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Fluid-induced petrophysical changes of blueschist-facies overprinted eclogites: consequences for exhumation processes along the subduction plate interface

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The bulk chemical data of the Tianshan eclogite-blueschist sequence points to a back-arc derived oceanic basalt. The sample describes a counter clockwise P-T path, at distinct higher temperatures and a retrograde contemporaneous cooling and decompression, which typically results from uplift and exhumation in the subduction channel. During retrograde metasomatic fluid infiltration and associated metamorphism Mg, transition metals, and LILE were gained in the replacing blueschist compared to the precursor eclogite, while HFSE and Al behaved immobile. Additionally Si, Ca and REE are mobilised and removed during this conversion process. These chemical changes together with the nearly total LREE lost in the sample indicate that the fluid prior to infiltration had been in equilibrium with a rock of peridotitic composition, most likely with the partially serpentinised mantle wedge. Fluid-induced element loss and slight volume increase result in a decreased density of the affected blueschist and eclogite. Compared to the assumed serpentinite matrix in the subduction channel the calculated density contrast between the HP-rocks of the Tianshan is high enough that the serpentinite is able to carry these HP-rocks to shallower depths. Serpentinite with incorporated low-density rocks in a matrix of unaltered and thus denser mantle peridotite is able to rise up, particularly by buoyancy-driven forces. Although the changed chemistry of the eclogites and blueschists points to infiltration of an external fluid that was in equilibrium with a peridotitic source (most likely the serpentinite in the subduction channel), occurrences of outcropping serpentinite in the Tianshan are very rare. Alternatively the meta-sedimentary units in the Tianshan are suitable to overtake the role of the serpentinite as carrier matrix in the subduction channel.