

Geochemical characteristics of the latest eruptions in the Ulleung Island, Korea

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The Ulleung Island, the largest Quaternary alkaline volcanic body in the back-arc basin of East Sea (Sea of Japan), mainly consists of trachybasaltic, trachytic and phonolitic lavas and pyroclasts. These volcanics, ranging from 1.4 Ma to 5.6 ka in their ages, can be divided into two different suites: earlier trachybasaltic-trachytic lavas and later phonolitic pyroclasts. Geo-chemical analyses of previous workers suggest that the source of phonolitic tephra significantly differs from that of the earlier lava flows. The phonolitic pyroclastic deposits have been recently subdivided into five members (N5-N1), varying in their eruption styles. These latest eruptions in the Ulleung Island have piled up the trachyandesitic lava and scoria, suggesting a dynamic evolution of the underlying feeder system. To investigate the chemical evolution of final volcanic stage in the island, we studied the whole-rock geo-chemistry of the most recent eruptive sequences in stratigraphic order. All the analyzed samples share the similar trace element patterns: the positive Li and negative B, Ba, and Sr anomalies. The basal N5 holocrystalline trachytic clasts and pumices, occasionally containing sanidine and kaersutite phenocrysts, are characterized by highly-evolved trace element patterns and Al₂O₃ contents (20.2-20.4 wt.%) greater than those of other samples (18.8-19.0 wt. %). The upper members (N4-N2) are characterized by hypocrystalline phonolitic pumices which contain variable phenocrysts such as sanidine, sodic plagioclase, kaersutite, diopside, apatite, and titanomagnetite. The final dome-forming lava contains olivine (Fo₆₃₋₇₅) and ilmenite-titanomagnetite in the holocrystalline groundmass of plagioclase, kaersutite, apatite and leucite. These dome samples are lacking in Eu and Li anomalies (Gd/Eu=0.73-0.75; Li/Ho=1.23-1.31) and have the minimal Sr and Ba anomalies. Our whole-rock geochemistry data suggest that the final eruptions in the Ulleung Island have been governed by dynamic magmatic feeder system characterized by episodic recharges and fractionation.