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Environmental parameters as a control on the spatial variation in sand wave morphology on continental shelves

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Sand wave morphology and dynamics on continental shelves vary spatially, depending on local bed properties and hydrodynamic characteristics. To date, empirical studies are mostly limited to local studies and process-based modelling has not been able to simulate realistic equilibrium sand wave heights. In order to explain the spatial variation in the morphology of equilibrium sand waves on continental shelves, a large-scaled quantitative investigation is required. We use high-resolution multibeam echo soundings for the quantification of sand wave shape characteristics, and hydrodynamic models & databases and sedimentary data for correlating sand wave shapes to hydrodynamics and seabed sediments on the Netherlands Continental Shelf (NCS). Herein, we tested basic local parameters as well as marine processes of sediment transport. The results are quantified lengths, heights and asymmetry of all sand waves at the NCS at grid resolution. From the hypothesised processes, we find that the mode of sediment transport (bed load versus suspended) may be a dominant factor in explaining sand wave length, height and asymmetry. Full results of the quantified shape characteristics of all sand waves on the Netherlands Continental Shelf together with the tidal velocities, water depths, surface wave heights and median grain sizes will become openly accessible in a repository (http://doi.org/10.4121/uuid:0d7e016d-2182-46ea-bc19-cdfda5c20308). These results are highly valuable for applied offshore engineering projects and to modellers for validating their morphodynamic model results.