Geophysical Research Abstracts, Vol. 7, 07201, 2005
SRef-ID: 1607-7962/gra/EGU05-A-07201

Adakites without slab melting, Mindanao, the Philippines

C.G. Macpherson (1), S. Dreher (1), M.F. Thirlwall (2)

(1) Department of Earth Sciences, University of Durham, Durham, DH1 3LE, UK (colin.macpherson@durham.ac.uk)

(2) Department of Geology, Royal Holloway University of London, Egham, TW20 OEX UK

Melting of subducted basalt is widely regarded as rare but not impossible. Magma generated in this way will display distinctive geochemical fingerprints of a garnet-bearing residue, including elevated Al_2O_3, Sr/Y and La/Y, and low Y. Such rocks occur in several subduction zones where the subducted slab is young, and therefore hot. This observation has been used as evidence that slab melting occurs, and the term adakite was coined for the magmas produced. Subsequent recognition of adakite generation above older, cooler slabs has required alternative models for heating subducted basalt e.g. melting the leading edge of newly subducted slabs, heating exposed slab interiors along subducted fracture zones, or heating due to slab-flattening. An alternative explanation for adakites in a wide range of subduction zones is that they are not all produced by slab melting. Other mechanisms have been proposed where arc crust is thick enough to project into the garnet stability field, but cannot be supported where the arc crust is less than 30km thick. Therefore, the presence of adakites in arcs with thin crust continues to be interpreted as evidence that adakites originate from subducted oceanic crust.

To test the slab melting hypothesis, we analysed a suite of adakites from Surigao del Norte, Mindanao, the Philippines. The Sr and Nd isotopic composition of these rocks is not consistent with derivation from the subducted slab. Instead, their isotopic resemblance to earlier “arc” lavas and the spatial distribution of major and trace element variations suggest remelting of basaltic material stored in the overriding plate. The garnet-bearing signature in the adakitic rocks indicate that this basalt resides in the mantle beneath the arc crust.