Geophysical Research Abstracts
Vol. 18, EGU2016-1001, 2016
EGU General Assembly 2016

Variations of the BrO/SO_2 molar ratios during the 2015 Cotopaxi eruption

Florian Dinger (1,2), Santiago Arellano (3), Jean Battaglia (4), Nicole Bobrowski (2,5), Bo Galle (3), Stephen Hernandez (6), Silvana Hidalgo (6), Christoph Hörmann (1), Peter Lübcke (2), Ulrich Platt (2), Mario Ruiz (6), Simon Warnach (2), Thomas Wagner (1,2)

(1) Max-Planck Institute for Chemistry, Mainz, Germany, (2) IUP, University of Heidelberg, Germany, (3) Chalmers University of Technology, Gothenburg, Sweden, (4) LMV, Université Blaise Pascal-CNRS-IRD, France, (5) University of Mainz, Germany, (6) IGEPN, Quito, Ecuador

Cotopaxi volcano is located 50 km south of Quito, the capital of Ecuador. In case of a large eruption producing lahars, these may cause damage to the inhabited areas located to the south and north of the volcano and to the local water supply and other infrastructure. After almost 140 years of relative quiescence, increasing activity is observed in seismicity and gas emissions since May 2015. During August 2015 ash and gas emissions are recorded. Cotopaxi volcano is part of the Network for Observation of Volcanic and Atmospheric Change (NOVAC) since 2009, thus the observations include the overall eruptive activity onset and its evolution. NOVAC regularly monitors the SO_2 emissions of more than 30 volcanoes using scanning UV-spectrometers. Today, monitoring of volcanic SO_2 emissions by UV-spectrometers is a widespread tool but its interpretation can be improved by additionally recording halogen/sulphur emission ratios. Recently, it has been shown that spectra from NOVAC instruments can also be used to retrieve the BrO/SO_2 molar ratio by applying Differential Optical Absorption Spectroscopy (DOAS).

We apply this new technique to analyse the plume composition of Cotopaxi volcano and will present time series of the BrO/SO_2 ratios as monitored by the ground-based NOVAC instruments since March 2015. The SO_2 column densities were below $6 \cdot 10^{16} \frac{molec}{cm^2}$ prior to May 2015 and up to $1.5 \cdot 10^{18} \frac{molec}{cm^2}$ between May and August 2015. For these periods, the BrO column densities were below the detection limit of $3 \cdot 10^{13} \frac{molec}{cm^2}$. After the phreatic explosions on 14.08.2015, SO_2 column densities of up to $3 \cdot 10^{18} \frac{molec}{cm^2}$ and BrO column densities of up to $5 \cdot 10^{14} \frac{molec}{cm^2}$ were observed. Until December 2015 these SO_2 column densities kept at about the same level but the BrO column densities increased up to $3 \cdot 10^{14} \frac{molec}{cm^2}$. After the phreatic explosions we find a detectable signal of BrO. Soon after the eruption the BrO/SO_2 molar ratio was low as $1 \cdot 10^{-5}$, but during September-December 2015 this ratio varies between $3 - 11 \cdot 10^{-5}$ as observed by three NOVAC stations. The variations in the BrO/SO_2 ratios are compared with SO_2 measurements from NOVAC and satellite observations as well as seismic data and volcanological observations.