Conference Paper, Published Version

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Abstract:

Besides their ecological functions, coastal and estuarine wetlands may contribute to mitigation of flood risks by damping of storm surges and tidal waves. However as the geomorphology of marshes changes, for instance due to sediment accretion in response to accelerated sea level rise or sediment infilling of marsh channels, tidal propagation and flood attenuation in these marshes might change as well. We use TELEMAC 2D as a modeling tool to study the effect of marsh geomorphology and the presence of marsh vegetation on tidal wave propagation through a large marsh area.

A TELEMAC 2D model is set up for the *'Verdronken Land van Saeftinghe'*, a brackish tidal marsh along the Western Scheldt estuary (SW Netherlands) that covers over 3000 ha. The model comprises the entire Scheldt estuary, but the mesh is locally refined at the tidal marsh. An attempt is made to implement the complex channel and creek network of the marsh in the model by forcing the mesh to follow some of the smaller side-channels. The model is calibrated by tuning Manning's bottom friction for the bare tidal flats and the vegetated marsh platform and velocity diffusivity coefficients. Data from in-situ water level measurements from locations along a 4 km long marsh channel, in some surrounding side-channels and on the marsh platform are used for calibration, as well as velocity measurements along a cross-section in the same marsh channel. The water level measurements include the full range of spring to neap tidal cycles and severe storm surge tides.

After the calibration, the model will be used to study interactions between the geomorphological development and changing tidal hydrodynamics in the marsh. For instance, geomorphological scenarios are set up in which further sediment infilling of the marsh channels or further sediment accretion on the marsh platform is simulated. The effect of the evolving marsh morphology on its capacities for flood attenuation can then be studied as well. Ultimately, it is intended that the model settings are applied on a larger scale to historical and possibly also future bathymetries of the estuary. The impact of intertidal area changes such as embankments, de-embankments and the long term geomorphological evolution of marshes on tidal hydrodynamics can then be studied on the estuary scale.