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The history of water-rock interaction at Logatchev hydrothermal field as stored in the secondary mineral paragenesis

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Our new data on mineral compositions, clay and bulk rock chemistry of altered rocks and sediments together with isotopic data for clay minerals show complex and multi-stage alteration processes (e.g., seawater-rock interaction, fluid mixing) in the ultramafic hosted Logatchev hydrothermal field (MAR, 15˚N). Our preliminary interpretation is that an early low-temperature serpentinization (e.g., lizardite) is overprinted locally by chlorite and/or talc alteration followed by quartz precipitation. Three active sites at Logatchev reveal an alteration type of strongly lizardite-altered rocks. At the Logatchev-I hydrothermal field, a site of active venting, lizardite is also abundant but locally smectite, chlorite-smectite mixed layer (e.g., corrensite) and chlorite are part of a “chloritic” alteration assemblage. In addition, talc is locally abundant. There is a strong relationship of the chlorite and talc assemblage to high temperature fluids below the surface. Geochemical modelling suggests that the rocks have been altered at temperatures of about 200 - 300˚C. Significant changes in trace element concentrations in the bulk rock and clay separate chemistry represent the diversity of alteration processes. The elements Cr, Cu, Zn, Sr, Ba, Pb and U appear to have a general enrichment in the lizardite and chlorite concentrates in comparison to a depleted mantle. However, Cu and Zn are most probably related to sulfides which are finely dispersed in the clay concentrates. Cr, Sr, Ba, Pb and U are obviously mobile, probably as a result of serpentinization and/or seafloor weathering. In addition, the clay concentrates are characterized by the development of U-shaped REE pattern with pronounced pos-

itive and negative Eu-anomalies. We suggest that these differences are most probably related to high fluid/rock ratios under different redox conditions. $^{87}Sr/^{86}Sr$ ratios of clay fraction lizardite concentrates suggest the formation of clay minerals under nearly seawater conditions, whereas Sr-isotopes of chlorite samples from sediments beneath a hydrothermal crust suggest a precipitation from a fluid with lower seawater content. Detailed geochemical and isotopic studies of talc samples will provide further constrains on the complex interplay between hydrothermal fluids and seawater during the progressive alteration of predominantly ultramafic rocks.