

Melt-Rock Reaction during back arc spreading forming the Mado Megamullion in the Shikoku Basin

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The Mado Megamullion has been reported and sampled by YK18-07, KH-18-02 and YK19-04S cruises. It is an oceanic core complex (OCC) in the Shikoku basin within the Philippine Sea Plate which provides a unique tectonic window to understand the processes operating in the lower crust/ upper mantle during the evolution of the backarc basin. Until now the Godzilla Megamullion (in the Parce Vela Basin) in the Southern part of the Philippine Sea Plate is the only studied example of backarc OCC formation.

We sampled peridotites from the KH-18-02 dredge and YK18-07 submersible ROV cruises. Our sample suite comprises plagioclase-bearing peridotites and dunites. The peridotites contain amorphous pseudomorphs after plagioclase as well as plagioclase-spinel intergrowths. Spinels show a wide range of compositional variability in terms of the major element chemistry. Zonation in spinels is also observed from both the sample localities. Exsolution lamellae of clinopyroxene occur in orthopyroxene, and Cr-rich oxides in clinopyroxenes also occur in these lherzolites. These exolutions warp along deformed/mylonitized fabrics of pyroxenes. The crystallization temperature from a 2-pyroxene geothermometer (Bertrand and Mercier, 1985) ranges between 860-1140°C. Late stage veins crosscutting the rock fabric incorporate plagioclase, pargasitic amphibole, chlorite, zircon and apatite.

The wide range of composition of the spinels, and the textural relationships between plagioclase and spinels indicate melt stagnation and melt-rock interaction beneath the detachment fault zone. The crystallization temperatures and the presence of exsolution textures indicates that these rocks crystallized in the mantle and were then exhumed to crustal depths. These processes were operative in the last stages of OCC formation where large volumes of mantle rocks are exhumed along a detachment fault. This is similar to the processes operating in the Godzilla Megamullion and might be a pervasive phenomenon throughout the Philippine Sea plate.

Bertrand, P., Mercier, J.C.C., 1985. The mutual solubility of coexisting ortho- and clinopyroxene: toward an absolute geothermometer for the natural system? *Earth and Planetary Science Letters* 76, 109–122.
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