NUMERICAL MODELLING OF SUSPENDED SEDIMENT DYNAMICS IN THE MEKONG DELTA

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The worldwide sediment flux to the coastal ocean is roughly estimated at about 12.8-15.1 Gt per year (Syvitski and Kettner, 2011). The sediments feed systems like the Mekong Delta prograding its delta and coastline, but also supply sediment to agricultural areas and wetlands during river floods. Understanding the sediment dynamics in more detail helps to have a better insight into the functioning of the river and delta system and the helps to forecast development under climate change scenarios Deriving sediment budgets by data alone brings along high uncertainties due to limited data availability.

Numerical modelling is an efficient tool for understanding sediment dynamics and estimating sediment budget. This study aims at understanding the suspended sediment dynamics and estimating the sediment budget in the Mekong Delta using a numerical model.

Delft3D Flexible Mesh (DFM) was used in 2D to compute hydrodynamics and sediment transport in the Mekong Delta. DFM is a process-based model which is solves the two- and three-dimensional shallow equations, based on the finite volume method (Kernkamp *et al.*, 2011).The computational grid covers the entire Mekong Delta, from Kratie, Cambodia to East Sea shelf (South China Sea, Fig.1). It consists of a multi-dimensional grid which includes 1D and 2D combinations. The primary and secondary canals are represented in 1D networks while 2D cells are used for the Mekong River mainstreams, floodplains and shelf. The hydrodynamics results was calibrated and validated by (Thanh *et al.*, 2019). The sediment model was calibrated against the measured data of suspended sediment concentration and fluxes during water year 2011.

Simulated and measured sediment concentrations and fluxes show good correlation (Skill > 0.6). Like in observations the model shows a sediment concentration hysteresis during a flood wave. The Tonle Sap Lake probably plays a large role in this effect. Analysis of the modeled sediment budget shows that 36% of the sediment supplied during the 2011 flood deposited in the floodplains and wetlands. The Mekong River delivered around 30% of the yearly sediment flux to the sea in 2011, with an amount of approximately 30 Mt. This estimate is significantly smaller than the common value of 160 Mt. The reduction of Mekong River's sediment supply was observed by several recent studies. In addition, the sediment budget helps to understand morphodynamics and supports planning in the Mekong Delta.

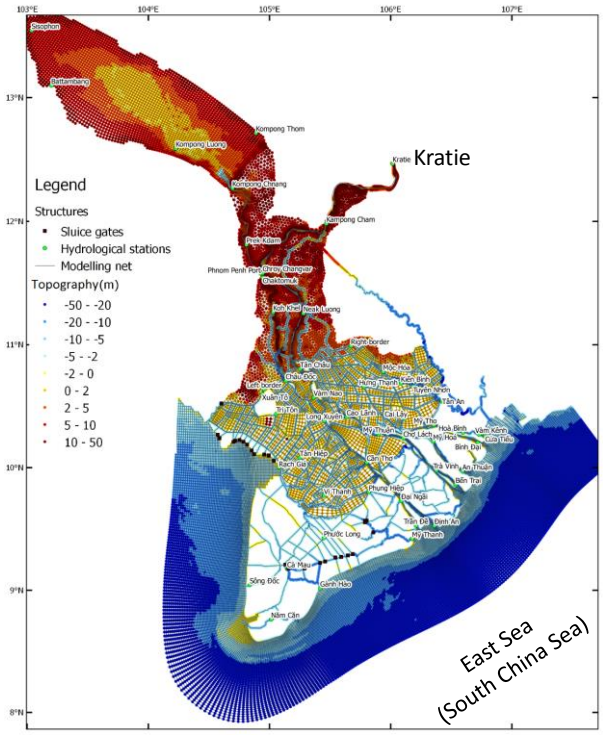

Figure 1. Numerical grids and river topography from cross-section interpolation and shelf topography of the Mekong Delta.

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