Mixing and fluid-related processes in the slab-mantle interface during incipient subduction: records from the Dalrymple Amphibolite, Philippines

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The slab-mantle interface separates the downgoing slab from the mantle wedge in arcs. This shear zone is the locus of complex mechanical and fluid-related processes which control the chemistry of fluids and/or melts passing through. During incipient subduction, the slab-mantle interface is sometimes preserved at the base of the ophiolite as a high grade metamorphic sequence. In this study, we present the petrographic and geochemical signatures of the Dalrymple Amphibolite, a mélange sequence which occur at the base of the Palawan Ophiolite, Philippines. The block-and-matrix sequence is composed predominantly of metamafic blocks which record prograde metamorphism (~625 °C, 11.5 kbar to ~700 °C, 13 kbar) surrounded by a hybridized matrix with comparable peak metamorphic conditions (~700 °C and 13 kbar). The surrounding matrix share characteristics of both metamafic and metasedimentary blocks and is composed of kyanite+ilmenite±Ca-amphibole±biotite±garnet±epidote.

The edge of some amphibolite blocks adjacent to the matrix are characterized by enrichment in light rare earth elements (REEs), Th, U, Nb and Ta relative to their mid oceanic ridge (MOR) basalt protolith. Such enriched signatures follow an apparent mixing line connecting metamafic and metasedimentary blocks in the ternary Ni-Th-Rb diagram. The same trend is followed by surrounding matrix. This indicate that the edges of the blocks may have experienced substantial mixing with the surrounding matrix material during matrix-forming deformation events and before recrystallizing at peak *P-T* conditions. The Grt amphibolite block B214-21furthermore, is cut by a Qz-Ky vein and contain local Al-rich zones composed of Ky and Ep. These Al-rich zones occur in the interstices of Hbl and Grt and were possibly once dilatant sites filled with fluids equilibrated with the matrix. Rutile grains included in the prograde mantle and rim of Grt porphyroblasts of this sample record an abrupt increase in Nb content (= 161-6664 ppm) compared to those in the Grt core (= 175-266 ppm). This possibly indicate the pre-peak *P-T* mixing processes during matrix formation.

The geochemical characteristics of the matrix largely mirrors the REE and extended trace element patterns of some metasedimentary blocks. This is marked by enrichment in light REEs and large ion lithophile elements such as Th and Pb in the MORB-normalized spidergrams. Notable differences between the metasedimentary blocks and matrix were however also observed. At a given FeO/MgO ratio, the matrix has lower Cl, Si and Sr content and higher concentrations of Th, Ni, Zr, Al and light REEs with respect to the matrix. The potential role of mechanical mixing between end member components, i.e. mafic basalt, sediments and ultramafics, and fluid infiltration in controlling the chemistry of the matrix will be investigated.

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