THE EFFECT OF TURBULUNCE ON MODELLING THE SEDIMENT TRANSPORT IN THE SWASH ZONE

To better estimate whether coastal systems can withstand storms, it is important that the behaviour of the sand under the influence of waves is understood in a higher extent. Therefore, this research checked if the inclusion of turbulence a sediment transport model (XBeach) could improve the results by comparing them with a dataset (RESIST). It does this comparison by focussing on the swash zone. To make a fair comparison between the point-measurements from the RESIST data and the depth-averaged data from XBeach, the point-measurements were converted into depth-averaged values as well by applying a Rouse profile.

Two types of turbulence datasets are included: one resulting from an OpenFoam model and one obtained by an analytical approach. This turbulence is included in a self-made sediment transport point-model which was based on the Van Thiel-Van Rijn method. Yet such a model could not cope with advective processes, which could cause some deviations in the results.

Based on this research there can be concluded that XBeach is quite good in modelling the hydrodynamics in deeper water and in the swash zone. Yet the sediment transport is modelled not so well and should be improved.

Including the turbulence did not improve the sediment concentration and the transport when checked with the Correlation Coefficient and the normalized Root Mean Square Error. This outcome was checked by changing some made assumptions (assuming uniform sediment distribution instead of applying the Rouse profile or using the near-bed instead of depth-averaged turbulence) yet the conclusion did not change.

It is recommended to use at least a 1DH-model in further research since such a model could consider advection and (horizontal) diffusion which tend to be important processes in sediment transport research in the swash zone. It would even be best to use a 2DV-model to also include differences in the vertical plane in for instance the sediment concentration and the amount of turbulence.

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9 July 2020

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