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Dissolved organic compounds in hydrothermal fluids from the Mid-Atlantic Ridge: implications for the behaviour of metals at vent sites

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The special priority program SPP 1144 funded by the German Science Foundation, DFG, aims to quantify hydrothermal processes occurring at two distinct regions along the northern and southern Mid-Atlantic Ridge. The areas targeted by this program are the Logatchev hydrothermal field lying at 14˚45‘N and newly discovered hydrothermal vent fields along 4-11˚S. One of our aims of the geochemical investigations is to determine the role of organic compounds in controlling heavy metal behavior in the fluids.

Organic compounds are thought to play an important role in many processes occurring at hydrothermal vent sites. It is known that organic compounds form strong complexes with most metals in aquatic environments that are more stable than most inorganic metal complexes. Organic complexation is one of the main factors that influence the distribution, mobility and bioavailability of metals in natural systems. For instance, hydrothermal vents are characterized by extremely high metal concentrations and the complexation of metals by organic ligands might be a detoxification mechanism, thus decreasing the bioavailability of the metals to the vent biota. Formation of stable metallo-organic complexes might also influence mineral precipitation by increasing the solubility of the metals.

To date, only a limited number of studies have focused on the organic chemistry of the

vent fluids and thus, there is a need to determine the type and abundance of organic ligands in hydrothermal fluids in order to assess the significance of metal-organic interactions in hydrothermal environments. Fluid samples with variable amounts of hydrothermal fluid component were collected during the M64/1 and M64/2 cruises of RV Meteor. In this presentation we focus on the analysis of dissolved amino acids. Amino acids are known to be present in significant concentrations in hydrothermally influenced seawater and contain functional groups which are capable of chelating metal ions. Furthermore, the measured concentrations of amino acids will be used as input parameters in order to simulate hydrothermal fluid – seawater mixing in the presence of amino acids using the geochemical modeling software, Geochemists Workbench (GWB). This will allow the assessment of the influence that amino acids and potentially other organic compounds have on metal speciation and mineral precipitation processes in the fluid-seawater mixing zone.