Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.20455

The B isotopic signature of serpentine from Supra Subduction Zone ophiolites: mixing of fluids and tectonic implications.

CELINE MARTIN[1], KENNET E. FLORES[2], GEORGE HARLOW[1], SAMUEL ANGIBOUST[3], FLORENT HODEL[4] AND GEORGE L. GUICE[1]

[1]American Museum of Natural History
[2]The University of North Carolina at Chapel Hill
[3]Chair Earth Sciences Department, Ecole Normale Supérieure de Lyon, France
[4]Université de Franche-Comté

Presenting Author: cmartin@amnh.org

Obducted ophiolites expose oceanic lithosphere slivers in suture zones. The few previous studies focusing specifically on the serpentinization of the ultramafic part of ophiolites mostly concluded that serpentinization was driven by seawater. Recent developments in B isotope geochemistry have enabled the tracking of fluid source(s) in serpentinites, suggesting $\delta^{11}B$ values above +10 ‰ mostly reflect seawater hydration and $\delta^{11}B$ values below +10 ‰ mostly reflect hydration by subducted crust-derived metamorphic fluids. Here, we investigate the fluid source(s) recorded by ophiolitic serpentinites by presenting B isotopic geochemistry for well-characterized Supra Subduction Zone (SSZ) ophiolites in Guatemala, Iran, and Cuba, and Ocean-Continent Transition (OCT) samples from Brazil. Most of the samples display the pseudomorphic mesh matrix and bastite microtexture typical of serpentinites. Among the samples with a narrow $\delta^{11}B$ range (i.e., at isotopic equilibrium), those from a fossil OCT ophiolite have $\delta^{11}B$ ranging from +3.8 to +23.2 ‰, which is broadly consistent with serpentinization by seawater. In contrast, serpentinites from fossil SSZ ophiolite have $\delta^{11}B$ straddling 0 ‰, ranging from -7.7 to +13.5 ‰. These data indicate that seawater alone cannot be responsible for serpentinization of these ultramafic rocks, but rather either subducted crust-derived metamorphic fluids, or a mixture of seawater and subducted crust-derived metamorphic fluids. This interpretation supports the recent suggestions that SSZ ophiolites possibly represent fossil forearc lithosphere.