Horeki backarc volcano of the Izu-Bonin arc

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Horeki seamount is located about 110 km west-northwest of Torishima volcano. Detailed bathymetric studies of Horeki seamount were carried out from the RV Kairei in April 2004. At the depth of 1800-2000 m, the main body of Horeki has an elliptical base 23 km long and 15 km wide. Its summit, ranging in depth from 450-700 m, is fairly flat and is 11 km long and 6 km wide. Horeki is dotted with many satellite cones or knolls, especially on its northern and southern slopes. The northern knolls form parallel ridges trending from NNE to SSW, but the southern knolls are distributed radially from the center of the main body. Dredges by R/V Kairei and ROV HyperDolphin dives were carried out in 2004.

There is a systematic difference in K2O content between this backarc volcano and frontal Torishima volcano. All basaltic rocks from the Torishima volcano are low-K, but most of those from Horeki are medium-K. Importantly, the main body of Horeki seamount (˜3 Ma) is made up of medium-K basalts, and some of younger ridges and knolls (˜1.7 Ma) are low-K. Both suites, however, have significantly higher values of K2O than the basalts of Torishima.

Gravity and magnetic data, with densely distributed survey tracks (˜1.8 km), were also collected. Bouguer gravity anomaly (assumed density 2670 kg/m3), calculated from the newly obtained data, shows slightly high anomaly over the seamount body. This result indicates that bulk density of the seamount is higher than the assumed density, and the main body consists of basalts (more than 2700 kg/m3). Amplitude of dipole-like magnetic anomaly associated with the seamount body is low in considering the volume. This result suggests that the seamount consists of basalts erupted in different magnetic polarities, thus the magnetic anomaly produced by these basalts cancel each other out.

K/Ar studies of rocks from main body of Horeki seamount and the NNE-SSW ridges north of the main Horeki edifice have fairly uniform ages of ˜3 Ma, although other ridges, and a knoll in this area, have younger ages of ˜1.7 Ma and 0.5 Ma, respectively. The main Horeki body and associated ridges (˜3Ma) are younger than many other back-arc volcanoes to the north (e.g. Genroku and Enpo), although the younger ridges and knolls just north of Horeki have ages similar to other small backarc knolls further to the north (Ishizuka et al., 1998). The main body of Horeki has an elliptical shape, which suggests a structural influence on magma extrusion. Thus some of the ridges having similar NNE to SSW orientations are likely genetically relate to the Horeki main body. It is difficult, however, to bathymetrically distinguish the older ridges and knolls from the younger ones associated with them.

Olivines from Horeki volcano are primitive, and the most magnesian olivines contain ˜0.4 wt. % NiO. Moreover, Horeki basalts display two different olivine fractionation trends, in which Fo contents of most magnesian olivines having ˜0.4 wt. % NiO are Fo90 and Fo92.5, respectively. The more magnesian trend is defined by olivines from the main body of the Horeki edifice (344R2), an arc volcano of 3 Ma, and the less magnesian trend is defined by those from the ridges and knolls to the north that are both contemporaneous and younger than the Horeki main body. Importantly, olivines from the main Horeki edifice form a continuous extension of olivines from frontal Torishima volcano, suggesting that mantle sources are similarly depleted below Torishima and Horeki volcanoes.