アセノスフェア組成の探究：新青丸KS-18-9航海による「直プチ」調査
Exploring more asthenospheric melt: the preliminary report of KS-18-9 cruise, R/V Shinseimaru

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The petit-spot magmas originate from the asthenosphere, ascending along the flexed zone of the outer-rise prior to plate subduction (Hirano *et al.*, 2006, *Science* 313, 1426; Valentine & Hirano, 2010, *Geology* 38, 55; Yamamoto *et al.*, 2014, *Geology* 42, 967; Machida *et al.*, 2015, *EPSL* 426, 267). This forms a unique opportunity to examine the asthenosphere below the ocean in a region outside of the well-examined but spatially restricted areas of MORs and hotspots. Recent researches, however, indicates that most of petit-spot erupted on concavely flexed plate are highly reacted with the depleted lithosphere during the magma ascending to surface. Geochemical composition of entrained xenolith from depleted mantle is disturbed by wall-rock interaction (Pilet *et al.*, 2016, *Nature Geosci.* 9, 898). From the observation that silica-poor alkaline melt is shifted to silica-rich subalkaline melts as a result of metasomatic interaction with lithospheric peridotite, the wall-rock interaction with silica-poor and strongly alkaline melts produces melts such as the majority of those at petit-spot lavas in NW Pacific (Pilet *et al.*, 2008, *Science* 320, 916). Experimental studies conducted by Machida *et al.* (2017, *Nature Comm.* 8, 14302), moreover, reported that the NW Pacific petit-spot melts were last equilibrated with peridotite at 1.5–2 GPa corresponding to the mid-depth or lower part of NW Pacific lithosphere as well. The melt fractionation must occur at depths greater than the mid-lithosphere because the geobarometer of peridotitic xenoliths shows the deepest 43 km (Yamamoto *et al.*, 2014) in spite of the lack of olivine phenocrysts. The most of petit-spot magma fractionated in mid- or lower lithosphere with some metasomatic reactions with depleted mantle at lower lithosphere during the magma-ascending to surface.

We newly discovered the directly ascending petit-spot melt from asthenosphere (Sato *et al.*, 2018, *Int'l. Geol. Rev.* 60, 1231). The lavas, silica-poor and strongly alkaline with phenocrystic olivines, are completely discriminated from the majority of previously reported petit-spot. They selectively erupt atop the outer-rise wherein the lithosphere behaves entirely in an extensional regime during the ascent of melt from asthenosphere. We conducted several dredge samplings in order to access the asthenosphere more directly, by the research cruise KS-18-9, R/V *Shinseimaru*, in August 2018, supported by AORI, Tokyo University, and the JSPS Japanese-German Graduate Externship. Special thanks to shipboard scientific party (S. Machida, N. Akizawa, T. Ishii, A. Matsumoto, M. Kaneko, Y. Sato, Y. Nakano, T. Yutani, K. Azami, S. Sakai, Y. Katsuragi), captain A. Tsuji, and crews on KS18-09, R/V Shinsei.

The petit-spot rocks are dredged at a lava field displayed by multibeam survey without any topographic highs, which are small blocks surrounding very fresh glass with less palagonitic alteration and manganese coating, implying the lavas are quite young. The quenched glass rinds were analysed for major and trace elements by an electoron microprobe at University of Bayreuth, Germany (co-work with T. Yutani), and an inductively coupled plasma–mass spectrometer (LA-ICP-MS) at Nanyang Technological University,

Singapore (co-work with F. Rodriguez, J. Oalmann, Y. Katsuragi), respectively. As we gained “directly ascending petit-spots” from several volcanoes on this cruise, it is possible to recognize their source and melting process from their geochemical variations. The strongly alkaline lavas, directly ascending petit-spot, show clear trend in Zr/Hf, Sm/Hf ratios and HREEs, implying the carbonatite addition with the depth in source mantle. We present here the several processes of lithospheric flexure, metasomatized lithosphere, magma-fractionation, and finally, upwelling directly from asthenosphere occur prior to trench-oceanward slope, which would be significant components into the incoming oceanic plate.

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