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Dynamics of sub-aquatic bed form structures in the tidal Elbe, Northern Germany

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Sub-aquatic bed forms (dunes) are characteristic structures of a sandy river bed. The direction, migration and geometrical parameters of their movement are important spatial and time indicators of the sandy sediment loads carried near the bottom. Subject to the availability of sediments, the dynamics of dunes are influenced by a number of factors, such as river discharge / tidal flow, water depth / tidal characteristics and grain size distribution. Once dunes increase in height they can impair the safety and ease of shipping. Individual shallows created by this are then eliminated, for example through water injection procedures. On an annual average, about 1.5 million m^3 of sediments have been dredged in this way in the area of the channel of the tidal Elbe (Entelmann, 2010).

With the broad data base available, the dynamics of these structures have been studied in different sections along the tidal Elbe river. As a first step multibeam echo-soundings were systematically analysed using a geographic information system (GIS) to classify existing bed forms according to their average height. Results of this analysis is a baseline map of bed forms for the tidal Elbe river. Within smaller focus areas, which are located in different sections along the tidal Elbe, targeted datasets of multibeam echo-soundings had been recorded for the purpose of this study. Using a software tool called Rheno Bedform Tracking (refer to Frings, et al. 2012) it was possible to derive from these datasets bed form dimensions on individual structures. This study gives an overview of the quality of correlations found with the aforementioned factors in different focus areas.

Entelmann, I. (2010): WI-Einsatz im Kontext des Strombau- und Sedimentmanagementkonzeptes Tideelbe. Beitrag zur BfG-Veranstaltung Umweltauswirkungen von Wasserinjektionsbaggerungen, BfG-2/2011, Koblenz.
Frings R.M. (2011): Proposal for the revision of the dunetracking software DT2D. Institute of Hydraulic Engineering and Water Resource Management, RWTH Aachen University.