



Sr, Nd and Pb isotopic systematic of the Jijal-Patan basal section of the Kohistan island arc complex (Indus Valley, N Pakistan)

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The Kohistan Arc complex (KAC), in northern Pakistan, represents the exhumed section of an island arc formed within the Neo-Tethys Ocean during the Mesozoic. This complex has been obducted during the Late Cretaceous-Palaeocene onto the Indian plate along the Indus Suture. Lower to mid-crustal level rocks of the Jijal and Patan-Dasu metaplutonic complexes represent the plutonic roots of the KAC accreted during the ~110-90 Ma island arc formation. The Jijal sequence, the deepest exhumed part of the KAC, is subdivided into a basal ultramafic section (dunites, wehrlites and pyroxenites) and an upper gabbroic zone of granulite facies rocks (mainly garnet gabbros with hornblendites lenses and rare hornblende-gabbronorites with “melt-like” REE patterns). Ultramafic rocks are commonly regarded as high-pressure cumulates from mantle-derived melts, later extracted to form the overlying gabbroic plutonic crust, although field relationships and REE results (Burg et al., 1998; Garrido et al., submitted) argue towards a non-cumulative (i.e. mantle) origin for these rocks. Sr-Nd-Pb analyses performed on whole rocks, plagioclase and clinopyroxene from representative samples across the Jijal sequence provide new insights into the origin of ultramafics and unravel the spatial/temporal evolution of the basal rocks of an island arc during its building.

The Jijal ultramafic section (whole-rocks and CPX) displays rather scattered Pb, Sr and Nd isotopic ratios (calculated at $t_0=95$ Ma), which contrast with the limited iso-

topic variation of garnet gabbros and gabbronorites from the gabbroic section (including plagioclase concentrates). The narrow domain obtained for the gabbroic section samples suggests a homogenous source for these rocks and/or an emplacement during a short timescale. The present isotopic results combined with field observations and REE data suggest that the Jijal ultramafics constitute the mantle/crust transition zone into the island arc. Formation of such rocks is explained by a melt-rock reaction between a depleted mantle and arc basalts with a composition similar to the melt-like gabbros located atop the Jijal complex. A harzburgite lens sampled on top of the granulites yields Pb isotopic values significantly distinct from the Jijal ultramafic and gabbroic section. This sample is tentatively interpreted as a remnant of the Thetyan mantle prior to arc accretion and can be regarded as the depleted mantle pole. High initial $^{87}\text{Sr}/^{86}\text{Sr}$ values observed in the ultramafic section, along with the negative correlation with the Nd data, reflect a contribution of a radiogenic component either during the subduction event or during obduction of the KAC onto the Indian plate.

Burg et al. (1998) "Infra-arc mantle-crust transition and intra-arc mantle diapirs in the Kohistan Complex (Pakistani Himalaya): petro-structural evidence. *Terra Nova*, v.10, p. 74-80

Garrido et al. "Origin of the island arc petrological Moho via melt-rock reaction: evidence from the Jijal complex (Kohistan complex, N. Pakistan), submitted to *Geology*.