A simplified model to describe the flow field on tidal floodplains

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Tidal salt marshes are intriguing morphological features occurring abundantly at the boundary between the continental shelf and the main land. These areas are vital for the coastal ecosystem since they provide the lion's share of primary production in the coastal zone and host an extremely high biodiversity. Moreover, these regions act as a first barrier against storm surges. Presently, however, climatic changes challenge the existence of tidal salt marshes. Numerical models are suitable tools to assess the proneness of tidal salt marshes. Yet, these models need to be simplified since the phenomenon evolves over long time scales and large spatial scales, thus preventing the use of sophisticated models.

Here, a new simplified hydrodynamic model is presented to describe the flow field on the floodplains of tidal salt marshes. The model follows from a study of the magnitude of the terms appearing in the momentum balance; expanding subsequently the conservation equations in the small variables appearing. A comparison with a full-fledged numerical model appears to support the simplified approach, suggesting that this new model could provide a valuable tool to address the eco-morphological evolution of tidal landscapes.