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Primary and diagenetic signals in late Quaternary sediments - A case study from the Zambesi deep-sea fan (SW Indian Ocean)

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Pore water and high-resolution solid phase analyses as well as magnetic investigations were carried out on a 6.15 m long gravity core (GeoB 9309-1), recovered during RV *Meteor* cruise M 63/1 from 1219 m water depth off the Zambesi river mouth (Mozambique). The sulphate/methane transition (SMT) at this site is located at a sediment depth of about 4.7 m. The concomitant processes of SO_4^{2-} reduction and CH_4 oxidation lead to the liberation of HS^-, which has a significant impact on the sediment pore water and solid phase composition. A whole series of biogeochemical reactions is taking place at this boundary in core GeoB 9309-1, making this site a useful reference example for processes typically occurring at the SMT. Reactions influence the sedimentary cycles of iron, manganese, sulphur, phosphorus, copper and zinc. In addition, there is a sharp drop in magnetic susceptibility around the SMT, indicating the dissolution/reduction of primary iron (oxyhydr)oxides and reprecipitation as iron sulfides (including pyrite). However, apart from the sediment components that are in part strongly altered, there are also clearly discernable primary sedimentary signals largely unaffected by early diagenesis. These are documented by the conventional terrigenous elements Al, Ti and Zr, but also by Mg, K, Sr and Ba. Concentrations of elements generally bound to clay minerals (Al, Mg, K, Sr, Ba) exhibit cyclic fluctuations in the sediment interval from 250-500 cm, whereas elements representing the heavy mineral fraction (Ti, Zr) remain at constant values over this depth interval. This discrepancy is attributed to winnowing or syndepositional fractionation processes, though the exact mechanism remains unclear as yet. The overall primary sedimentary record documents the importance of terrigenous input for the depositional system of the Zambesi deep-sea fan. Concluding, this study highlights the possibility to distinguish primary from secondary sedimentary signals by a combination of rock magnetics and inorganic geochemistry, and also points out the necessity to do so for a correct interpretation of the sedimentary record.