise scenario was based on a model built with the initial rate of SLR of 2.1 mm/year in 2000 and an acceleration of 0.08 mm/year². Based on the harmonic analysis of Setubal-Tróia tide gauge of 2005 data, the tide model was estimated and used to build the tidal tables to the period 2000-2016. With these tables, the average mean water levels were determined for the same time span. A digital terrain model was created from LIDAR scanning with 2m horizontal resolution (APA-DGT, 2011) and validated with altimetric data obtained with a DGPS-RTK. The response model calculates a new elevation for each pixel of the DTM for 2050 and 2100 based on the sedimentation rates specific of each environment. At this stage, theoretical values were chosen for the high marsh and the mudflat (respectively, equal and double the low marsh rate - 2.92 mm/year). These values will be rectified once sedimentation rates are determined for the other environments. For both projections, the total surface of the marsh decreases: 2% in 2050 and 61% in 2100. Additionally, the high marsh coverage diminishes significantly, indicating a regression in terms of maturity.

Keywords : ¹³⁷Cs, ²¹⁰Pb, saltmarsh, sea level rise, response model

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