Mixing and reaction of rocks facilitate fluid flow along the forearc slab-mantle interface

*Yasushi Mori*, Miki Shigeno, Tadao Nishiyama

1. Kitakyushu Museum of Natural History and Human History, 2. Kumamoto University


The Nishisonogi metamorphic rocks (a Late Cretaceous subduction complex exposed in Kyushu, Japan) contain serpentinite mélanges, which have been formed at 0.8 GPa and 460 °C. These pressure and temperature conditions are close to those of the forearc mantle corner. The mélanges have a matrix of chlorite-actinolite schist, talc schist and antigorite schist, together with tectonic blocks of meta-sedimentary, mafic and ultramafic rocks. They show various types and degrees of the mixing and reaction of rocks. The isocon analysis indicates that the reactions typically involve a decrease of solid volume and production of fluids. The loss of solid volume possibly reaches dozens percent relative to the initial volume. In addition, the reactions result in mobilization of silica without forming quartz veins. These findings suggest that the serpentinite mélanges are permeable and mechanically weak. The mélanges probably act as fluid flow channels. The fluid flow is favorable to transport silica toward the mantle corner and may induce deep slow earthquakes.

Keywords: serpentinite mélange, metasomatism, reaction-enhanced permeability, fluid flow, slow earthquakes