

Acoustically transparent deposits possibly originated from 7300 BP Kikai Koya PDC

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Kikai caldera (Matsumoto, 1943) is a mostly submerged highly active caldera complex located in 40 km off Kyushu Island. The caldera is considered to be the source of Akahoya tephra (Machida and Arai, 1978) which date was determined as 7300 cal. BP (Fukusawa, 1995). The climactic ignimbrite of the eruption was Koya-Takeshima PDC (pyroclastic density current), which extent was reached the deep inland of Kyushu (Ono et al., 1982). Recent work by Maeno and Taniguchi (2007) provided much detailed insights for the escalating evolution of magma-water interaction in the eruption, however present mostly subaqueous setting prevents further understanding of its geographical distribution and morphology. Here we report with the observation of seismic reflection, relatively thick (100~ m) and acoustically transparent layer that can be compared to Koya-Takeshima PDC because of its substantiality.

The seismic reflection observations were held in two survey cruises (KT-10-18 and KT-11-11) in 2010 and 2011 using a research vessel Tansei-maru of JAMSTEC (Japan Agency for Marine-Earth Science and Technology). The sound source was a 150 cubic inches G-I gun with 10 seconds of shot interval, and a 48-channled 1.2 km-length streamer cable was used for acquisition. Totally 24 profiles were obtained with the speed of 4 knots.

The caldera has 20 km wide rim and 10 km wide inner ring fracture. They were previously speculated as two different calderas of outer-older one and inner-newer one (e.g. Yokoyama et al., 1966), however it is unlikely according to our interpretation because both of their structure is fresh. At the southeastern end of the caldera, the rim is appeared as a major fault for caldera basin subsidence, which the latest displacement can be expected for 400 m in maximum. The inner fracture is the deepest structure in the caldera (~600 m), which is characterized as poorly deposited subcircular valleys surrounding the central rise of the caldera.

The distinctive transparent layer is named A3 in our interpretation. We assume that because of its wide distribution (most areas in Kikai except the central rise) and voluminosity (40~ cubic km), A3 is the submarine counterpart of the climactic Koya-Takeshima PDC. The morphology of A3 is highly constrained by its bottom unconformitive terrain therefore A3 is possibly some kind of flow deposits at least. It shows the maximum thickness at the southwestern caldera rim (~150 m) while it quickly loses its transparency and turned into chaotic facies at the caldera outskirts. The chaotic counterpart extends every direction from Kikai caldera with the constant thickness of about 100 m. Absence of A3 equivalent facies at the central peaks of the caldera supposes the area was a topographical high at the A3 outbreak.

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