Modelling sea level rise and extreme climatic events in Guadalquivir Estuary (Spain).

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Abstract:

Sea level rise and extreme climatic events are predicted to increase in frequency and magnitude as a consequence of global warming but their socio-ecological effects are poorly understood. The climatic events are most likely to affect worldwide in forthcoming decades and a further understanding how these climatic and global warming disturbances drive changes in the Guadalquivir Estuary is needed.

The Guadalquivir Estuary has been anthropologically modified throughout the last centuries. Now, there is no salt marshes, the river is bounded by embankments to protect rice and cotton plantations, the meanders have been transformed into straight channels and the Port of Seville, as part of Europe's strategic priority transport network, periodically dredge the main navigation channel.

A hydrodynamic model has been developed to hindcast a severe storm event that hit the estuary by conducting paired control and climate events. To simulate the effects of increased sea level the mean tidal level in the model was raised. The changes in the local wind, atmospheric pressure and sea level conditions have been studied in detail and several scenarios are obtained by running the model under control and real conditions.

The model output has been validated with *in situ* water elevation and good agreement between modelled and real measurements have been obtained. Our preliminary results show that the model demonstrated the capability of describe a tide-surge and future water levels rise in the estuary, opening the possibility to study the interaction between climatic events and global warming impacts on port operations and food production activities.

The hydrodynamic model provide spatially explicit information on the key variables governing the tide dynamics of estuarine areas under severe climatic and sea level rise scenarios and it will be a powerful tool in future climate change mitigation and adaptation programs.