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Development and validation of hydroacoustic monitoring concepts for the coastal German Bight (SE North Sea)

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The joint research project WIMO (Wissenschaftliche Monitoringkonzepte für die Deutsche Bucht/Scientific Monitoring Concepts for the German Bight, NE North Sea) aims at providing methods for detection and analysis of seabed habitats using modern remote sensing techniques. Our subproject focuses on hydroacoustic techniques in order to gain information about seafloor environments and sediment dynamics. In a timeframe of four years, several key areas in the German Bight were repeatedly observed using different hydroacoustic gear (i. e. sidescan sonars, single/multibeam echo sounders and sub-bottom profilers). In order to ground-truth the acoustic data, hundreds of grab samples and underwater videos were taken. With these techniques it is possible to distinguish between different seafloor habitats, which range from muddy to sandy seafloors (esp. near the barrier islands) to rugged or vegetated/populated reefs around Helgoland. The conducted monitoring program revealed seasonal changes regarding the abundance of the sand mason worm (Lanice conchilega) and the brittle star (Amphiora filiformis) as well as ongoing sedimentary processes driven by tidal currents and wind/storms. It was also possible to determine relationships between sediment characteristics and benthos in some key areas. An essential part of our project included a comparison between the datasets obtained with different hydroacoustic devices, configurations, and evaluation methods in the same study areas. The investigation reveals that there could be distinct differences in interpreting the data and hence in the determination of prevailing seafloor habitats, especially in very heterogeneous areas and at transition zones between the habitats. Therefore, it is recommended to employ more than one hydroacoustic system (preferably a singlebeam device combined with a wide-swath sonar system) synchronously during a survey in order to gain more reliable and detailed information about the seafloor environments. The results of this project study form an important contribution to ongoing and future projects, in particular with regard to the technical configuration of the sonar systems, the workflows concerning post-processing and validation of the hydroacoustic data as well as the monitoring concepts that were worked out. However, a full automation of these workflows is not feasible. For the time being, measurements, post-processing and data evaluation still need supervision and expert knowledge.