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Effect of sediment transport formulations on long-term morphology

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Tidal inlets facing relative sea level rise can be expected to act as sinks of sediment, often at the cost of adjacent coasts. The long-term aim of this study is to understand and model the behaviour of such inlets and their effects on the adjacent coasts. The present study is focused on the long-term morphology of Ameland Inlet, which is a relatively undisturbed inlet located between Ameland and Terschelling barrier islands in the Dutch Wadden Sea. Numerous studies are found in the literature with different approaches for long - term coastal morphology. A process-based 2D numerical model, Delft3D, is the tool in this analysis. The model consists of a schematized bathymetry. This model is simulated with tidal force and constant as well as a series of morphological scale factors to understand the long-term morphology with different transport formulations; Van Rijn (1993), Soulsby-Van Rijn (1997) and Engelund-Hansen (1967). Further, this schematized approach is used to study the pattern formation with different locations of back barrier basin relative to inlet. Typical for Ameland inlet is that the tide propagates from West to East. The resulting 50 - year morphology in the first two transport formulas shows eastward oriented braided channel patterns in the back barrier basin. However, the third formula presents quite slow evolution. Therefore, it requires about 200-year morphology to reach the equivalent volumetric change in the basin. The lower the morphological factor the higher the extension of ebb delta at initial morphological years. The main channel at inlet has an upstream orientation in all formulas. The first two formulas present strong bed evolution compared to the last formula. These strong morphological patterns may be due to initial conditions or due

to wave effects which were not included yet.