

Morphodynamic development of the Yangtze and Scheldt Estuaries under influence of human interferences

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Abstract

The morphodynamic developments of the Yangtze Estuary in China and the Western Scheldt Estuary in The Netherlands under influence of human interferences inside and outside the estuaries are compared with each other.

Physically the two estuaries seem to be very different. The Yangtze Estuary is much larger and much more influenced by the upstream river than the Western Scheldt. However, they still have some morphological features in common. Both estuaries have a multi-channel system and extended intertidal flats. These morphological systems are under impact of the same kind of environmental changes and human activities in the two estuaries. The relevant human activities are engineering works and dredging activities for improving and maintaining the navigation channels, shoreline management activities including land reclamations and setbacks, etc..

Developments in the two estuaries on various spatial and temporal scales are considered.

On the mega-scale the sediment budget of the estuary as a whole is analysed. A remarkable finding for the Western Scheldt is that the sediment withdraws from the estuary has caused a sediment surplus rather than a sediment deficit because of the strong interaction between the tidal motion and the morphological change. For the Yangtze Estuary it is the decreasing sediment input from the upstream river that draws attention. The question is whether and when the extension of the delta into the East China Sea will turn into retreat. Another concern is if the tidal flow regime will change in the future because at present the estuary is a high concentration estuary that the sediment concentration has significant influence to the apparent roughness to the tidal flow.

On the macro-scale the cells of flood- and ebb-channels in the Western Scheldt and the ordered branching channels in the Yangtze Estuary are considered. In both estuaries the stability of the system of competing parallel channels are under influence of the engineering works and dredging-dumping activities for improving and maintaining the navigation channels.

On the meso-scale the developments of connecting channels, intertidal flats and sills in the two estuaries are considered. Especially the interaction between changes of the connecting channels and the developments of the tidal flats is interesting. In both estuaries the disappearance of the connecting channels and the grow of the intertidal flats enhance each other. In the Yangtze Estuary this process has been accelerated by the engineering works. In both estuaries there are indications that the developments of the connecting

channels also have influence on the stability of the multi-channel systems on the macro-scale.

The similar morphodynamic problems of the two estuaries in combination with the very different physical systems form a good basis the Sino-Dutch cooperation in the research to the two estuaries (De Vriend et al., 2012).

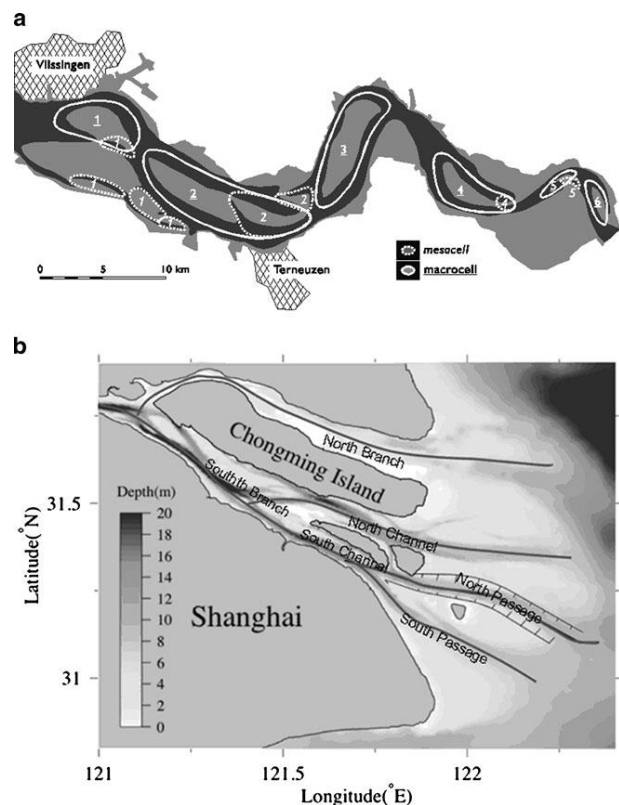


Figure 1: Cells of flood- and ebb-channels in the Western Scheldt (a) and ordered branching channels in the Yangtze Estuary (b), From De Vriend et al. (2012).

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References

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