Peridotites outcroppted in the southern Mariana Trench

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The Izu-Bonin-Mariana(IBM) arc, which is a typical oceanic arc, has 3000 km in length from the north to the south. The IBM forearc is non-accretionary convergent plate margin, where lithologies outcropped on the land-side slope is similar to those found in many ophiolites. The Mariana trench axis forms an arc-like shape due to collision of Ogasawara plateau and Caroline ridge [1]. Thereby, the southern Marianas from the south of Guam to Yap Trench junction shows characteristic morphology where the trench axis runs across both Mariana volcanic arc and backarc basin (Mariana trough). Geological expeditions in the southern Mariana Trench on the eastern side of the Challenger Deep have found trench peridotites as shallow as 5800 m below the sea surface [2]. The petrological compositions of these peridotites have both forearc-like depleted compositions and fertile compositions similar to those reported in the northern Mariana trough [3]. In this study, we report the geochemistry and fabric data for peridotites on the western side of Challenger Deep for the first time since Hawkins and Batiza (1977) and attempt to present the full picture of mantle domain outcropped in the southern Mariana trench.
We have selected about 140 samples from MARA20, MARA27 (dredged by R/V Thomas Washington during MARIANA Expedition in 1978), KH98-1-D1, KH98-1-D2, KH98-1-D3 (dredged by R/V Hakuho during cruise KH98-1 in 1998), KH03-3-D7, KH03-3-D8 (dredged by R/V Hakuho during cruise KH03-3 in 2003), 6K-1094, 6K-1095 (collected by R/V Yokosuka during cruise YK08-08 in 2008), 6K-1232, 6K1233, 6K1234 (collected by R/V Yokosuka during cruise YK10-12 in 2010), 6K-1397,6K-1398 (collected by R/V Yokosuka during cruise YK14-13 in 2014) and 6K-1429 (collected by R/V Yokosuka during cruise YK15-11 in 2015).
Petrological compositions of peridotites from the western side of the Challenger Deep show different characteristics between survey sites. Peridotites from the southwesternmost Mariana forearc near the Yap Trench junction area (Site1:11°2’N139°3’E) have fertile compositions (Cr#=0.25-0.6) similar to those from the Parece Vela backarc basin [4], whereas peridotites from the other site close to Challenger Deep (Site2:11°1’N140°3’E) have depleted compositions (Cr#=0.6-0.9) similar to those from the northern Mariana forearc [5]. In our presentation, We will show all chemical compositions of peridotites derived from the southern Mariana Trench in addition to the data from the western side of the Challenger Deep obtained by this study.
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