

The Jurassic magmatism of protoliths of Mikabu greenstones in SW Japan: zircon U-Pb dating and trace element analysis

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The Mikabu greenstones, incorporated with the Cretaceous high P/T-type Sanbagawa metamorphic belt in SW Japan, are accreted fragments of an oceanic plateau. We identified a Late Jurassic igneous age for the protoliths of the Mikabu greenstones in the eastern Kii Peninsula, by measuring U-Pb age and trace element composition (REE, Y, Sc, Nb, Ta, Hf, U, Th) of zircon grains with an Agilent 8800 single-collector triple quadrupole ICPMS coupled to a NWR-213 laser-ablation system. The U-Pb ages have a weighted average of 154.6 ± 1.6 Ma (the Kimmeridgian, Late Jurassic) with an overlap within 2-sigma error. The igneous age is slightly younger than the previously reported radiolarian ages (Middle Jurassic) of deep-sea pelagic chert associated with the Mikabu greenstones. The age difference between them suggests that mafic magmas intruded pelagic deep-sea sediments on the pre-existing oceanic lithosphere. Trace element composition further indicates that the dated zircon grains are more similar to those in oceanic crusts than in granitic continental crusts, and the host mafic magma of the zircon grains was derived from depleted mantle like the mid-oceanic ridge-type source, rather than fertile mantle sources like Hawaii and Iceland. As rocks from the Shatsky Rise in the modern NW Pacific Ocean have similar age and compositional characteristics, this study concluded that the protoliths of the Mikabu greenstones had formed a part of an oceanic plateau, which was generated by the Late Jurassic intra-oceanic plate mafic magmatism in the ancient Pacific Ocean.

Keywords: Mikabu greenstones, zircon, Jurassic, oceanic plateau, U-Pb age, trace element