

A new estimate of gas emissions from Ebeko volcano, Kurile Islands

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Concentrations and emission rates of major gas species were measured in August 2015 at Ebeko volcano, a quiescently degassing andesitic volcano on Paramushir Island, Northern Kuriles. Using mobile and scanning DOAS measurements we estimated SO₂ emission from the active crater of the volcano at 100 +36/-15 t/d. Based on the comparison of plume areas of individual fumaroles, ca. 90% of the total gas emission from Ebeko in 2015 was provided by a single powerful vent (“Active Funnel” fumarole) and the rest was shared among low-temperature fumaroles. At the time of measurements, gases from the main fumarole had temperature from 420 to 490 °C and composition close to the average arc gas [1], as shown in Table.

Gas species	CO ₂	SO ₂	H ₂ S	HCl	H ₂ O	T, °C
mmol/mol						
Main fumarole	27.9	23.5	6.1	5.6	936	420
Low-temp. jets	92.2	2.62	0.68	1.6	902	<120

Low-temperature fumaroles (<120 °C) emitted gas enriched in CO₂ (up to 28 mol%, 9.2 mol% on average). Such CO₂ enrichment together with depletion in HCl and sulfur species can be explained by scrubbing of soluble gas species by a well-developed hydrothermal system which discharges ultra-acid SO₄-Cl waters [2]. A weighted-average estimate of the total gas+vapor emission from the Ebeko summit provided 1470 t/d, which includes ~ 101 t/d SO₂, ~ 110 t/d CO₂, ~ 14 t/d H₂S and HCl, and 1230 t/d of water vapour with > 50% of the magmatic component. The gas fluxes measured in August 2015 using DOAS fall into the range of previous measurements made from 1960 to 2012 that used direct methods [2] and correspond to the moderate degassing rate of the volcano. This work was supported by RSF grant # 15-17-20011.

[1] Shinohara (2013) *JVGR* **268**, 46–63. [2] Kalacheva *et al.* (2016), *JVGR*, **310**, 118-131.