Sensitivity of tide and river water transport distribution in an estuarine tidal network to river discharge, tidal forcing, channel geometry and sea level rise

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Many estuaries of the world consists of multiple connected channel, in which the water motion is primarily driven by tides and river discharge. Knowledge of tide and the distribution of river water transport over different channels is essential for both scientific and management purposes and gives implications for the ecological processes and formation of turbidity maxima.

In this contribution, a generic, tidally dominant 2DV estuarine network model is applied to study and understand the dependence of the along-channel and vertical structure of tides and river water transport on forcings, geometry characteristics and sea level changes. The model will be applied to the Yangtze Estuary to investigate different scenarios, such as seasonal variation, spring-neap modulation, an additional shortcut channel, before and after the construction of a navigational channel and sea level rise.

Modelled results of both tides and river water transport are in good agreement with observation for present-day condition. The responses of tidal characteristics and the discharge distribution to each change will be explained by means of the interaction between eddy viscosity, bottom stress and tidal propagation in the network. This simple model also provides a solid base for modelling the subtidal (i.e. net) water transport due to various physical processes such as density-driven flow, Stokes transport and advection in estuarine networks. The outlook of some preliminary results regarding the subtidal water transport will be provided.