2017 Geodynamics Seminar

Low Degree Melts and Their Significance for MORB, FOZO and OIB

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Carriage House, Quissett Campus, WHOI

Abstract

The global data set on ocean ridge basalts is now sufficient to define the global systematics for major elements, trace elements and isotopes. Major elements are largely explained by differences in mantle temperature on the scales of ocean basins and large scale convective patterns in the mantle. Hot spots are hot. Cold spots are cold. Ultra-slow spreading ridges have the additional effect of a thick lithospheric lid. Highly incompatible trace elements and isotopes are not accounted for by the same model. They require movement and fertilization by very low degree melts that migrate through the upper mantle. The signature of these melts can be seen in hot spots, and even along the most depleted portions of the ocean ridge system. They are also apparent in the systematics of abyssal peridotites. FOZO, the common component seen in both ocean islands and ridges, is formed from low degree melt migration. Recycled ocean crust has a mineralogical reservoir has little importance for the enriched component at either ridges or islands. Simple mass balance at subduction zones also shows the unsuitability of recycled ocean crust. An isotopic signature of recycled crust can be inherited by low degree melts of recycled crust, that carry the memory, but not the mineralogy, of the recycled reservoir.

BIO

I started to work on rocks from FAMOUS area by accident as a graduate student-- the first well located samples from an ocean ridge. After arriving at Lamont as a post-doc I was fortunate to get a faculty position. In addition to a long interest in ocean ridges, approximately half of my research has focused on convergent margins and fundamental geochemistry, and more recently on the relationships between volcanism and climate, and the possible role of human beings in planetary evolution.