



Nature and structure of the Sistan « mélange » ophiolitic belt (Eastern Iran): Insights on deep accretionary wedge and subduction channel processes

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Convergence between the Lut and Afghan blocks and subsequent closure of a N-S arm of the Neotethys ocean during Late Cretaceous-Early Tertiary times led to the formation of the Sistan Ophiolitic Belt (SOB). The ophiolitic domain is composed of several branches and basins stretching N-S across 100 x 500 km along the Iran-Afghanistan border. One of these ophiolitic branches (Ratuk complex) exposes disrupted HP ophiolitic blocks from a paleo-subduction complex generally interpreted as a tectonic “mélange”.

In order to understand the overall structure and evaluate the degree of mixing within this mélange, we collected an extensive set of samples of serpentined peridotites, mafic rocks and metasediments in Sulabest and Gazik areas (Ratuk complex). We also performed the first detailed geological and structural map of the Sulabest area. Mapping revealed that several slices 50-100 meters thick, with different lithological affinities, can be recognized in the field. Tectonic mixing appears limited to the contacts between the different slices. P-T estimates on these rocks show that (i) these slices were all buried along a same HP-LT gradient (ii) significant differences in peak and retrograde portions of the P-T path exist between each slice. Trace-element geochemical signature of mafic rocks indicate a wide range of compositions from N-MORB to enriched MORB and even includes OIB material, whereas serpentined ultramafics appear to be primarily of oceanic-floor origin. The lack of arc signatures suggests the mélange rocks were entirely derived from the subducting slab.

This well-preserved fossilized segment of the SOB did not form by chaotic tectonic intermingling and therefore does not correspond to a tectonic mélange as described in the Franciscan complex (i.e. where small tectonic blocks are mixed in a mechanically weak matrix showing a clearly distinct P-T history). This portion of the SOB rather formed by complex accretionary processes of tectonic slices with different P-T histories detached from the downgoing slab along the subduction channel.