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Can multibeam-derived acoustic backscatter be used to monitor changes in seabed habitats?

Within the Marine Strategy Framework Directive, the benthic habitat is the backbone of many seabed related indicators. To assess its distribution and extent, seabed mapping, and particularly multibeam echosounding (MBES), is increasingly used. However, to monitor the environmental status of the seafloor, evaluations are needed on the precision, sensitivities and repeatability of the acoustic devices; taking into account the factors other than those exclusively related to the seabed that may influence the MBES BS level from one survey to another. This is especially the case for MBES backscatter (BS) since its decibel values' ranges, being a proxy of seabed type, depend on a range of instrumental and environmental parameters that need quantification before individual data products can be compared from one survey to another. Results relate to assessing the effect of suspended particulate matter (SPM) and near-bed sediment load on MBES backscatter, hitherto seldom quantified. During a 13h tidal cycle MBES backscatter was collected in combination with oceanographic data using a benthic lander and a profiler equipped with current and turbidity meters, as well as a particle-sizer and water samples. A strong correlation was found between the intensity of backscattering in the water column and MBES seafloor BS. Around highest current velocities, water column backscattering reached a maximum, with a higher absorption in acoustic energy. Around slack water, MBES BS was most reflective, with moderate water column backscattering. A significant difference of 3 dB was found against the variability given by the manufacturer. The variation in decibel range needs accounting for when evaluating changes in MBES BS, though this will depend on sediment type and dynamics. Our results emphasize the influence of SPM on the MBES seabed BS. Up to now this factor is not considered by the sonar equation itself. Given the temporal variations of SPMs concentration in coastal areas, the real-time measurement of SPM concentration in the water column and its effects on BS measurement remain serious challenges.

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