



Deciphering Pressure-Temperature path of the Stak eclogites (Pakistan)

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The Stak massif is located in the NW Himalaya syntaxis (northern Pakistan) and corresponds to a newly recognized occurrence of continental eclogite formed during the subduction of the northern margin of the Indian continent. This high pressure (HP) to ultra-high pressure (UHP) unit was extensively retrogressed during the Himalayan collision. This retrogressed metamorphic event occurs under lower pressure and is associated with the replacement of eclogite-facies minerals by amphibolite-facies minerals.

We propose a continuous pressure-temperature (P-T) path assessed from a single thin-section, using a micro-cartographic approach with the program XMapTools (more details at <http://www.xmaptools.com>). This method uses electron microprobe X-ray compositional maps of a small thin-section area of $520 \mu\text{m} \times 670 \mu\text{m}$ showing three assemblages. The HP assemblage (1) made of garnet + omphacite + phengite. This first assemblage is destabilized into (2) symplectites of clinopyroxene + amphibole + plagioclase. The low-pressure assemblage (3) is made of amphibole + plagioclase +/- biotite and is associated to the late collisional event. The study of the chemical images is followed by the calculations of ~ 200.000 P-T estimates using for each assemblage appropriate thermometers and barometers from the literature.

This study shows that the Stak eclogite underwent prograde metamorphism, increasing from 650°C and 2.4 GPa to the pressure peak conditions of 750°C and 2.5 GPa . Then this unit is retrogressed to $700\text{--}650^\circ\text{C}$ and $1.6\text{--}0.9 \text{ GPa}$ under amphibolite-facies conditions. The estimated peak metamorphic P-T conditions and P-T path are similar to those of the Kaghan and Tso Morari HP/UHP massifs in NW Himalaya. We propose that these two HP/UHP massifs and the Stak massif define a large HP to UHP province covering more than $500 \text{ km} \times 150 \text{ km}$ partly covered by the Kohistan-Ladakh arc and metamorphic Tethyan series. This NW Himalayan province is comparable in size to the Dabie-Sulu province in China and the Western Gneiss province in Norway (Lanari et al., 2013).

Lanari, P., Riel, N., Guillot, S., Vidal, O., Schwartz, S., Pêcher, A., Hattori, K. (2013). Deciphering High-Pressure metamorphism in collisional context using microprobe-mapping methods: application to the Stak eclogitic massif (NW Himalaya). In Press, *Geology*, doi:10.1130/G33523.1.