Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.5753

Preservation of oceanic oygen isotope signatures of ophicalcites through the Alpine overprint

PHILIPPE BOULVAIS[1], RÉMI COLTAT[2], YANNICK BRANQUET[3] AND GIANRETO MANATSCHAL[4]

[1]University of Rennes 1
[2]Géosciences Rennes
[3]University of Orléans
[4]University of Strasbourg

Presenting Author: philippe.boulvais@univ-rennes1.fr

The circulation of hydrothermal fluids leading to the carbonation of mantle rocks during Jurassic oceanic opening has been documented in Tethyan ophiolites throughout the Alpine realm. In the Platta nappe (Swiss Alps), hydrothermal carbonation occurred during mantle exhumation at the interface between serpentinites and basalts. The possiblility of isotopic resetting during the Alpine orogeny is a long-term debate (Bernoulli and Weissert, Int. J. of Earth Sci., 2020). These authors argue that during the Alpine orogeny fluid circulations led to the recrystallization of carbonates in post-rift sediments and ophicalcites, leading to a reequilibration of the oxygen isotope compositions. However, at the Falotta outcrop (Platta nappe), calcite displays cataclastic fabrics in the zones of active fluid circulation (i.e., in foliated ophicalcites), without evidence for recrystallization. Also, the $\delta^{18}O$ values from the neary Marmorera-Cotschen ophicalcites (12‰) are 4‰ lower than at Falotta ($\delta^{18}O$ = 16‰) in conflict with their proposed correlation between oxygen isotope composition and Alpine metamorphic grade. In the case of a total isotopic reset caused by burial during the Alpine orogeny, one would have expected that the oxygen isotope signatures of ophicalcites from both sites would have been homogenized, which is obviously not the case. Rather, we argue that the differences in oxygen isotope compositions of ophicalcites between the two sites reflect pre-Alpine thermal discrepancies controlled by Jurassic magmatic additions. In the nearby Tasna outcrop (Engadine window, Swiss Alps), we have measured $\delta^{18}O$ variations as high as 12‰ in ophicalcites along a Jurassic detachment, which precludes the idea of isotopic resetting during Alpine overprint. Actually, the $\delta^{18}O$ values of the ophicalcites increase towards the seafloor. This evolution reflects the increased proportion of seawater in the fluid from which carbonation occurred. Clearly, the oxygen isotope compositions of ophicalcites in the Alps reveal the conditions of fluid-rock interactions during Jurassic mantle exhumation.