# Rebuilding the natural integrity of barrier islands

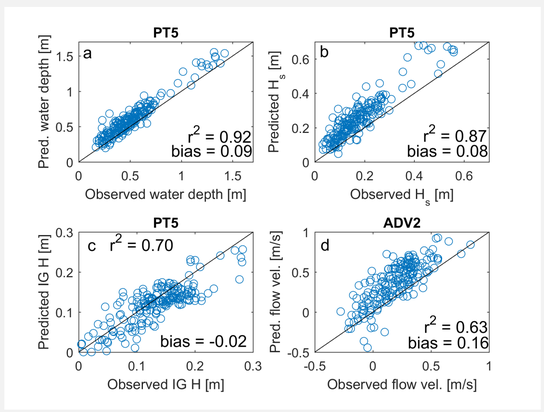
## The effect of storm surges and washover geometries on sediment transport during inundation

## Research aim

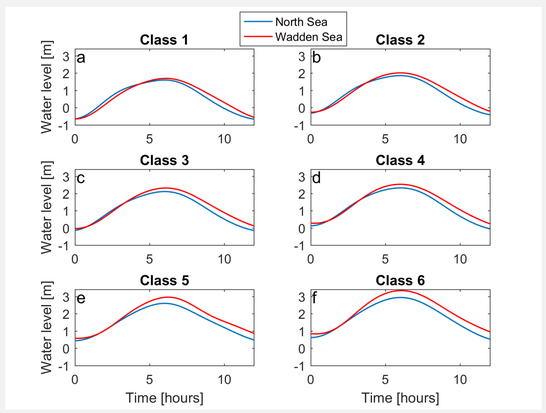
- Our studies focus on understanding the prerequisites for a successful redevelopment and activation of overwash, inundation, and the formation of washovers. The purpose of these measures is to reintroduce dynamic processes, which can promote sediment deposition to compensate for subsidence and sea level rise and to stimulate ecological development and biodiversity. In these studies we will not only consider the feasibility and effectiveness of such an approach, but we will also generate design procedures and dimensions.

- This project focusses on the short- and long term modelling of washover processes with XBeach. The 1D simulations identify the dominant hydrodynamic processes and its influence on sediment transport during storms. The 2D simulations show the influence of different washover geometries on the sediment transport through a washover opening. In the last phase this will result in design criteria for the re-activation of washovers.

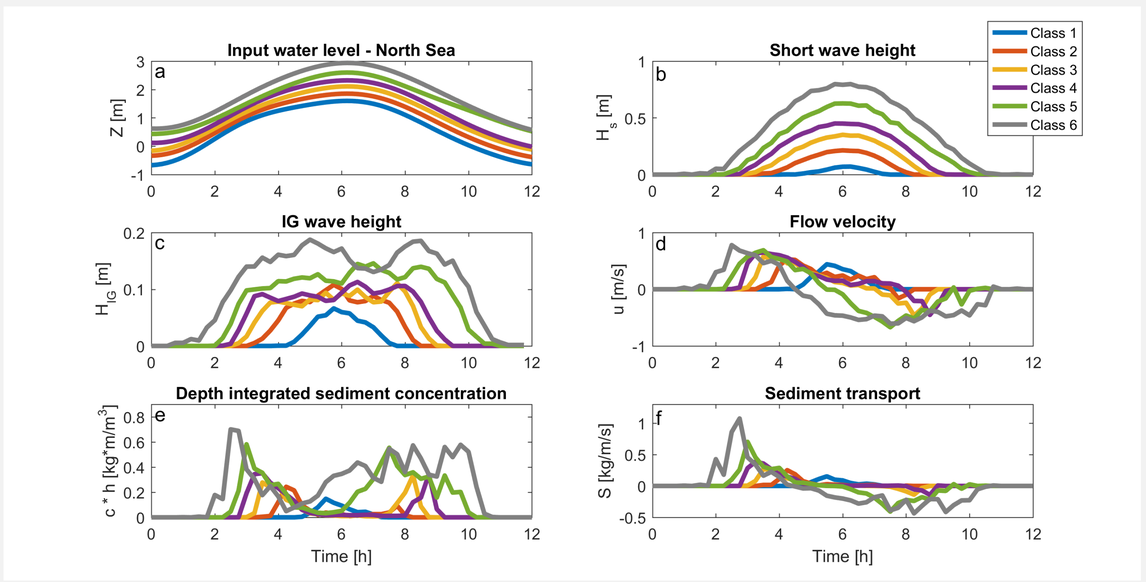
## XBeach modelling - 1D results



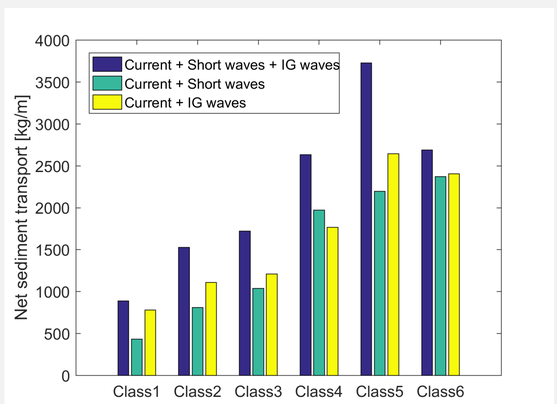

XBeach validation with field data for water depth, short and long waves and currents.



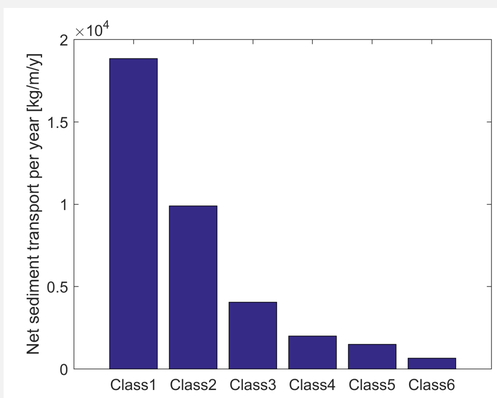

Higher class = higher water levels & larger waves & relatively larger water level in Wadden Sea.




Hydrodynamics and sediment transport for all classes.



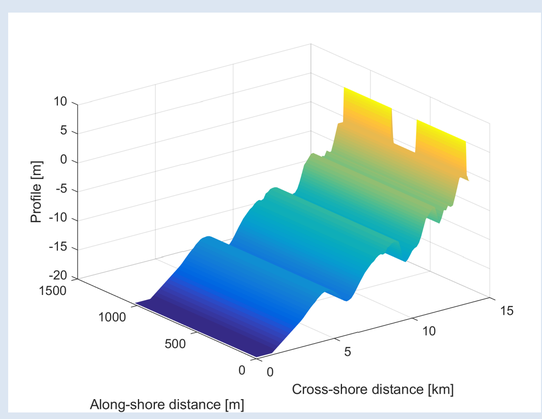

Net sediment transport per class per storm.



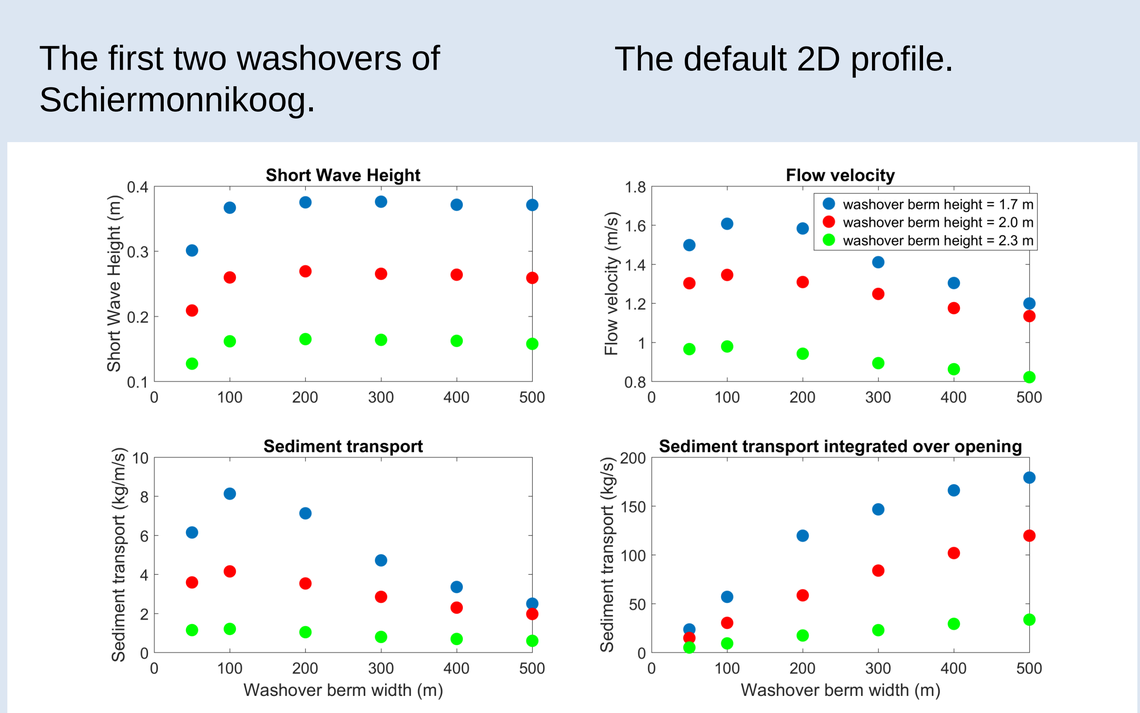

Net long-term sediment transport per class (= frequency * storm).

## XBeach modelling - 2D results

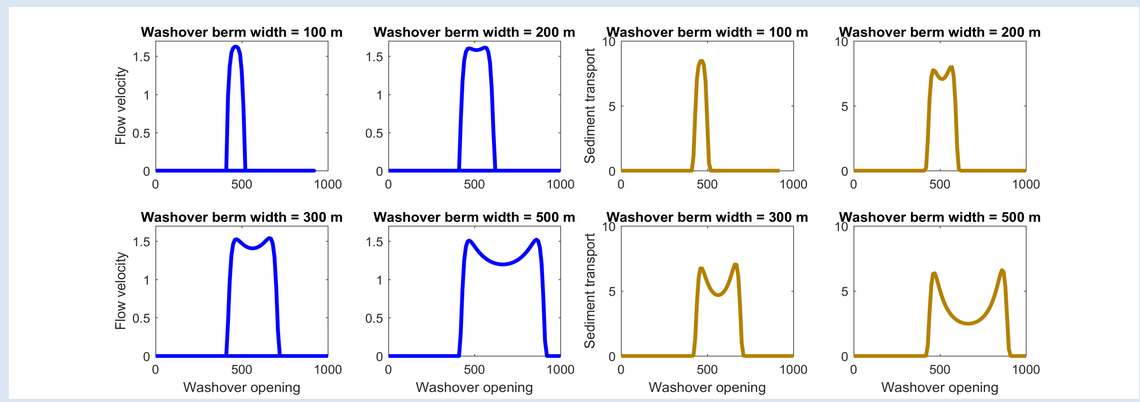

The first two washovers of Schiermonnikoog.




The default 2D profile.




Wave height, flow velocity and sediment transport in the middle of the opening for various combinations of washover opening width and height. Water levels in North Sea and Wadden Sea are constant (no tide).




Flow velocity and sediment transport over the entire washover opening, for different widths.

## Main findings

- Currents across the island are the dominant factor for onshore sediment transport during inundation.
- The net sediment transport during smaller, more often occurring storms is more important than the effect of larger and rare storms.
- Lower washover berms result in more sediment transport.
- Washover berms wider than 300 meter appear not to result in more transport through the entire opening.

## Work in progress

- Investigate role of the green beach on the hydrodynamic processes at Schiermonnikoog.
- Design optimal washover geometries.
- Fieldwork at the washover of Rottumeroog to analyze the bed level changes after one storm season.
- Investigate the long-term influence of inundation events on the vertical accretion of barrier islands.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