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Validation of process-based sand wave models: applying a linear and nonlinear sand wave model to the Netherlands Continental Shelf

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Tidal sand waves are dynamic large-scale bed forms occurring in tide-dominated, sandy shelf seas such as the North Sea. Since they may interfere with various activities, understanding sand wave dynamics is important from a practical point of view. Recently, two process-based model studies were carried out to investigate the influence of storm processes on sand wave dynamics (Campmans et al., CSR2017; JGR2018). While this type of model gives insight in the morphodynamic mechanisms, quantitative comparison with field observations remains a challenge.

Here we present a systematic validation of the afore mentioned linear and nonlinear models, against a wide range of sand wave observations from the entire Netherlands Continental Shelf (Damen et al., JGR2018). Specifically, from the available locations with sand wave observations and environmental characteristics, we have chosen a grid for calibration and, staggered to that, a grid for validation. For the so-called calibration locations, we tuned the linear model (using local environmental conditions) in order to minimize the difference between observed and modelled wavelengths. Next, on the validation locations, we used the thus obtained parameter settings (location-independent values of slip parameter and effective wave period) to test our model performance, both in the linear and nonlinear regime. First results demonstrate fair agreement for the wavelengths from the linear model and indicate a systematic overestimation of sand wave heights by the nonlinear model.

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