



On the influence of vegetation on tidal channel network formation in sediment accretion contexts: preliminary results of an eco-geomorphic model

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Tidal channels represent a major morphological component in tidal wetlands as they transport tidal waters, suspended sediments and nutrients in and out of the marsh platform (e.g., Fagherazzi et al., 2012). Recent studies have helped to get further insights into tidal channel morphodynamics, yet a profound debate still prevails in the scientific community as regards the chief processes governing their formation and further elaboration. The dominant paradigm for tidal channel formation via headcutting of first order channels has been challenged by observations which suggest alternative mechanisms to explain tidal channel origination. Indeed, in view of the abundance and the high diversity of morphology tidal channels depict in worldwide estuarine landscapes, it comes to mind that other models different from the well-documented erosive-based model may be responsible for tidal channel ontogeny and further development. Therefore, models based on the presence of hummocks due to vegetation colonization, or via wind/wave erosion coupled with elongation of salt pans in the marsh surface, or linked to groundwater drainage mediated by crab burrowing activity have been successively proposed to explain origins of tidal channels. Moreover, based on observations of depositional channel network development in prograding deltas, Hood (2006) has suggested a model for tidal channel formation and evolution resulting from depositional processes of delta progradation, leading to the conversion of distributaries into blind tidal channels and creation of meanders occurring concurrently. Depositional channel development was also noticed in other marshes located in different estuarine landscapes. In fact, under conditions of high sediment supply and marsh progradation, depositional tidal channel development may prevail instead of erosional channel development.

This diversity in tidal channel formation processes is not reflected in conceptual models of tidal channel evolution as they mostly assume erosional formation, and not all consider tidal flat colonization by marsh vegetation with channel development. In this respect, we develop a conceptual model of tidal channel evolution, incorporating a simplified representation of the vegetation growth and its effects on sedimentary processes in an accretion context. This “accretion model” is therefore characterized by high sediment availability, in an attempt to reproduce depositional tidal channels and provide modelling interpretations consistent with the theory of tidal channel development as a consequence of depositional processes. This type of model may help to refine our understanding of the formation of tidal networks and their subsequent evolution, and may be beneficial for issues in line with tidal wetland restoration and conservation.

References

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