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Organic matter reactivity across the northern Arabian Sea Oxygen Minimum Zone

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Organic matter recycling at the sea floor directly relates to the functioning of benthic ecosystem through dictating the energy flow of the environment. Sediments from the Arabian Sea Oxygen Minimum Zone (OMZ) typically contain high concentrations of organic matter and are thus potentially capable of sustaining an active ecosystem. However, faunal abundances within the OMZ are typically low, a feature which has previously been related to the low oxygen content of the environment. Alternatively, these low abundances within (and outside) the OMZ may be due to low organic matter quality rather than oxygen availability. To investigate this, the bioavailability and fate of organic matter in the surface sediments of the Arabian Sea Oxygen Minimum Zone were studied through a series of incubations and analyses of intact sedimentary phytopigments. The results suggest that, indeed, the sedimentary organic matter accumulating in the OMZ has a very low quality. The slurry incubations of surficial sediments yielded OM remineralisation rates between 77-42 nmol C ml-1d-1 with a residence time of up to 79 yrs. The low OM quality is also clearly demonstrated by the sedimentary pigments, which were strongly dominated by degraded phaeopigments, chlorophyll a being nearly absent already in the top half centimeter of the sediment. In addition, a short-term experiment was performed where 13C-labeled (particulate and dissolved) organic matter was added on sediment from a low oxygen site (bottom water oxygen content $\pm 45 \mu$m), to investigate potential turnover of labile carbon. The deliberate tracer experiment focused on uptake by bacteria and foraminifera, key players of organic matter recycling in these low oxygen settings. In addition, Gromia, large eukaryotes commonly found in the lower boundary of the Arabian Sea OMZ, were targeted in the tracer study.