Geophysical Research Abstracts
Vol. 17, EGU2015-11955, 2015
EGU General Assembly 2015

Changes induced by sea level rise on network properties of restoration areas

Mirian Jiménez, Sonia Castanedo, Zeng Zhou, Giovanni Coco, and Raúl Medina

Environmental Hydraulics Institute "IH Cantabria". Universidad de Cantabria. C/ Isabel Torres nº 5, 39011. Santander, Spain (jimeneztm@unican.es)

Human actions have been reducing the natural domain of estuarine systems for centuries. In the past, estuaries were perceived as unhealthy areas, source of diseases, which were adapted to human use by drainage and heavy engineering. Our current understanding shows that estuaries are not sources of disease, but rich ecosystems that cover important ecosystem functions. They need to be restored to their natural state. However, restoration actions may induce morphological changes that may change the estuary current behavior. It is thus of the utmost importance to understand the morphodynamic changes induced by restoration actions, more so when the final aim is to predict these changes.

Dikes have been the most used mean to enclose and drain areas of estuaries. In this work, we focus our attention on dike removal as a means to restore the areas enclosed by these dikes. Dikes may be removed completely, or only partially (opening one or several breaches), to allow the tidal flow to enter into the area to be restored. Morphodynamic effects of dike removal are simulated numerically using Delft3d. Different dike removal configurations are studied and their effect on the recovery of the estuary quantified.

Estuarine tidal networks are characterized by means of a new approach that links network connectivity to the spatial hydrodynamic fields developed in the estuary. The impact of different restorations strategies in the drainage properties of the network has been studied in the short term (5 -10 years) and in the long term (100 years) allowing the connectivity to evolve with time.

Results show, for different scenarios, differences not only in the spatial distribution of the tidal network but also in statistical characteristics after different dike removal actions. The new distribution of channels will have implications for the location of the tidal flats, flood patterns and thus biological environments within the tidal networks. These changes in the morphological properties are quantified with the new approach (Jiménez et al.,2014), which allows to highlight the changes that induce deep behavioral changes in the system. The importance of sea level rise in these behavioral changes is also assessed in the study.

References:

Jiménez, M., S. Castanedo, Z. Zhou, G.Coco, R. Medina, and I. Rodriguez-Iturbe (2014). Scaling properties of tidal networks, Water Resources Research., 50, doi:10.1002/2013WR015006.