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Effect, deposits and mechanism of the 2019 explosive eruption of Raikoke volcano, Kurile islands.

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Raikoke - uninhabited island 2 km across located in the central part of Kurile arc. Raikoke represents subaerial summit (550 m high) of active volcanic stratocone rising from depth of 2500 m. The volcano produced 3 historical eruptions, which were not closely observed. All the eruptions were purely explosive, and led to nearly complete devastation of the island's ecosystems. Our field investigation of pyroclastic deposits of 2019 eruption, combined with the published acoustic and satellite data shown that this eruption started abruptly as phreatomagmatic Subplinian activity that lasted 4.5 h and formed pulsating eruption column up to 10 km high. The column was overloaded with fine-grained pyroclastic material and experienced partial gravitational collapse, forming numerous small pyroclastic flows, which affected the entire island and destroyed the vegetation and the habitat of numerous birds and Steller lions. The PFs deposited several fans up to 10 m thick composed of coarsely layered, poorly sorted pyroclastic material: moderately vesicular (33-40%) juvenile clasts mixed with old dense rocks. Phreatomagmatic mechanism of the initial Subplinian stage of the eruption was governed by interaction of the rising batch of basaltic andesite (52-53% SiO2) magma with ground water, which was probably represented mostly by sea water percolated inside the island's aquifer. After the eruption the sea water seeped into the deepened central crater of the volcano and formed new crater lake. During the course of the eruption, the aquifer was exhausted and the initial phreatomagmatic Subplinian activity changed to magmatic Plinian activity that lasted 3.5 h and formed eruption column up to 13 km high. The Plinian stage deposited the uppermost pyroclastic layer of the vesicular volcanic bombs and lapilli. Total volume of the erupted pyroclasts is estimated as 0.1 km3. The deposits considerably displaced the shoreline seaward and increased the area of the island by 15%.