

The Structure of Mantle Plume Conduits: Insights from Geochemical and Isotopic Studies of Hawaiian Volcanoes

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The recent accomplishments of the Hawaii Scientific Drilling Project, together with the results of a diving mission along the southwest rift zone of a Mauna Loa with the Jason ROV, allow for detailed comparisons between Mauna Kea and Mauna Loa volcanism on Hawaii during their respective shield-building stages.

Advances in analytical techniques (MC-ICP-MS and TIMS triple spike) now result in significantly better precision of isotopic analyses, especially for Pb isotopes. New results on carefully selected samples of basalt from Hawaii, the most active mantle plume on Earth and one of the best studied, show the presence of chemical heterogeneities, at variable scales, in the plume source and have implications for the structure of the mantle plume. There are also significant geochemical and isotopic differences between basalts from the Loa and Kea volcano trends, going back in time for almost three million years.

In this talk, I will present new results from the Hawaii Scientific Drilling Project (Phase 2B, 3000-3280 m depth) in Mauna Kea and from the Mile High Section (1600 m) on the southwest rift zone of Mauna Loa. I will discuss the source of the heterogeneities, their origin, the reasons for the existence of the two major geochemical trends in Hawaii (Loa and Kea), and integrate this in a model for the evolving structure of the plume beneath Hawaii. The talk will also be accompanied by pictures of the 2002 diving mission.