

Ultrahigh-pressure mafic rocks in the Higashi-akaishi peridotite mass, central Shikoku, Japan

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The Higashi-akaishi peridotite body of southwest Japan is the only kilometre-scale garnet peridotite body yet found in a subduction-type metamorphic belt. Garnet-bearing ultramafic rocks including clinopyroxenite, wehrlite and websterite locally crop out in the Higashi-akaishi peridotite of the Besshi region in the Cretaceous Sanbagawa metamorphic belt. These rock types occur within dunite as lenses, boudins or layers with a thickness ranging from a few centimetres to 1 metre. The wide and systematic variation of bulk-rock composition and the overall layered structure imply that the ultramafic complex originated as a cumulate sequence. Garnet and other major silicates contain rare inclusions of edenitic amphibole, chlorite and magnetite, implying equilibrium at relatively low P-T conditions during prograde metamorphism. Orthopyroxene coexisting with garnet shows bell-shaped Al zoning with a continuous decrease of Al from the core towards the rim, consistent with rims recording peak metamorphic conditions. Estimated P-T conditions using core and rim compositions of orthopyroxene are 1.5-2.4 GPa/700-800 C and 2.9-3.8 GPa/700-810 C, respectively (Enami et al. 2004).

Recent experimental work (Jung & Karato 2001) suggests that under conditions of high water activity, a 'B-type' olivine preferred orientation may form, with the a-axis maximum perpendicular to the flow direction. The B-type olivine LPO patterns are regionally developed in the Higashi-akaishi body. This result confirms the suggestion from experimental work that B-type olivine LPO patterns can develop in the mantle wedge above subducting slabs in the presence of water (Mizukami et al. 2004).

These results suggest down dragging of hydrated mantle cumulate parallel to the slab-wedge interface in the subduction zone by mechanical coupling with the subducting slab and ensuing HP-UHP prograde metamorphism.