Hydrodynamics and Morphodynamics of Tidal Channels
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The analysis tackles the problem of the hydrodynamics and morphodynamics of tidal channels through the morphological characterisation of a real estuary, the definition of the most important parameters affecting the flow field at a global scale and the local analysis of the morphological evolution of the altimetric and planimetric patterns.
In the first part, the morphological features of the Western Scheldt estuary (the Netherlands - Belgium) are studied within the context of a macro-scale description. A set of parameters is introduced in order to clarify the existence of different morphological zones within the estuary.
In the second part, the estuarine hydrodynamics is studied by means of a one-dimensional numerical model. The main features of the flow field and their dependence upon the most important parameters are pointed out. Several aspects are taken into account and a comparison with theoretical results is pursued; in particular, non-linear effects are shown to play a crucial role in real estuaries.
In the third part, an analytical local model of tidal channel morphodynamics is proposed. Through a perturbation technique, the formation of free-developing and curvature-induced bars is investigated. Then, their effect on the planimetric evolution is considered and a new approach for the development of meandering channels in tidal system is introduced.