Role of the biotic habitat for benthic biogeochemical fluxes and function in the Weddell Sea

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Seafloor habitats provide a number of functions, including secondary productivity and remineralisation of organic matter. On a global scale, the relation between such ecosystem functions and biodiversity is assumed to be positive [1], albeit with differences among habitats and studies. Extending the pure biodiversity–function approach by including the influence of environmental parameters, we tested the effect of different habitat parameters on biogeochemical fluxes in two Southern Ocean benthic shelf systems, the north-western Weddell Sea, characterized by above-average warming of surface waters and sea-ice reduction, and the south-eastern Weddell Sea, generally representing a stable high-Antarctic marine environment that is not (yet) affected by climate change. We performed replicated experiments at 13 sites during two Polarstern expeditions in 2013 and 2016, using ex-situ sediment core incubations [2] to investigate benthic boundary fluxes (oxygen, silicic acid, nitrate, phosphate, ammonium) and their relation to macrofaunal and environmental parameters (Chl a, sea-ice extent. As an example, oxygen fluxes were generally higher in the north-western Weddell Sea (2 to 7 mmol $m^{-2}d^{-1}$) than in the south-eastern Weddell Sea (1 to 3 mmol $m^{-2}d^{-1}$), and this pattern is correlated with differences in sediment pigment concentration and ice-cover patterns. We discuss the importance of different ecosystem compartments in the biotic habitat (macrofaunal diversity, sediment pigments) for benthic boundary fluxes, clarifying their role for the marine biogeochemical function.

References

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