

伊豆大島火山，カルデラ形成期の火砕物密度流堆積物：
差木地層 S₂ 部層の層序・岩相・年代の再検討

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Pyroclastic Density Current from the Caldera-forming Eruption of Izu-Oshima Volcano, Japan:
Restudy of the Sashikiji 2 Member Based on Stratigraphy, Lithofacies, and Eruption Age

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The Sashikiji 2 (S₂) Member in the products of Izu-Oshima volcano was formed by an explosive eruption accompanied with caldera depression. This member is characterized by breccia called as a “low-temperature pyroclastic flow deposit”. In this paper, the S₂ breccia is re-examined based on stratigraphy, grain fabrics, grain-size distributions and modal compositions. The S₂ Member is divided into six units from S₂-a to S₂-f in ascending order. The S₂-a unit consists of scoria, bomb and aa lava flows from flank fissures. The S₂-b unit is made up of well-bedded ash and fine-lapilli from the summit. The S₂-c unit is composed of matrix-supported breccia, locally filling valley bottoms and containing abundant deformed soil fragments and woods. The S₂-d unit consists of reverse to normal grading, clast-supported breccia with ash matrix, covering topographic relief in the whole island. The S₂-e unit is composed of dune- to parallel-bedded lapilli and ash in the proximal facies. The S₂-f unit is clast-supported breccia with and without ash matrix. New ¹⁴C ages of wood fragments in the S₂ Member have been determined as about Cal AD 340. Although the S₂-c and -d units are previously interpreted to the low-temperature pyroclastic flow deposit, these units are quite different in sedimentological features as follows. The grain fabric measurements have revealed that the S₂-d unit has a-type imbrication showing the longest axis of grains parallel to the flow direction. On the other hand, the S₂-c has random fabric of grains. The grain size distribution of the S₂-d unit shows a bimodal nature having subpopulations at phi -1.0 to 1.0 and coarser than phi -2.5. The bimodal nature and a-type imbrication suggest that the two transport processes overlap; the load of a turbulent suspension is not all in true suspension as the coarser population may travel in a cast-dispersion mass flow. The S₂-c unit shows a polymodal grain size distribution with multi subpopulations from coarse to fine. The poor sorting, massive appearance, valley-confined distribution, and random grain fabric of the S₂-c unit are characteristic of deposition from a cohesive flow without formation of traction-related bedforms or sorting of different grain sizes by turbulence. The modal composition measurements have indicated that the S₂-c and -d units lack essential scoriceous or glassy fragments. This evidence indicates that both units are derived from steam explosions due to outburst of highly-pressurized geothermal fluid within the edifice. The S₂-c unit was plausibly generated by remobilization of phreatic debris around the summit caused by ejection of condensed water from a plume or heavy rainfall. The S₂-d unit was a pyroclastic density current deposit resulted from collapse of a highly-discharged phreatic plume. Estimated velocities of the current are 150 to 30 m/s based on suspended grain sizes.

Key words: Izu-Oshima, S₂, pyroclastic density current, caldera, steam explosion

1. はじめに

火砕流 (pyroclastic flow) は、火山現象で生じる熱い、
気体と固体粒子からなる空気よりもやや重い密度流であ

る (Fisher and Schmincke, 1984)。火砕流にはその規模や
構成物に大きな多様性があり、火山灰流・軽石流・スコ
リア流などが含まれる。火砕流が火砕物 (pyroclastic ma-

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