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Benthic nutrient dynamics across the Pakistan and Indian margins

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Nutrient cycling and re-generation in sediments is an important function of the benthic system, which ultimately provides fresh nutrients to the water column, and thus regulates ocean nutrient budgets. The biogeochemical cycling of nutrients can be affected by a range of factors, including redox state, organic matter supply, and benthic faunal activity, thus its pattern and rates are likely to be significantly impacted by the gradients in oxygen, organic matter concentration, and benthic community structure typically exhibited by oxygen minimum zones (OMZs).
During multidisciplinary, international research cruises conducted in 2003 and 2008, comprehensive studies of nutrient biogeochemistry have been undertaken at transects across the continental margins of Pakistan and India (respectively). Methods employed include characterisation of porewater profiles, and modelling of benthic nutrient fluxes, as well as in situ and shipboard direct flux measurements. Thus this data allows a consideration of the factors and processes affecting benthic nutrient cycling, as well as a comparison of benthic nutrient cycling in two key regions of the Arabian Sea OMZ.
In contrast to the Pakistan margin, the Indian margin displays more intense hypoxia, and higher sedimentary organic carbon concentrations. In concerts with this, contrasts were apparent in nutrient concentrations and dynamics. For example, porewater ammonia concentrations on the Indian margin were lower than off Pakistan, as were ammonia fluxes across the sediment-water interface. Further, nitrate consumption rates were lower on the Indian margin, producing an overall picture of suppressed nitrogen cycling.
These and other similarities and differences in processes (such as nitrogen cycling and bioirrigation) between the two margins will be described, and the reasons for these differences will be discussed.