



Effect of varying oxygen conditions on biogeochemical processes and benthic activities at the Crimean shelf of the Black Sea

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Low, varying bottom-water oxygen concentrations have a strong impact on marine ecosystems, affecting community composition and benthic processes. The Black Sea can be considered as a natural laboratory to study the influence of hypoxia (low oxygen conditions) on microbial community structure and biogeochemical turnover rates. During the MSM 15/1 expedition HYPOX with the German research vessel MARIA S. MERIAN we investigated how benthic microbial communities and biogeochemical processes in the sediment change along a transect with varying oxygen availability between 0-150 $\mu\text{mol L}^{-1}$ oxygen in bottom waters of the Crimean shelf (100-400 m water depth). The distribution of geochemical parameters was studied on sediment cores retrieved from different water depth. In addition, high-resolution benthic oxygen profiles (100 to 200 μm vertical resolution) were measured in situ with microprofilers and total oxygen uptake rates were assessed with benthic chamber incubations.

The results showed that at the Crimean shelf benthic oxygen fluxes were comparably low (diffusive fluxes: 1-9 $\text{mmol m}^{-2}\text{d}^{-1}$; total fluxes 4-16 $\text{mmol m}^{-2}\text{d}^{-1}$) and oxygen penetrated mostly less than 5 mm into the seafloor. Interestingly, temporal variations in oxygen variability at one site were as high as between different sites of the transect. The electron acceptors nitrate, iron- and manganese oxides were present only in environmentally insignificant amounts, but sulfate was also barely used for anaerobic degradation of abundant labile organic material in the sediments. Apparently, the rapid fluctuation of bottom water oxygen concentration strongly influences both microbial as well as biogeochemical benthic processes and has a negative effect on benthic community activity.

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