



Seabed mapping of the inner and outer Weser estuary, NW Germany, based on sidescan-sonar data

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The semidiurnal tide-dominated Weser estuary, discharging into the German part of the North Sea, is an important navigation channel. An increase of the tidal range over the last hundred years changed the dynamics of the sediment transport, and hence the morphology. Higher sediment turnover mainly from the seaward direction influences the navigation safety. In this study, the first full coverage high resolution sidescan sonar survey of the navigation channel of the inner Weser estuary (Bremen) up to the outer mouth was carried out. The area-wide distribution of fluvial morphological structures and surface sediments and their temporal as well as spatial variability were the main interests. The sonar backscatter, combined with information from surface sediment grab samples, show a grain size spectrum of the clastic as well as biogenic sediments ranging from clay to coarse sand. On average, the Weser estuary surface sediments are dominated by medium sand fractions. Seabed morphology is characterised by plane bed and subaquatic dunes with wave lengths of 0,5 m to 120 m. The mostly ebb flow orientated asymmetric dunes attest a downstream net sediment transport. Apart from geological structures, the anthropogenic influence is illustrated by dredging marks. The seabed mapping allowed us to identify five fluvial morphological units, which appear to be coupled with sedimentary processes. Three sonar surveys of the congruent Weser section attest the co-existence of the five zones over a period of May 2002 to January 2003. Morphological dynamics is reflected by shifting boundaries of the five zones, which seem to be mainly influenced by hydraulic parameters. The significant variability of the spatial extension of the five zones in January 2003 in comparison to May 2002 and November 2002 was linked with the maximum discharge of 1200 m³/s and storm events in January 2003. Tidal influence is particularly

observed in the variability of the position of a homogenous fine grained zone close to Bremerhaven, which is assumed to be connected with the turbidity zone of the Weser estuary. Considering the complete study area seasonal variability seems to dominate over tidal influences.