Trace element and isotopic characteristics of high Nb basalts from Kyushu arc and back arc

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Basalts and basaltic andesites from south-west Japan arc and Back arc region show signature of HFSE enrichment similar to high Nb basalts (HNB) and Nb enriched basalts (NEB) (i.e. Philippines, Castillo et al., 2007; Central America, Hastie et al., 2011).

We use previously published data from Kyushu basalts and basaltic andesites from both arc and back arc setting to compare the geochemical characteristics of these rocks. We observe that the rocks of our interest in this area, show a much higher Nb/Zr and Nb/Hf ratio than that of typical MORB values (0.032, Sun and McDonough, 1989) or of NE Japan arc (similar to MORB, Shibata and Nakamura, 1997). The samples from Kita-Matsuura area as reported by Sakuyama et al (2009, 2014) and Fukuejima- Goto island volcanoes (Uto et al., 2004; Hoang et al., 2013; Kuritani et al., 2017) also show significantly high Nb content, up to 50 ppm and 60 ppm respectively. This type of signature is more common to OIB type mantle than to MORB type mantle (Sun and McDonough, 1989); however, isotopic plots using Sr, Nd and Pb isotopic data in 2D and 3D space show that these rocks are not likely to be related to the enriched mantle (EM1, EM2) or the HIMU components and more likely to be related to MORB type mantle and a mixture with Philippine sea plate (PHS) sediments or slab melt as suggested by Shibata et al. (2014). Samples from Fukuejima islands show the same trend as arc rocks in Pb-Pb isotopic space despite not likely to be affected by PHS plate sediment or slab melt. This suggests that the mantle geochemistry beneath Kyushu is the product of mixing between MORB type mantle and slab or sediment like Pb isotope enriched component, which may have also contributed to the HFSE enrichment. The nature of this component is subject to further investigation.

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