

Geochemical study of serpentinization along an ocean- continent transition zone: the Alpine Tethys as a case study (SE- Switzerland)

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The Platta, Tasna and Totalp nappes (SE-Switzerland) represent remnants of a former Ocean-Continent Transition (OCT) of the Alpine Tethys. These nappes are mainly composed of subcontinental peridotites that have been strongly serpentinized during their exhumation to the seafloor. Since these rocks have been preserved from Alpine metamorphism, they provide a unique opportunity for studying fluid-rock interactions and mass-transfer related to the serpentinization processes affecting the subcontinental lithospheric mantle in OCTs. Here, we present a comprehensive study including petrological, mineralogical (XRD and μ -XRF) and geochemical (major and trace element concentrations, Sr-Nd, B-Li isotopes) data on serpentinites with the aim of constraining the nature of serpentinizing fluids, the chemical transfers and the conditions (pH, temperature) at which serpentinization occurred.

Mineralogical observations show that primary silicate minerals (i.e., olivine and pyroxenes) are rarely preserved in serpentinites, and that several generations of serpentine are identified. Trace element concentrations of serpentinites display a strong enrichment in fluid mobile elements such as Li, B, Sb, Cs and U compared to initial peridotite. Radiogenic and stable isotope compositions suggest that serpentinization occurs under a wide range of temperatures (150-300°C) and at low fluid-rock ratios (< 20), similar to those observed in mid-ocean ridge serpentinites. Based on B and Li isotopic signatures, we demonstrate that serpentines recorded the evolution of the serpentinizing fluid composition over the serpentinization course in exhuming subcontinental mantle.