MODELLING TIDAL FLAT RESTORATION IN THE GUADALQUIVIR ESTUARY (SW SPAIN)

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Abstract:

The Guadalquivir (SW Spain) is a complex estuarine system where many factors converge: navigation of cargo ships, water intake and outtake for agricultural and aquaculture uses, its location bordering the Doñana National Park, etc. Recently, shore and marshes restoration are being considered [1,2]. For years the recovery of tidal marshes in the lower part of the estuary has been suggested as a solution to the degradation of the shores and to counteract possible negative consequences associated to bathymetric changes in the estuary [3]. However, recent studies have been carried out only with exploratory 1D models [3]. These studies, which are enough to provide a primary evaluation of trends, demand more detailed investigations with more complex computational models such as the one GOFIMA has developed in the Guadalquivir estuary using Delft3D. In this work, different domains that simulate a tidal flat have been created. These experiments test different surfaces, depths and locations for two different connections of the tidal flat with the navigation channel. The results are compared with a no-tidal flats configuration where only the main forcing (astronomical tide) is considered and where constant boundary conditions (ecological discharge $\sim$110 km from the mouth and salinity at the mouth) are fixed. This work aims to understand the effect of the recovery of marshes in the lower part of the estuary, assessing the modifications they originate on the tidal harmonics of surface oscillations and currents as well as salinity distribution along the estuary. It raises that the amount of water exchanged with the restored tidal flat and its location are the critical variables for the induced changes in tidal and saline dynamics. Future studies will include other physical variables such as temperature and possibly address more realistic cases of tidal marsh restoration.

Key words: Guadalquivir estuary, tidal flat, marsh recovery, modelling, Delft3D.

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