Geophysical Research Abstracts, Vol. 8, 05833, 2006
SRef-ID: 1607-7962/gra/EGU06-A-05833


# The Trace Element Composition of Mantle Endmembers and the Role of Recycling of Upper and Lower Continental Crust

**M. Willbold** and A. Stracke
Max-Planck-Institut für Chemie, Postfach 3060, D-55020 Mainz, Germany
(willbold@mpch-mainz.mpg.de; stracke@mpch-mainz.mpg.de)

The chemical and isotopic composition of ocean island basalts is often thought to originate from recycling of oceanic crust together with different types of marine sediments. Here, we present new high-precision trace element data on samples from St. Helena, Gough, and Tristan da Cunha, in addition to recent data from the literature. The data show that the trace element and isotope systematics in enriched mantle (EM) basalts are more complex than previously thought. HIMU basalts (high $\mu = ^{238}$U/$^{204}$Pb) show remarkably uniform trace element ratios, with a characteristic depletion in incompatible trace elements (Rb, Ba, Th, U, Pb) and enrichment in Nb and Ta relative to EM basalts. Similar Nb/U, La/Sm, La/Th, Sr/Nd, Ba/K, and Rb/K ratios in both, EM and HIMU basalts suggest that their sources share a common precursor, most likely recycled oceanic lithosphere. At the same time, EM basalts have some common characteristics (e.g. high Rb/La, Ba/La, Th/U, Rb/Sr, low Nb/La, U/Pb) that distinguish them from HIMU basalts. These compositional differences between HIMU and EM basalts can only be explained if the EM sources contain an additional heterogeneous component. The isotopically distinct EM-1 and EM-2 basalts, however, cannot be clearly distinguished based on incompatible trace element ratios. Ultimately, each suite of EM basalts carries its own specific trace element signature that must reflect different source compositions. The parent-daughter ratios in subducted marine sediments have a unimodal distribution. Recycling of sediments alone can therefore not account for the isotopic bimodality of EM basalts. The upper and lower continental crust have similarly variable trace elements ratios, but are systematically distinct in their Rb/Sr, U/Pb, Th/Pb, and Th/U ratios. Thus, the upper and lower continental

crust evolve along two distinct isotopic evolution paths, but retain their complex trace element characteristics, similar to what is observed in EM basalts. We therefore propose that recycling of oceanic lithosphere together with variable proportions of lower and upper continental crust provides a plausible explanation for the trace element and isotope systematics in ocean island basalts. As a possible mechanism for recycling lower and upper continental crust we favor subduction erosion and/or subduction of marine sediments, respectively.