MODELING NET SEDIMENT TRANSPORT RATES IN THE SWASH ZONE

THE ANALYSES OF THREE NET SEDIMENT TRANSPORT FORMULATIONS IN THE SWASH ZONE

A better understanding of the swash zone is essential for coastal management. The swash zone is essential because the processes in the swash zone determine whether sediment is sored inshore or transported offshore. Further, it determines the swash zone the evolution of the shoreline. However, the swash zone is not fully understood. Therefore, this research checked which formulation can be used to model net sediment transport in the swash zone and how the formulation can be improved.

Within this research, the RESIST and BARDEX II data sets are used and the new Shaping the Beach data set (2020). Form each data set one erosive and one accretive wave conditions are used. For each wave condition is the net sediment transport rate, for the active part of the profile, determined. Figure 1 shows the net sediment transport rates for the erosive wave condition of Shaping the Beach. Further, is for all the six wave conditions a representative velocity and acceleration signal for one swash cycle obtained.

The three formulations are a bed shear stress and run-up limit based formulation both from Larson et al. (2004) and the SANTOSS formulation. The SANTOSS formulation and the bed shear stress calculate, for most of the erosive runs an opposite direction than measured. The direction for the accretive runs are mostly in the same direction of the measured direction. Larson et al. (2004) formulation based in the run-up limit has for 77% of the erosive runs the same direction as measured. All the formulations, in general, overestimated the height of the net sediment transport rate, except for the bed shear stress formulation of Larson et al. (2004) for wave condition A6 of BARDEX II.

For the improvement, the run-up limit and Kc-value are investigated, because these two have the most influence on the calculated net sediment transport rate. The run-up limit is calculated with a formulation instead of the measured run-up limit. With this formulation, it is possible to use the net sediment transport formulation before an experiment is done. To improve the Kc-value, the formulation is calibrated to obtain the best Kc-values for the data sets. It turns out that the Kc-values should be lower than the used value of Larson et al. (2004). Further, shows the Kc-value a tendency with the wave period.

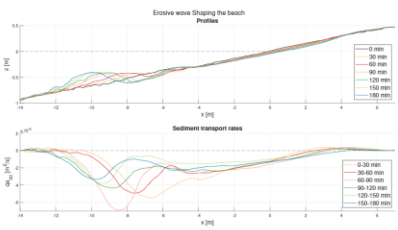

Figure 1: Net sediment transport rates erosive wave condition shaping the Beach.

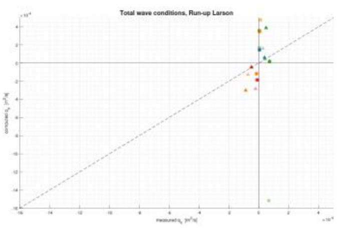

Figure 2: Calculated net sediment transport rates with the run-up limit formulation of Larson et al. (2004)

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Larson, M., Kubota, S., & Erikson, L. (2004). Swash-zone sediment transport and foreshore evolution: Field experiments and mathematical modeling. Marine Geology, 212 (1-4), 61{79. doi: https://doi.org/10.1016/j.margeo.2004.08.004.

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