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## **The 2019 Eruption Dynamics and Morphology at Ebeko Volcano Monitored by geophysical instrument networks and Unoccupied Aircraft Systems (UAS)**

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Vulcanian explosions are hazardous and are often spontaneous and direct observations are therefore challenging. Ebeko is an active volcano on Paramushir Island, northern Kuril Islands, showing characteristic Vulcanian-type activity. In 2019, we started a comprehensive survey using a combination of geophysical field station records and repeated unoccupied aircraft system (UAS) surveys to describe the geomorphological features of the edifice and its evolution during ongoing activity. Seismic data revealed the activity of the volcano and were complemented by monitoring cameras, showing a mean explosion interval of 34 min. Digital terrain data generated from UAS quadcopter photographs allowed for the identification of the dimensions of the craters, a structural architecture and the tephra deposition at cm-scale resolution. The UAS was equipped with a thermal camera, which in combination with the terrain data, allowed it to identify fumaroles, volcano-tectonic structures and vents and generate a catalog of 282 thermal spots. The data provide details on a nested crater complex, aligned NNE-SSW, erupting on the northern rim of the former North Crater. Our catalog of thermal spots also follows a similar alignment on the edifice-scale and is also affected by topography on a local scale. New analysis are included in this presentation as well as a long term change analysis based on remote sensing data.