

Tephrostratigraphy and petrological study of Chikurachki and Fuss volcanoes, western Paramushir Island, northern Kurile Islands

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A tephrostratigraphic and petrological study of the Chikurachki (1,816 m)-Tatarinov-Lomonosov volcanic chain (CTL volcanic chain) and Fuss (1,772 m), located at the southern part of Paramushir Island in the northern Kurile Islands, was carried out to reveal the explosive eruption history during the Holocene and the temporal change of the magma systems of these active volcanoes. We described tephra successions at 54 sites and identified more than 20 major eruptive units consisting of pumice fall, scoria fall and ash fall deposits, each of which are separated by paleosol or peat layers. The source volcano of each recognized tephra layer is confirmed by correlation with proximal deposits of each eruption center with respect to petrography and whole-rock and glass chemistry. The age of each layer was determined by radiocarbon dating and the stratigraphic relationship with the dated, widespread tephra from Kamchatka according to the thickness of paleosol sandwiched between tephra layers. The Holocene activity in this region was initiated by eruptions from the Tatarinov and Lomonosov volcanoes. After the eruptions, the Fuss and Chikurachki volcanoes started their explosive activities at ca. 7.5 ka, soon after the deposition of widespread tephra from the Kurile Lake caldera in southern Kamchatka. Compared with Fuss located on the back-arc side, Chikurachki has frequent, repeated explosive and voluminous eruptions. Whole-rock compositions of the rocks of the CTL volcanic chain and Fuss are classified into medium-K and high-K groups, respectively. These suggest that magma systems beneath the CTL volcanic chain and Fuss differ from each other and have been independently constructed. The rocks of the Chikurachki volcano are basalt-basaltic andesite and have gradually changed their chemical compositions; when graphed as SiO₂-oxide diagram, these form smooth trends. This suggests that the magma system could evolve mainly by fractional crystallization. In contrast, matrix glass chemistries for Fuss pumices are distinct for each eruption and show different K₂O levels on a SiO₂-K₂O diagram. This implies that the magma system of Fuss has been frequently replaced. Both volcanoes have been active under the same subduction system. However, the Chikurachki volcano would continue eruptive activity under a stable magma system with a higher magma discharge rate, whereas Fuss may continue construction with an intermittent supply of distinct, small magma batches.