Test of hotspot tracks in the West Pacific Seamount Province

*Yuya Jindo[1], Naoto Hirano[1], Shiki Machida[2], Taisei Morishita[3], Hirochika Sumino[4]

1. Tohoku University, 2. Chiba Institute of Technology, 3. Japan Coast Guird, 4. The university of Tokyo

The West Pacific Seamount Province (WPSP) on the oldest part of Pacific Plate is an area recognized as group of short-lived Cretaceous hotspot tracks erupted in the present South Pacific Isotopic and Thermal Anomaly (SOPITA). No post-Cretaceous volcanic edifice has been found in WPSP excluding Caroline hotspot track and petite-spot volcanos. Some Paleogene basalts were first reported at Chuo Seamount of Ogasawara Plateau, Uyeda Ridge, and submarine flank slope below the Minamitorishima Island, most of which overprint the Cretaceous volcanic edifices of WPSP. Such hiatus cannot be explained by simple theory of hotspot. The N-Wake seamount chain, northern part of WPSP, have ever recognized as a hotspot track based on only two samplings with Ar-Ar ages of the middle Cretacoeus both at eastern and western tips of the track. This study represents geochemistry and Ar-Ar ages of basaltic rocks newly obtained at two seamounts along the N-Wake seamount chain, the Uda Spur at western extension of the N-Wake, and the Paleogene basalts in WPSP. Our data redefine the N-Wake hotspot track and verify the Paleogene hotspot track in WPSP. The Ar-Ar dating and the sample irradiation were done at Isotope Science Center of the University of Tokyo and the International Research Center for Nuclear Materials Science of Tohoku University, respectively. The whole-rock isotopic composition was measured using multi collector ICP-MS and TIMS at the Chiba Institute of Technology.
The isotopic compositions in this study clearly discriminate the two end components of DMM and HIMU. The isotopic compositions of Uda Spur and N-Wake seamounts in this study are enriched in the HIMU component (high $^{208}Pb/^{204}Pb$ ratios at a given $^{206}Pb/^{204}Pb$ value), which is similar to those of previously reported N-Wake seamounts. On the other hand, the samples of Minamitorishima Island and Chuo Seamount erupted during the Paleogene show more depleted compositions (low $^{208}Pb/^{204}Pb$ ratios at a given $^{206}Pb/^{204}Pb$ value). The two trends in isotopic composition and ages mean that the Paleogene volcanoes are clearly discriminated from the majority of Cretaceous seamounts in WPSP. Based on the Absolute Plate Motion Model, the eruptive site of Uda Spur is estimated at a location similar to those of seamounts on the N-Wake seamount chain backcalculated around the present French Polynesia in SOPITA. Our isotopic data, age, and the backcalculation of eruptive region indicate the Uda Spur and N-Wake seamount chain are plausibly originated from a single hotspot. Paleogene basalts from Minamitorishima Island, Uyeda Ridge, and Chuo Seamount, on the other hand, are backcalculated around the present Mid-Pacific Mountains where zero-aged hotspots are not reported. However, seismic tomography suggests the presence of a low-velocity anomaly in the lower mantle at the edge of LLSVP and in the upper mantle as well, implying the source mantle of the Paleogene hotspot track.

Keywords: seamount, hotspot, plume, isotope, absolute plate motion

