

Forearc mantle wedge devolatilization during continental subduction and collision: a reappraisal of Tso Morari (Ladakh, India) serpentinite petrology

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The Tso Morari ultra-high pressure continental unit is composed of metasedimentary rocks and eclogite lenses which reached 3.9 GPa and 750 °C. This unit is bounded to the north by the Zildat fault, which contains lenses of serpentinite interpreted as retromorphosed relicts of the forearc mantle wedge. Here we revisit this famous area by presenting new evidences for several stages of forearc mantle wedge hydration and dehydration during continental subduction and collision, respectively.

Relicts of forearc mantle wedge hydration in a subduction like setting are rarely preserved in Tso Morari serpentinites. They mainly correspond to antigorite, sulfide and magnetite inclusions in both metamorphic olivine and humite/chondrodite minerals. The metamorphic climax is marked by the crystallization of granoblastic olivine/humite disseminated within serpentinite matrix and by olivine and humite/chondrodite bearing veins crosscutting massive serpentinites. Based on equilibria between olivine-humite/chondrodite-antigorite, we re-visit the P-T conditions of forearc mantle wedge devolatilization during Himalayan orogeny at 2.5-3 GPa and 500-700°C. These P-T conditions are closed to that of the continental unit, confirming that both units evolved in close association during subduction and collision. Interestingly, the dehydration of Tso Morari serpentinites is also associated with magnesite and dolomite crystallization. These observations suggest an open system high pressure dehydration of forearc serpentinites. Late stages of forearc exhumation during continental collision are marked by the crystallization of a second generation of antigorite associated with brucite and by the devolatilization of carbonate into talc at relatively low pressure (< 1.4 GPa) and temperature (< 450°C).

Mots-Clés : Tso Morari, Himalaya, Subduction, Collision, Forearc Serpentinite, Eclogite