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The nature and composition of a slab derived component involved in the formation of the Kohistan Island arc

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The nature and composition of the agent recycling lithophile elements from the subducted slab back into the mantle wedge are largely unknown. The discussion mainly circles around the dichotomy of dehydration vs. melting of the slab. As an additional type of transfer agent, supercritical liquid have been recently proposed. Knowing the nature and composition of the slab component allows to draw conclusion on the thermal state of the subducting slab and thus provides important geodynamic constrains. Studies which describe the chemical composition of an inferred slab-derived component are still scarce and mainly focus on volcanic rocks. This approach however, bears the pitfall of incorporating intracrustal contamination into the calculated component. Assimilation and intracrustal fractionation is especially important for highly lithophile elements. Here we present a mineral trace element and whole rock isotopic (Pb, Sr, Nd) study from lower crustal and mantle rocks of the Kohistan paleo-Island arc. The Kohistan is an accreted and uplifted Mesozoic-Tertiary Island arc exposed in NW Pakistan. The excellent exposure of a crust-mantle transition in the Chilas and Jijal complexes allow us to approximate the slab derived component at MOHO depth. Thereby we omit possible intra crustal assimilation and differentiation processes. We focused mainly on the Chilas section where large dunitic bodies have been interpreted as km-scale melt channels. We use trace element data deduced by La-ICPMS from high Mg# clinopyroxene, present in the melt channels. The calculated melt composition, in Mg#-equilibrium with the mantle assemblage, display typical island arc trace element pattern (e.g. LREE, LILE enrichment). We combined the results with a mantle non-modal batch melting model following the approach of (Grove et al., 2002), to characterize the chemical composition of the subducted slab contribution. The cal-

culated component is strongly enriched in LREE and incompatible elements and depleted in HREE. It account for more than 99 % of the highly incompatible elements and between 30-80 % of the MREE. The trace element concentration is comparable to the previously published composition of slab derived components for the Mt. Shasta and the Mariana Through magmas. The absolute trace element concentrations are most similar to a low percentage melt or supercritical liquid (2%-5%) derived from an eclogitic basaltic part of the slab. The variation in Pb, Sr and Nd isotopes measured on whole rock samples from the Jijal and Chilas mantle-crust transition zone, is also best explained by a mixture between an enriched component, and a depleted mantle. The enriched component could be modeled as a combination of oceanic sediments and MORB. The correlated variation of Pb and Nd isotopes supports a melt/or supercritical liquid as a transfer agent.

Grove, T.L., Parman, S.W., Bowrig, S.A., Price, R.C., and Baker, M.B., 2002, The role of an H (sub 2) O-rich fluid component in the generation of primitive basaltic andesites and andesites from the Mt. Shasta region, N California: Contributions to Mineralogy and Petrology, v. 142, p. 375-396.