Diagenetic mobilisation of Fe and Mn in hydrothermal sediments

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The Bransfield Strait is a tectonically-active marginal basin between the Antarctic Peninsula and the South Shetland Islands. We present data linking diagenetic metal cycles to hydrothermal activity on *Hook Ridge*, a submarine volcanic edifice in the Central Basin. Water column E_h-anomalies, visual observation of fluid flow at the seafloor, and pore-fluid chemistry confirm hydrothermal activity on *Hook Ridge* [1]. Concentration-depth profiles of NO_3^-, Mn^{2+} and Fe^{2+} indicate early stage, suboxic diagenetic reactions. However, compared to a nearby reference site, the sediment surface at *Hook Ridge* is enriched in solid phase Fe (reactive oxides and carbonates) and Mn, and underlain by elevated pore-fluid Fe and Mn content (Fig. 1).

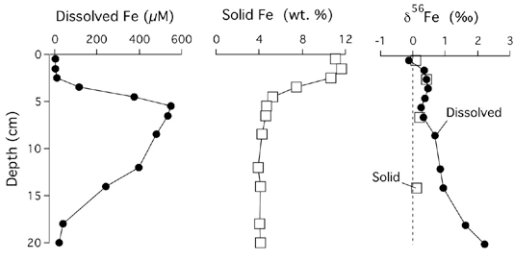

Figure 1. Down-core concentration and isotope composition of Fe in sediments and pore-fluids from *Hook Ridge*.

The isotope composition of dissolved pore-fluid Fe maxima ($\delta^{56}Fe_{dissolved}$ = +0.29 ± 0.05 ‰) is similar to the solid phase isotope composition ($\delta^{56}Fe_{solid}$ = +0.21 ± 0.15 ‰; Fig. 1), and distinct from light values that typify reductive Fe dissolution. Deeper dissolved Fe isotope compositions are consistent with Fe-sulfide reactions. Hydrothermal sediments are routinely overlooked as a significant source of metals to seawater, but *Hook Ridge* sediments indicate vigorous diagenetic mobilisation and enrichment of Fe and Mn with potential to impact Fe-limited primary production in the Southern Ocean.

[1] Aquilina *et al* (2013), PLoS One, 8(1) e54686

Distribution, correlation and health risk assessment of heavy metal contamination in surface soils around an industrial area, Hyderabad, India

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Due to rapid industrialisation and urbanisation there has been much concern over the soil contamination with heavy metals. One such example is soils of Kazipalli (Hyderabad), India which has become a serious environmental problem. This region hosts several industrial activities which are the main source for hazardous waste which include pharmaceuticals, drugs, metal, packing, machinery and chemicals. Soil samples from fifty seven (57) sampling sites were collected from this industrial zone and were analyzed for heavy metals (HM) like As, Cr, Cu, Ni, Pb and Zn. Concentrations ranged from 4.4-796.3 mg/kg for As, 9.7-598.6 mg/kg for Cr, 7.9-183.5 mg/kg for Cu, 10.2-129.6 mg/kg for Ni, 25.3-1830 mg/kg for Pb and 23.8-879 mg/kg for Zn.

Application of factor and cluster analysis indicates that heavy metal contamination in soils originates from industrial activities which are of anthropogenic origin. Pearson's correlation analysis showed that there exists close correlations among As-Pb, Cr-Ni, Cu-Zn. Contamination of soils in the study area were further classified for geoaccumulation index (I_{geo}),enrichment factor (EF), contamination factor(CF) and contamination degree (C_{deg}). The values of pollution index (PI) and integrated pollution index (IPI) indicated that metal pollution levels were in order of As>Pb>Cu>Cr>Zn>Ni. Potential ecological risk indices (PERI, RI) showed the area suffered with high As contamination, followed by Cr, Cu, Pb, Ni, and Zn. The health risk assessment based on average daily doses (ADD) of individual elements were calculated using exposure parameters and reference doses from integrated databases of USEPA. Further, the average levels of chronic and carcinogenic risk based on hazard quotient (HQ) and hazard index (HI) are presented in the form of stock plots and tables. These results are important for the development of proper management strategies to decrease point and non-point source of pollution by different remediation methods.

DOI:10.1180/minmag.2013.077.5.1