U-Th-Ra disequilibria in basalts from the Mid-Atlantic Ridge 6-11°S: Constraints on melting, mixing and time-scales of magmatic processes

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The melting processes and melt evolution as well as eruption dynamics at mid-oceanic ridges are poorly understood. Short-lived U series nuclides add unique dynamic and temporal insights that help to understand these processes in more detail. We propose to study the U, Th, Pa, and Ra isotopic compositions of zero-age MORB samples from the slow-spreading Mid-Atlantic Ridge between 6 and 11°S. This part of the spreading axis shows large variations in axial depth, crustal thickness and samples melts with significant variations in major and trace element geochemistry as well as Sr, Nd, and Pb isotopic composition. The existing data indicates a complex interplay of variations in mantle sources, binary mixing and degree of magma differentiation during melt ascent. In this project we suggest to determine U, Th, Pa and Ra isotope compositions of fresh young samples of selected lava formations and from young (<200,000 yrs) near-axis seamounts to evaluate the depth and extent of melting, the mantle composition, porosity and upwelling rate and the mixing processes along a propagating ridge segment as well as the timing of magma evolution and eruption processes on this spreading axis. The U series isotope data will provide important insights into the time scales of volcanic events which form the basis for hydrothermal and biologic activity of mid-oceanic ridges. Consequently, the project has strong links to other geoscientific as well as to biologic-microbiologic working groups.