

Recent morphological evolution of the Gironde estuary through some synthetic indicators

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Drastic changes of the physical coastal environment are expected in the future under the effect of climate change. They make necessary to better predict the morphology evolution, especially considering areas that are the habitat for some specific ecosystems. Understanding the past evolution of the systems is then a necessary step to achieve this aim. Moreover, because the context of the water framework directive (WFD), EU members need to generate indicators to describe and evaluate the status of water masses. These indicators are still under development, in particular those concerning the hydro-morpho-sedimentary (HMS) functioning of large turbid estuaries.

To satisfy these two objectives, the recent evolution of the Gironde estuary has been studied by the analysis of bathymetry changes with GIS. The Gironde estuary is the largest estuary of western Europe, and one of the most turbid. Investigations on sedimentology of the Gironde estuary have been numerous in the past, but they are old and do not focus in morphological changes in the last 40 years. In this study, the analysis period extends from 1962 to 2000, i.e. the year of the most recent available bathymetry. Results show that the zone of maximum volume of deposited sediment has migrated continuously towards the upstream portion of the estuary, which is coherent with the intensification of the low river flow periods and the upstream shift of the turbidity maximum zone to the riverine sections. In general, cross section areas have experienced little variation in 32 years, but contrasted changes have been observed locally. Stable and unstable zones can be identified, apparently similarly to those already recognized through the evolution over 160 years (1825-1984). This seems to be independent from the fluvial regime, but rather related to long term effects of the interaction between the tide and the general morphology, which need to be elucidated.

Moreover, four HMS indicators useful to the WFD have been evaluated: distribution of depths, changes on cross section areas, changes on sedimentary volumes and intertidal areas. These indicators are discussed to discriminate the "natural" and "anthropogenic" contribution to morphological changes observed in the estuary between 1962 and 2000.