Terrigenous fluxes and seawater circulation in the north Red Sea since the last interglacial from ε_{Nd} and trace element concentrations

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The Red Sea, an elongated semi-enclosed water body located between the hyper-arid Sahara and Arabia deserts, is highly sensitive to regional and global climate change. Water circulation in the Red Sea is controlled by sea level changes that impose varying degrees of exchange across the shallow Bab-el-Mandeb Straights. During glacial periods, limited connection resulted in weakend water circulation, while interglacials are characterized by a more vigorous, lagoon-like mode of circulation. The seawater composition is influenced by both water mass mixing and external inputs. Fluvial and riverine inputs are negligible, and most terrigenous inputs are eolian, originating from local and distal sources, mainly in north Africa.

In order to constrain the different inputs and to determine what processes controlled them in the past, the isotopic composition of Neodymium (Nd) and trace element concentrations were determined in ferromanganese oxides and the decarbonated terrigenous fraction of marine sediment cores covering the last interglacial to present. The cores are located in the north Red Sea and the Gulf of Aqaba (GOA), a semi-enclosed basin at the northern tip of the Red Sea.

ε_{Nd} values range from -0.9 to -5.0 and -2.5 to -6.4 for the oxides and terrigenous fraction, respectively, with a consistent depletion of ε_{Nd} in the terrigenous fraction relative to corresponding oxides. In the Red Sea, ε_{Nd} in both fractions correlate well with sea level changes, while GOA sites display more uniform secular evolution. A characteristic GOA ε_{Nd} of -6 is thought to represent the local terrigenous input composition, which is dominant during the last glacial cycle. By contrast, the last interglacial is controlled by a far more radiogenic end member (-2.5).

Building on the identification of the primary terrigenous end members in the north Red Sea region, and coupling them with corresponding authigenic ferromanganese oxides, which trace bottom water compositions, we present a history of the late Quaternary evolution of the north Red Sea and the GOA.