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Research papers

Hydrodynamic modelling of a tidal delta wetland using an enhanced quasi-2D model

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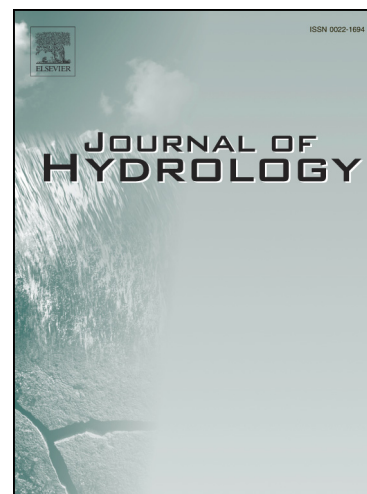
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1 **Title.** Hydrodynamic modelling of a tidal delta wetland using an enhanced quasi-2D model

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8 **Abstract**

9 Knowledge about the hydrological regime of wetlands is key to understand their physical and biological  
10 properties. Modelling hydrological and hydrodynamic processes within a wetland is therefore becoming  
11 increasingly important. 3D models have successfully modelled wetland dynamics but depend on very  
12 detailed bathymetry and land topography. Many 1D and 2D models of river deltas highly simplify the  
13 interaction between the river and wetland area or simply neglect the wetland area. This study proposes  
14 an enhanced quasi-2D modelling strategy that captures the interaction between river discharge and  
15 moon tides and the resulting hydrodynamics, while using the scarce data available. The water flow  
16 equations are discretised with an interconnected irregular cell scheme, in which a simplification of the  
17 1D Saint-Venant equations is used to define the water flow between cells. The spatial structure of  
18 wetlands is based on the ecogeomorphology in complex estuarine deltas. The islands within the delta  
19 are modelled with levee cells, creek cells and an interior cell representing a shallow marsh wetland. The  
20 model is calibrated for an average year and the model performance is evaluated for another average  
21 year and additionally an extreme dry three-month period and an extreme wet three-month period. The  
22 calibration and evaluation are done based on two water level measurement stations and two discharge  
23 measurement stations, all located in the main rivers. Additional calibration is carried out with field water  
24 level measurements in a wetland area. Accurate simulations are obtained for both calibration and  
25 evaluation with high correlations between observed and simulated water levels and simulated  
26 discharges in the same order of magnitude as observed discharges. Calibration against field

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