# Identification of submarine volcanic ash around the Kikai caldera with the Koya pyroclastic flow deposit inferred from glass composition

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Koya pyroclastic flow deposit (PFD) is large scale ignimbrite generated during formation of the Kikai caldera in Kikai-Akahoya eruption at 7.3 ka. Kikai caldera is located ~50 km south of the Satsuma Peninsula and largely presents at the bottom of sea. Koya PFD is thickly distributed on land of Takeshima and Satsuma-Iwojima which represent subaerial part of the northern rim of the Kikai caldera. It is also thinly distributed over distal area, adjacent islands and mainland of south Kyusyu which is 40-60 km away from the source across the sea. This pyroclastic flow deposit has been suggested to exhibit rather low aspect ratio ignimbrite (Ui, 1973). However, on-land survey revealed that the maximum pumice size tends to decrease with increasing the distance across the sea. This may lead to a hypothesis that a significant amount of pyroclastics was lost during traveling over the sea and deposited on the sea floor (Yamane and Suzuki-Kamata, 2017). Our multi-channel seismic (MCS) reflection experiments around the Kikai caldera further suggested several seismic units (Shimizu et al., 2018). We have concluded that the uppermost unit should be a candidate layer for Koya PFD. This layer is recognized extensive distribution around the proximal islands (~30 m thick) and continuous to the Kagoshima bay (~10 m thick). As mentioned above, the Koya PFD is expected to be thickly distributed on the sea floor around the Kikai caldera. However, identification of submarine deposit with the subaerial Koya PFD is not sufficiently. In this study, we measured chemical composition of glass shards on the sea floor obtained by remotely operated vehicle (ROV) and compared with the subaerial Koya PFD.

The ROV conducted four dives to sea floor where MCS data indicate that uppermost unit is distributed near sea floor around the caldera wall and one dive in the south of the Satsuma Peninsula and collected volcanic ash on the sea floor using nozzle. The chemical composition of glass shards (<200 micrometers) from both subaerial and submarine were measured by Electron Probe Micro Analyzer (EPMA).
The glass shards on the sea floor around the caldera wall show bimodal geochemical characteristic which contain a high proportion of high $SiO_2$ glass shards ($SiO_2$=72-78 wt.%) and lesser amount of low $SiO_2$ glass shards ($SiO_2$=64-68 wt.%). The low $SiO_2$ glass was reported by Fujihara and Suzuki-Kamata (2013) and confirmed that it is unique characteristic for the Kikai-Akahoya eruption by glass and whole rock composition of other volcanics of the Kikai caldera. This indicate that the sea floor around the Kikai caldera covered by volcanic ash derived from the Koya PFD. Samples from the sea floor in the south of the Satsuma Peninsula were also confirmed that they contain small amount of glass shard corresponding the Koya PFD. These results correspond to the MCS data showing that candidate layer for the Koya PFD is thickly and widely distributed at uppermost part around the Kikai caldera. The vertical variation for contents of low $SiO_2$ glass on Takeshima Island, which is proximal area of the Koya PHD with a thickness of ~20 m, shows that the content of low $SiO_2$ glass lacks at the basal level and increases upward and reaches >10% at early stage (~10% level of the total thickness). While, the contents of low $SiO_2$ glass at distal areas across the sea tend to increase upward to <5%, which are lesser than value of proximal area. The contents of low $SiO_2$ glass of the sea floor samples around the caldera rim are >10%. Ash size grains are considered to be less under the influence of segregation by difference of density (Nakaoka and

 

Suzuki-Kamata, 2018). Thus, the Koya pyroclastic flow reached distal area across the sea between the start of eruption and the beginning of containment of low $SiO_2$ glass and was waning to not reach distal area and deposit on sea floor after the content of low $SiO_2$ glass increases to >10%.

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