

Subtidal geomorphology and historical evolution of a meso-tidal coastal area: an example from the German Wadden Sea

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Coastal areas are highly dynamic natural environments where subaerial, fluvial, and marine morphogenetic processes interact with the local geological setting and set the geomorphological features up to the subtidal sectors. Besides natural factors, the intense human presence on most of the European coasts strongly interacts with the morphodynamics and affects the evolutionary processes. The Wadden Sea is of great scientific interest for investigating the interactions between geomorphological processes and human influences. It is one of the world's largest tidal system made of 39 distinctive tidal basins. Strong currents and waves induce intense morphodynamics of the dominantly sandy seafloor. Human activities like touristic facilities, some of the largest north European harbors, and a complex system of dykes built over the last centuries for land reclamation, further affect the coastal dynamics and play a significant role in the evolutionary process of the near-shore environment. The study investigates the geomorphological features of a subtidal area within two adjacent tidal inlets. It aims to figure out the variations of geomorphic processes during the last centuries in relation to natural processes and human activities. Sedimentological, geomorphological, and geological characterization were conducted combining different hydro-acoustics techniques. Full-coverage high-resolution bathymetry and reflectivity, calibrated by grab samples, formed the data basis for geomorphometric and sediment mappings. Subbottom profiles and sediment cores were used to look at the 3D morpho-stratigraphical setting of bedforms. Historical maps on the coastal evolution during the last 400 years provide valuable information for the chronological constrain of processes. The study provides a substantial contribution for understanding the geomorphology of the Wadden Sea tidal inlet and contains new information on the subtidal morphodynamics in relation to natural and anthropic factors.

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