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Vulcanian/hydrothermal eruptions of Ebeko volcano, Kurile Islands

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Ebeko is a small (1156 m a.s.l) andesitic volcano located in the northern part of Paramushir island of Kurile Island Arc. It is not well studied but in fact represents the most active volcano of the Kuriles with > 10 eruptions recorded in the 20th century. All historical eruptions of the volcano had similar style. They were purely explosive, mild (VEI 1 – 2) series of frequent short-lived outbursts of ash and bombs with eruptive clouds up to 3 km high. Some of the outbursts were more extended in time (lasted minutes-hours) and produced mostly fine ash. Common explosions occurred in the summit area of the volcano which characterized by strong hydrothermal activity and multiple fumaroles depositing sulfur. Each eruption produced broad, shallow craters surrounded by low rims of the ejected material. Commonly the craters are later occupied by shallow lakes.

In 2019 we realized a field work to investigate the most recent eruptive activity of Ebeko that commenced in 2016. We installed seismometers, monitoring cameras and recorded the terrain using unmanned aerial systems (UAS) together with optical and infrared cameras. The drone data shows dimensions and structures of the newly forming crater and shows deposition of erupted materials. Ejected material was probed and analysed. It is represented by ash and bread crust bombs composed of moderately vesicular two pyroxene andesite with glassy crusts. We found evidence for recycling and rewelding of ash shown by the clastic domains, which are enclosed / mantled by coherent lava. The eruptions of Ebeko volcano were in part phreatic (hydrothermal) and in part magmatic / phreatomagmatic (vulcanian in a broad sense). Mechanism of this (and probably of some other eruptions) can be explained by shallow intrusions of small batches of strongly crystallized andesitic magma into water-saturated hydrothermally altered rocks composing the volcano summit. We suggest a model of the Ebeko eruptions, where new batches of fresh magma incorporate and amalgamate previously erupted fresh material.