Lava Emplacement And Crustal Architecture Within An Ultraslow-Spreading Rift Valley

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In order to assess the importance of off-axis volcanism on crustal accretion, it is critical to constrain the temporal and spatial distribution of lava emplacement at mid-ocean ridge environments. The U-series decay scheme with its short-lived nuclides is ideal for investigating mid-ocean ridge petrogenetic processes occurring within the time-interval of 10^3–10^6 years. U-series age constraints combined with geologic observations have enabled important insight into the crustal architecture at 9º-10º N on the EPR [1-3], as well as other portions of the EPR and MAR. However, to date no U-series measurements have been published for ultraslow-spreading environments, thereby leaving a void in our understanding of accretionary mechanisms for these end-member spreading systems.

We report ($^{230}Th/^{238}U$) and ($^{226}Ra/^{230}Th$) activity ratios in mid-ocean ridge basalt glasses from the ultraslow-spreading 9º-25º E section of the Southwest Indian Ridge. Ten of twelve samples have ($^{230}Th/^{238}U$) $\neq$ 1, constraining their eruption ages to be < 375 ka. Ra-Th disequilibrium measured in three of these samples further constrain eruption ages to be < 8 ka. Therefore, six of ten basalts are significantly younger than the predicted spreading rate age of the ocean crust they sit on. These constraints suggest off-axis volcanism at ultraslow-spreading ridges plays a significant role in crusal accretion. In addition, these sample's young ages and locations provide evidence of fault controlled lava emplacement, adding support for the idea that heat flow and hydrothermal distribution are related to faulting and tectonic complexity.

References

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