Modeling morphodynamic response of estuaries to closure of secondary tidal basins

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Many estuaries are situated in very densely populated areas with high economic activities that often conflict with their ecological values. For centuries, geometry and bathymetry of estuaries have been drastically modified trough engineering works, such as embanking, sand extraction, channel deepening, closure of tidal basin, etc. It is generally recognized that these interventions have resulted in significant hydrodynamic and morphological changes in these estuaries (e.g. increasing tidal range and SPM concentrations, loss of intertidal areas, formation of new shoals and channels, channel migration, increasing tidal range and SPM concentrations, see e.g Winterwerp *et al.*, 2013; Wang *et al.* 2009). Examples include the Ems estuary, the Loire, the Scheldt, the Elbe and the Yangtze.

To successfully manage estuarine systems under the ever increasing pressure of population and economic growth, it is necessary to improve our understanding of potential impacts of engineering works on hydro- and morphodynamics of these systems. The aim of this contribution is to investigate effects of closure of secondary tidal basins on the long-term morphodynamic evolution of estuaries. For this purpose, numerical model Delft3D is used, which has been successfully applied to morphodynamic modeling of estuaries and other coastal systems (cf. Hibma *et al.*, 2003; van der Wegen *et al.*, 2008; Ridderinkhof *et al.*, 2014).

The current study considers a realistic geometry, which is based on that of the Scheldt estuary. Mean motivation to consider this estuary is that it used to consist of multiple secondary tidal basins (Sloe, Braakman and Hellegat), which have been gradually closed off between 1800 and 1968 (van der Spek, 1997). Another motivation to select this estuary is that many historical data on its geometry and bathymetry are available since 1800, which enables a comparison between model results and observations.