Petrology/Geochemistry of the Galapagos Hotspot and Hotspot-Ridge Interaction

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The petrological/geochemical data from the Galapagos Islands/Seamounts, the adjacent Cocos-Nazca Spreading Center and the Galapagos Hotspot tracks on the Cocos and Nazca Plates (Cocos, Carnegie, Malpelo and Coiba Ridges and associated seamounts) will be reviewed. The talk will focus on long-term compositional variations in the plume and how the plume interacts with the adjacent Cocos-Nazca Spreading center. Since it has been demonstrated that the Galapagos hotspot contains distinct compositional components that dominate in distinct geographical regions of the Galapagos Archipelago and Plateau, the Galapagos plume-ridge system provides a unique place to investigate the interaction between a mantle plume and a nearby spreading center. In particular, the talk will discuss whether the plume material travels to the ridge as a melt or a solid, what path the material takes as it flows to the ridge and the effects of water on melting beneath the ridge. Another goal of the talk will be to elucidate the origin of the different components present in the sampled Galapagos and spreading center volcanic rocks: specifically whether these components are derived from the Galapagos plume, the upper mantle or the oceanic crust. Increasing evidence suggests the presence of multiple depleted components derived from the plume and the surrounding upper mantle. At the end of the talk, several suggestions will be made as to what open questions still need to be addressed and how.

Future studies include: 1) generation of a comprehensive, high-quality geochemical dataset for whole rocks from the Galapagos Islands, seamounts and plateau, to evaluate the spatial distribution of different Galapagos components and the petrogenesis of Galapagos magmas, 2) more extensive and comprehensive studies of melt inclusions, particularly in olivine to determine range in primitive melt and primary volatile compositions, and 3) integrated studies of major and trace elements in olivine phenocrysts and whole rocks to determine the role of different source lithologies, such as pyroxenite, peridotite and gabbro.