

# BASIN SHAPE AND ERODIBILITY DETERMINANTS FOR THE LONG TERM DEVELOPMENT OF ESTUARIES?

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In this study we aim to understand the scale interactions in the physical and biological system and try to determine the impacts of climate change, increased storminess and change in zonation of benthic organisms on the fine sediment dynamics of the Western Wadden Sea and the sediment balance between the North Sea. Biota are known to strongly affect the stability of the bed in two opposite modes. First of all, stabilisation of the bed is induced by the secretion of extracellular polymeric substances by microphytobenthos. On the other hand, macrofaunal species destabilise the top layer of the bed during their burrowing and feeding activities. By incorporating a parameterisation of the biological activity in the state-of-the-art Delft3D model (Figure 1), it is shown that the bio-engineers can influence the suspended sediment concentrations and bed composition on an estuarine scale.

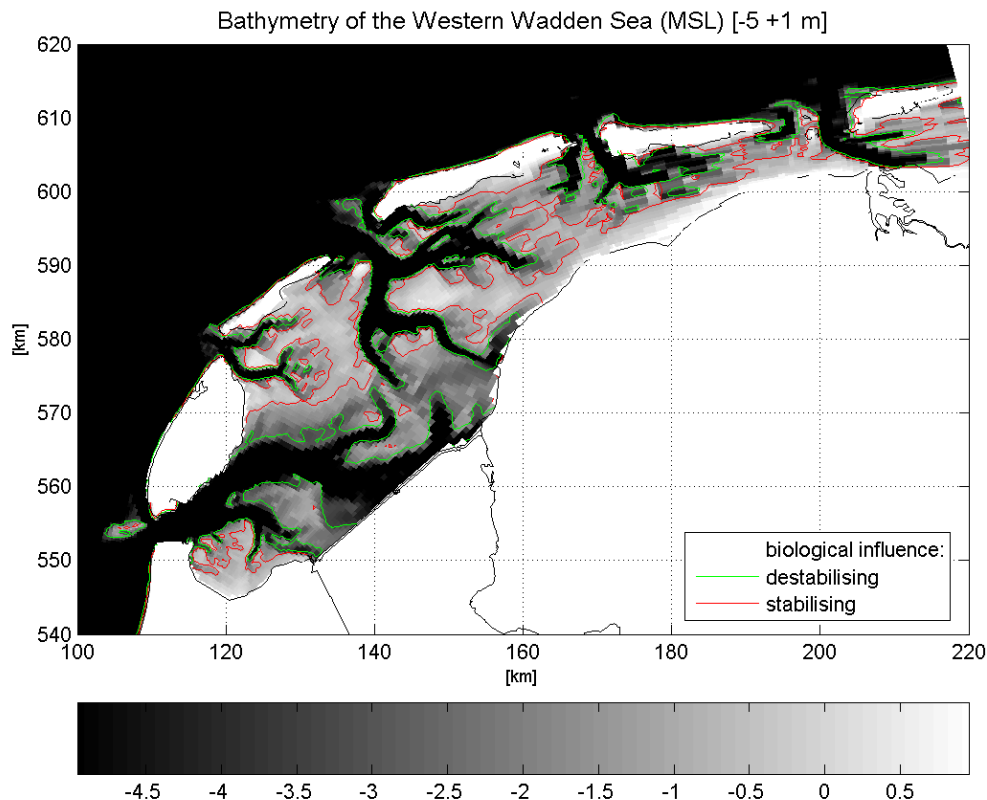


Figure 1: For the Western Wadden Sea, the critical shear stress for erosion and the erosion coefficient is influenced by benthic organism resulting in a (de)stabilised bed.

Furthermore, it is found that the fine sediment dynamics in every tidal basin in the Western Wadden Sea is influenced in a different way, depending on the basin shape. The shallow tidal basins are predominantly stabilised, while the larger and deeper tidal basins are predominantly destabilised. The larger tidal basins are also experiencing higher current speeds and more wave action, making them even more sensitive to erosion in comparison with the shallow tidal basins.

Future changes in both the physical environment and the species composition will influence the fine sediment dynamics in the Western Wadden Sea. Increasing depth will alter the zonation of the biota resulting in changed distribution of (de)stabilised areas. Moreover, global climate change will be accompanied by changed water temperature and increased storminess, influencing the fine sediment dynamics and species composition. This could indirectly affect the fine sediment balance between the Wadden Sea and the North Sea.