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Submarine volcanic front on the central Ryukyu arc

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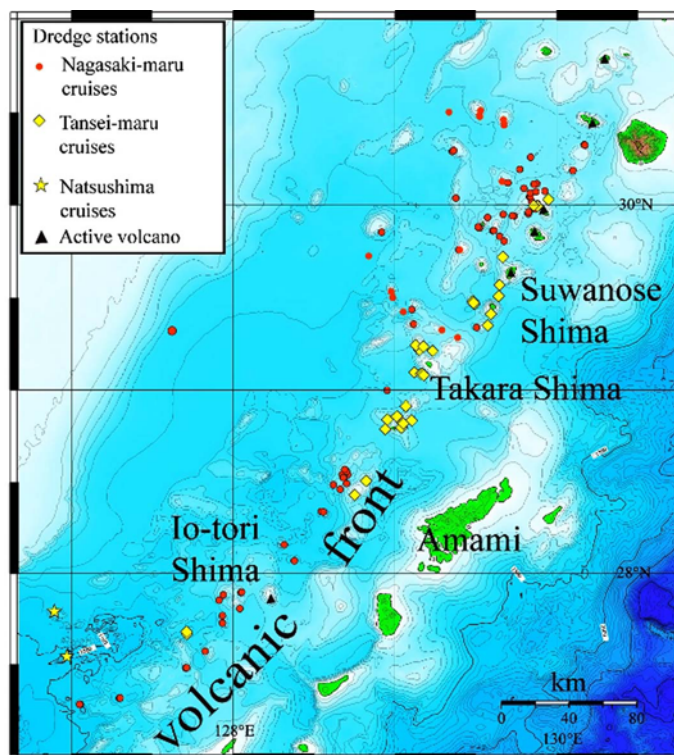
To understand the volcanism of the central and northern Ryukyu Arc (RA), nine cruises (KT-0015, -0702, -0721, NAG-252, -267, -274, -288, -294, NT9714) were carried out. Submarine investigations using dredge are over one hundred stations (see figure). Recently, Yokose et al. (2010) reported that submarine volcanoes of the Tokara Islands (TIs) are still active and are predominated in rhyolite. We will briefly summarize submarine volcanic activity of the southern extension of the TIs along the volcanic front on the central RA, from Yokoate Shima to Izena Hole.

Twenty six stations on the representative submarine flanks of volcanic cones were dredged. Rhyolitic pumices were recovered from many stations. They are fresh angular to subangular breccias and not covered with Fe-Mn oxide crust. As the occurrences of pumices are

inconsistent with a drifted pumice, they could be originated as in situ vesiculated lava fragments. Recovered volcanic rocks are classified into three types: aphyric rhyolite, fine-grained porphyritic rhyolite, coarse-grained porphyritic rhyolite. Pl, Opx, and Mt are main phenocrystic minerals, but one biotite rhyolite lava and Hb bg Opx rhyolites were also recovered. Andesite (scoria) were only recovered from Daiichi-Tokuno Shima. So far only two locations, on land of Iou-Tori Shima and Daiichi Tokuno Shima Knoll, andesiteic rocks are distributed on the central RA. Abundant Fe-Mn oxide fragments indicating the vigorous hydrothermal activity were recovered from Daiichi Tokuno Shima Knoll.

Groundmass of the most rhyolites is clear volcanic glass without alteration. K-Ar age of representative rhyolite recovered from unnamed knoll west of Daini Tokuno shima Knoll was measured (<0.3 Ma, which is detection limit of the sample).

The chemical variation of rhyolite is very small and are plotted in M-K rock series (SiO₂=74wt.%, K₂O=2wt. %). Andesites from Daiichi Tokuno Shima Knoll also plotted in M-K rock series. On the other hand, andesite of Iou-Tori shima and rhyolites 20 km west of Daini Tokuno shima Knoll are classified into L-K rock series and the biotite rhyolite into H-K (K₂O= 3.9wt. %) The LREE/HREE ratio of the central RA region are slightly higher than those of the submarine rhyolites from TIs. Many samples have negative Eu anomaly and their REE patterns show seagull REE pattern (Glazner et al., 2008). While samples from Daini Tokuno Shima knoll and Izena Hole have no Eu



anomaly and show U-shaped REE pattern (Glazner et al., 2008). The degree of negative Eu anomaly is greater than those in the volcanic rocks from the TIs. It is suggested that plagioclase phenocrysts should be a dominant fractionation mineral in the magma system under dry condition at the central RA.

Although minor petrographical differences are recognized between the recovered samples, petrographically similar volcanic rocks can be traced as a series of volcanism from the Tokara volcanic islands to Izena Hole. The clues for the eruption age of the submarine volcanoes are follows: (1) recovery of unaltered volcanic rocks, (2) no visible Fe-Mn oxide crust on recovered samples, (3) the result of K-Ar age determination, (4) because the central RA is belonging to the same tectonic flank with the northern RA and the TIs including submarine volcanism, volcanic activity on the central Ryukyu is considered to be a southern extension of volcanic front submerged and are probably younger than Mid-Pleistocene.

Submerged volcanic front align continuously from the southern part of Kyushu island to Izena hole were confirmed. Therefore it is reasonable that volcanism vicinity of the Izena hole is not in a back-arc proposed previously but in a volcanic front. Rock type differences between rhyolitic submarine volcanic cones and andesitic volcanic islands which have constructed above sea level, is remain unsolved.

<Reference> Yokose et al. (2010), *Journal of Geography* 119, 30-52; Glazner et al. (2008), *Geology*, 36, 183-186.

Keywords: central Ryukyu arc, Mid-Pleistocene, submarine volcanic front, rhyolitic volcanism