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テフラガラスの地球化学と日本列島の大規模酸性マグマの起源
Geochemistry of tephra glasses and sources and origins of huge-volume felsic magmas in Japanese subduction zones

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Dacitic to rhyolitic glass shards from eighty widespread tephras erupted in the past 5 Mys from large calderas in Kyushu, and SW, central, and NE Japan were analyzed. Laser ablation inductively coupled plasma mass spectrometry was used to determine 10 major and 33 trace elements and 207Pb/206Pb-208Pb/206Pb isotope ratios in the glass shards. The tephras were classified into three major geochemical types and their source rocks were identified as intermediate plutonic, sedimentary, and amphibolite rocks in the upper crust. Few tephras from SW Japan were identified as adakite and alkali rhyolite and regarded to have originated from slab melt and mantle melt, respectively. Pb isotope ratios of the tephras are comparable to those of the intermediate lavas in the source areas but are different from the basalts in these areas. The crustal assimilants for the intermediate lavas were largely from crustal melts and are represented by the rhyolitic tephras. A huge heat source is required for forming large volumes of felsic crustal melts; these are usually supplied by the mantle via basalt. Hydrous arc basalt formed by cold slab subduction is voluminous and its high water content lowers the solidus of the crustal rocks leading to effective felsic magma production. The frequency of caldera eruptions is thus thought to be fundamentally controlled by the basalt production rate depending on the subduction setting either cold-wet or hot-dry and by the subduction rate of the oceanic plate slab, which controls the amount of water being transported beneath subduction zones.

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