



Hydroacoustic monitoring of sorted bedforms west of Sylt (SE North Sea) - Interannual variabilities during five years

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Sorted bedforms can be found in coastal shelf seas worldwide. These spatially-grain-size-sorted bedforms with lengths of up to several kilometers are consisting of small rippled medium-to-coarse sand and can remain stable for decades. However, the knowledge about their development is still fragmentary. For this study, a shallow investigation area with water depth <15 m located west of the island of Sylt (SE North Sea, Germany) was annually surveyed with high-resolution hydroacoustic means (i.e. sidescan sonar, multibeam echo sounder, and sub-bottom profiler) within a time frame of five years. Aim was to detect short-time variances regarding the stability of the prevailing bedforms in an area which is strongly influenced by distinct tidal and wind-driven currents as well as storm surges. The measurements show sinuous stripes of rippled medium sand which are surrounded by smooth fine-sand areas. These sorted bedforms are basically linked to the morphology characterized by ridges and channels and could be identified as flow-transverse features that are maintained by ebb and flood currents of almost equal strengths. The bidirectional flow field generates sharp boundaries between the coarse- and fine-sand domains in both current directions. Further to the north, where unidirectional flow field conditions prevail, asymmetric bedforms could be detected with only one sharp boundary aligned counter to the current direction. While comparing the data sets of the different years, no significant changes regarding the morphology and distribution of the sorted bedforms were detectable. However, the boundaries to the fine-sand domains reveal small-scale variabilities. New minor bedforms and small rippled excavation marks developed and disappeared during the measure campaign. We suppose that these processes mainly occur during periodically recurring storm surges: Fine-sand layers are winnowed away and the shapes of the bedforms changes. Intensity and direction of these storms are manifested in the size and alignment of the small ripples appearing on the coarser grained domains and excavation marks.