Geophysical Research Abstracts, Vol. 7, 06914, 2005
SRef-ID: 1607-7962/gra/EGU05-A-06914
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1 The Ca isotope composition of hydrothermal fluids

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Hydrothermal activity at mid-ocean ridges are known to affect significantly the oceanic budget of alkaline earth elements like Ca, Sr and Mg. Known isotope values of divalent cation sources and sink help to better quantify their oceanic budget. In order to approach this problem we determined Ca isotope ratios ($\delta^{44/40}$Ca) in hydrothermal fluids sampled from the Logatchev hydrothermal field (15˚N/45˚W). The samples are supposed to be mixtures of at least two fluid endmembers, seawater and pure hydrothermal fluid.

Our results show that ^{44}Ca$/^{40}$Ca ratios of the samples are inversely correlated to the relative proportion of hydrothermal component calculated by Mg concentrations [Koschinsky, pers. comm.]. The sample with lowest contribution of hydrothermal fluid displays the same isotopic signature as seawater whereas the sample with the largest contribution of hydrothermal fluid (20 %) shows a $\delta^{44/40}$Ca value of –0.55 $\pm$ 0.05 per mill ($2\sigma_m$) relative to seawater.

Radiogenic Sr (^{87}Sr/^{86}Sr) isotope ratios in the samples are consistent with mixing of seawater and a hydrothermal fluid component. In contrast, Mg isotope ratios (δ^{26}Mg) of all samples resemble seawater. Our first results from Ca variations confirm existing models that the interaction between oceanic crust and seawater during hydrothermal alteration induces substantial changes of the isotopic composition and hence of the marine Ca budget. Further efforts will focus on the identification of the Ca isotope value of the hydrothermal endmember.