

Magmatic gases of Gorely volcano, Kamchatka: element fluxes and comparison with MultiGas data

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Basaltic Gorely volcano at Southern Kamchatka is characterized by a strong gas emission from its active crater since 1980. The volcano is located within a large caldera, 15 km to the NW from another strong gas emitter, Mutnovsky volcano. Remote measurements in September 2011 revealed the SO₂ flux from Gorely in the range of 400 to 1100 t/day (800 t/day on average). The MultiGas measurements of the plume composition on the crater rim realized at the same time showed that the gas is water and chlorine rich, with C/S ~1 and S/Cl ~ 2 (Aiuppa et al., 2012). Direct sampling of the 850 °C fumarole near the crater floor and the cold acidic crater lake was done two weeks after the DOAS and MultiGas measurements. Isotopic composition of magmatic vapor corresponds to mixing 25% of meteoric water with typical "andesitic water". Trace element composition of the volcanic gas condensates are compared with the available data from other high temperature volcanic gas emissions, in particular, with the chemistry of fumarolic condensates of Kudryavy volcano. Condensate of Gorely shows a similar trace element pattern but with a notable enrichment in chalcophile and depletion in siderophile elements comparing to Kudryavy. Concentrations of Re (up to 20 ppb) is similar for both volcanoes. Concentrations of Au and elements of Pt group are lower than detection limit of ICPMS. REE distribution in the Gorely condensate is parallel to the REE rock pattern with a slight enrichment in both light and heavy REE. Results for main components generally confirm those obtained by the MultiGas technique though there are some differences:

Date of sampling	H ₂ O	CO ₂	SO ₂	HCl	C/S	S/Cl
Direct 20.09.2011	94.9	1.7	1.9	0.83	0.91	2.26
MultiGas 06.09.2011	93.2	2.7	2.3	1.2	1.17	1.92

Emission rates of elements are calculated using their SO₂/E ratios and the average SO₂ flux from Gorely of 800 t/day.

Aiuppa, A., et al. First volatile inventory for Gorely volcano, Kamchatka. Geoph. Res. Lett., 39, L0637, 2012.