Modelling extreme climatic events in Guadalquivir Estuary (Spain).

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Abstract.

Extreme climatic events, such as heat waves and severe storms are predicted to increase in frequency and magnitude as a consequence of global warming but their socio-ecological effects are poorly understood, particularly in estuarine ecosystems.

The Guadalquivir Estuary has been anthropologically modified several times, the original salt marshes have been transformed to grow rice and cotton and approximately one-fourth of the total surface of the estuary is now part of two protected areas, one of them is a UNESCO, MAB Biosphere Reserve. The climatic events are most likely to affect Europe in forthcoming decades and a further understanding how these climatic disturbances drive abrupt changes in the Guadalquivir estuary is needed.

A barotropic model has been developed to study how severe storm events affects the estuary by conducting paired control and climate-events simulations. The changes in the local wind and atmospheric pressure conditions in the estuary have been studied in detail and several scenarios are obtained by running the model under control and real storm 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 describe of the tide-surge levels in the estuary, opening the possibility to study the interaction between climatic events and the port operations and food production activities.

The barotropic hydrodynamic model provide spatially explicit information on the key variables governing the tide dynamics of estuarine areas under severe climatic scenarios . The numerical model will be a powerful tool in future climate change mitigation and adaptation programs in a complex socio-ecological system.