Geophysical Research Abstracts, Vol. 7, 08363, 2005
SRef-ID: 1607-7962/gra/EGU05-A-08363

Tracing recycled material in the mantle using Li isotopes

T. Elliott and A. Jeffcoate

Department of Earth Sciences, University of Bristol, UK (tim.elliott@bris.ac.uk)

Altered oceanic crust is Li rich and has a heavy Li isotope ratio. Subduction of this material should cause Li isotopic variations within the mantle. Improvements in the precision and speed of Li isotope measurement by MC-ICP-MS has enabled us to exploit this exciting tracer of recycling. We have analysed a wide range of mantle derived materials including mid-ocean ridge basalts (MORB), a range of isotopic endmember ocean island basalts (OIB) and mantle peridotites. δ^7Li (relative to the L-SVEC standard) ranges from values $\sim$3‰ to $\sim$8‰, compared to an analytical reproducibility of 0.3‰. This dramatic variability clearly highlights the presence of recycled material within the mantle. Normal MORB and olivines from un-metasomatised peridotites have the lightest isotopic ratios. Thus the trend to higher Li isotope ratios in enriched MORB and some OIB seems to reflect the contribution of recycled material. This makes sense in terms of the elevated δ^7Li of subduction zone inputs to the mantle. However, analyses of Alpine eclogites, believed to be subduction zone processed oceanic crust, are isotopically light. Thus the heavy Li isotope signature observed in some mantle derived melts is not recycled crust. The heavy Li lost from the subducting slab is transferred to the mantle wedge, which is in turn is down-dragged until it becomes sufficiently hot to decouple from the descending plate. This process effectively mixes the subduction enriched material through the mantle, into the sources of MORB and OIB. Interestingly, there is no Li isotopic evidence to suggest that deep recycled oceanic crust itself is a major component any OIB analysed.