

Boron isotopes as tracers of the tectonic origin and geological history of serpentinites in subduction and suture zones.

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Serpentinites in subduction zones originate by hydration of peridotite by two different processes: (i) by a seawater source reacting with peridotite beneath the ocean crust and (ii) by reaction of peridotite at the base of the mantle-wedge with fluids released from the slab during subduction. In suture zones, both exhumed subduction channel mélange (mantle wedge) and ophiolite (oceanic crust), are found but recognizing their tectonic origin can be difficult. A recent study demonstrated that boron (B) isotopes could be used as a probe of the fluid from which serpentinites form. Serpentinites from an ophiolite complex have positive $\delta^{11}\text{B}$, as expected for peridotites hydrated by seawater-derived fluid, whereas serpentinite samples from the matrix of the mélange have negative $\delta^{11}\text{B}$, in agreement with hydration of mantle peridotites by fluids released at 30-70 km depth from metamorphic rocks.

Serpentinites from tectonically well-constrained locations were selected to verify this hypothesis. They include samples from ophiolites (Guatemala, Iran, Cuba), the subduction forearc (Nicaragua), and the mantle wedge (Guatemala, Iran, Japan). The trace-element contents and B isotopes were measured *in situ*, respectively by LA-ICP-MS and LA-MC-ICP-MS. The spider diagrams and REE patterns, as well as a B/La vs. As/La diagram do not show any reliable difference to distinguish the tectonic origin of the serpentinite. However, in a $\delta^{11}\text{B}$ vs. B content diagram, the serpentinites plot along different trends whether they form from seawater ($\delta^{11}\text{B} = 40\text{‰}$, [B] = 5ppm) or from subduction-related metamorphic fluids ($\delta^{11}\text{B}$ varies with temperature from +19 to -15‰, [B] is poorly constrained but likely varies with depth (i.e., T) from hundreds to a few ppm). Some samples might express signatures of both fluids. This study confirms that the tectonic origin of serpentinites encountered in suture areas can be defined by a $\delta^{11}\text{B}$ vs. B diagram.