MORPHODYNAMIC IMPACT OF SEA-LEVEL RISE ON THE WESTERN SCHELDT ESTUARY AND ITS MOUTH REGION: INSIGHTS FROM AN IDEALIZED MODELING STUDY

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Estuaries lie at the interface of land and sea, and are particularly vulnerable to sea-level rise (SLR). Understanding the impact of SLR on the long-term (order decades to centuries) morphodynamic evolution of estuaries is of great importance to successfully manage these areas, such as maintaining shipping routes and preserving ecosystems.

An analysis of historical water-level data for Vlissingen (Figure 1) between 1900 and present revealed that mean sea level has been rising at about 2 mm/yr. Moreover, these data show that the amplitude of the dominant tidal constituent (M_2) has been rising as well during this period (Figure 2), most likely in response to the rising mean sea level (Pickering *et al.* 2012, Idier *et al.* 2017).

The specific aims of this study are 1) to investigate the impact of SLR (2 mm/yr) on long-term evolution of the Western Scheldt and its mouth region, 2) to systematically explore sensitivity of model results to different rates of SLR (0-10 mm/yr), and 3) to address the combined effect of SLR and changes in tidal characteristics on the evolution of the estuary. To this end, the coupled SWAN-Delft3D numerical model is used, which accounts for both flow and waves. A curvilinear grid is created, which extends from Ghent to 30 km seaward. Concerning wave climate, a highly simplified wave forcing (constant wave height, wave periods and wave direction) is considered. The methodology employed is to first spin up the model until a bathymetry is obtained that is comparable to observations. Subsequently, the latter bathymetry is used to address the objectives.

An important model result is that stronger tidal currents are crucial to prevent sedimentation in channels caused by SLR. This result and other findings will be discussed during the presentation.

Figure 1. Study area.

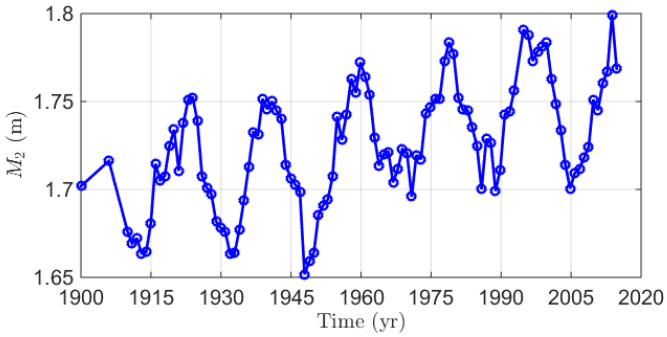

Figure 2. Evolution of amplitude M_2 between 1900 and present.

Pickering, M.D., Wells, N.C., Horsburgh, K.J., Green, J.A.M. (2012). The impact of future sea-level rise on the European Shelf tides. *Continental Shelf Research*, 35, 1-15.

Idier, D., Paris, F., Le Cozannet, G., Boulahya, F., and Dumas, F. (2017). Sea-level rise impacts on the tides of the European Shelf, *Continental Shelf Research*, 137, 56–71.