The Early-Cretaceous Sambagawa metamorphism and a cross-sectional view of the Late-Cretaceous Sambagawa subduction zone

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Recent petrological studies on the Sambagawa high-P/T metamorphic belt in Shikoku island, SW Japan, have recognized that the coarse-grained eclogite-bearing lithologies (so-called ‘tectonic blocks’ in earlier studies) in the Besshi area exclusively preserve evidence for the ‘early’ Sambagawa metamorphism, which can be related to onset of the Sambagawa subduction system during Early Cretaceous (c.116Ma). Geological mapping and associated multidisciplinary studies on the regional (spatially widespread) Sambagawa metamorphism (both the eclogite-facies and main metamorphic stages) have revealed the tectonic framework of the Late-Cretaceous Sambagawa subduction zone, which was located on the east Eurasian margin, as follows: (i) a spreading ridge was approaching to the margin and lay close to the trench; (ii) the subducting slab was coupled with the convective mantle at depths of >65 km; (iii) thickness of the hanging-wall continental crust was 30-35 km; and (iv) the forearc mantle wedge (30-65 km depth) was largely serpentinized. These features allow us to draw a semi-quantitative cross-section of the Sambagawa subduction zone at around 89-85Ma, implying that boundary conditions for thermo-mechanical modeling aiming to simulate exhumation of high-*P/T* metamorphic rocks are now well constrained. It has also become clear that ultramafic blocks having sizes of several-10s cm to several-km and dispersed in the higher-grade part of the Sambagawa belt were derived from the mantle wedge, i.e. the corresponding part of the belt has been re-evaluated as a ‘fossil subduction boundary zone’ of a relatively warm subduction zone. Field-based structural and petrological studies in the Sambagawa belt, therefore, have potential to provide invaluable information on material behavior at the slab-mantle wedge interface including domains of episodic tremor and slip (ETS) in present-day warm subduction zones.

Keywords: Sambagawa metamorphic belt, onset of subduction, ridge subduction, thickness of forearc continental crust, coupling of slab with convective mantle, serpentinized mantle wedge

