Geochemical constraints on origin and formation of the Mikabu–Sorachi Plateau

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It is generally accepted that mantle plume upwelling had been active in the Pacific Ocean during the Cretaceous period based on the thorough studies of Cretaceous oceanic plateaus (e.g., Larson, 1991; Coffin and Eldholm, 1994). The presence of the Izanagi–Farallon–Pacific triple junction in the Paleo–Pacific Ocean has been proposed based on the geometry of paleomagnetic anomalies (Sager et al., 1988, 1999; Nakanishi et al., 1989, 1999). An Early Cretaceous mantle plume arrival beneath the triple junction constructed the Shatsky Rise with its high degrees of melting (Sano et al., 2012). This plume also possibly formed several oceanic plateaus on the Izanagi and Farallon plates, and parts of them have been considered to be preserved as accreted fragments in continental margins (Sager et al., 1988; Larson, 1991; Kimura et al., 1994; Ichiyama et al., 2014).

The Mikabu and Sorachi–Yezo Belts are Cretaceous terrains distributed in Japan and contain voluminous greenstones as ophiolitic members, which are metamorphosed picrite, basalt, and gabbro. The Mikabu and Sorachi picrites have extremely magnesian olivine phenocrysts (up to $Fo_{93.5}$), and the mantle potential temperatures of more than 1600℃ are estimated (Ichiyama et al., 2012, 2014). The greenstones have been considered to be fragments of an oceanic plateau in the Jurassic–Cretaceous Pacific Ocean (Mikabu–Sorachi Plateau; MSP), and some scientists believe that this plateau was formed with the Shatsky Rise on the Izanagi–Pacific ridge (Kimura et al., 1994; Ozawa et al., 1999; Sakakibara et al., 1999; Ichiyama et al., 2012, 2014; Sawada et al., 2019). However, the zircon U–Pb dating of the Mikabu mafic rocks and sandstones shows igneous ages of ca. 155 Ma (Sawada et al., 2019; Endo and Yokoyama, 2019) and an accretion age of ca. 130 Ma (Endo and Wallis, 2017), respectively, implying that the MSP emerged on an intraplate (i.e., Izanagi plate) rather than on a plate boundary (i.e., Izanagi–Pacific ridge) because estimated travel time of the Izanagi plate would take ~80 Myr from the ridge to the trench (Müller et al., 2016).

Miyazaki et al. (2015) proposed that an isotopic boundary between the Indian and Pacific mantle types is present beneath the Pacific Ocean and has been stationary, at least, from Cretaceous to present. Recently, Aoki et al. (2019, 2020) suggested that metagabbro and mafic gneiss in the eclogite unit of the Sanbagawa Belt were formed in an island arc setting within the Pacific Ocean in 200–180 Ma. If this is a case, it would be expected that the Mikabu–Sorachi (ca. 155 Ma) greenstones record mantle isotopic heterogeneity beneath the Paleo–Pacific Ocean.

In this presentation, we will provide new geochemical and isotopic data of the Mikabu and Sorachi greenstones (picrite, gabbro, and alkali basalt). These data will enable us to constrain the source material and tectonic setting of the MSP in the Jurassic Pacific Ocean.

Keywords: Mikabu Belt, Sorachi–Yezo Belt, Matle plume, Paleo–Pacific Ocean, Indian–Pacific mantle boundary

