

Estimation of the sulfur dioxide emission by Kamchatka volcanoes using differential optical absorption spectroscopy

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During the 2012-2013 we have measured SO₂ on Kamchatka volcanoes (Gorely, Mutnovsky, Kizimen, Tolbachik, Karymsky, Avachinsky) using DOAS (differential optical absorption spectroscopy). Mobile-DOAS, on a base of USB2000+, has been used as an instrument. The goal of this work was to estimate SO₂ emission by Kamchatka volcanoes with the different types of activity. Mutnovsky and Avachinsky during the measurements period passively degassed with SO₂ emission ~ 480 t/d and 210 t/d, respectively. Gorely volcano was very active, with intensive vapor-gas activity with gas discharge rate 800-1200 t/d. During the measurements at Karymsky volcano there were relatively weak explosive events (ash plum rose up to 0.5 km above the crater) with 5-10 minutes periodicity. For this time, SO₂ discharge rate was ~350-400 t/d. Due to the remoteness and difficulties for accessibility of Kizimen volcano, the measurements were done only once – on October 15th, 2012. 5 traverses have been done above the gas plume. SO₂ emission was ~ 700 t/d. On Tolbachik fissure eruption we have measured SO₂ emission repeatedly from January until August 2013. The intensive effusion of the lava flows (basaltic andesite by composition) and frequent explosions in the crater of the cinder cone were characteristic features of this eruption. The measured gas emission was from ~1500-2200 t/d in January until 600-800 t/d in August 2013.

All measurements were made not permanently, but to the extent possible. Therefore, it is difficult to make detailed conclusions on the SO₂ emission on these volcanoes. Nevertheless, this research may become a starting point for the development of the system of the constant monitoring of volcanic gases emission by the active volcanoes of Kamchatka.