Contribution ID: **14** Type: **Poster**

# Determining long-term volcanic gas emissions of $SO_2$ and BrO with DOAS

*Tuesday 11 February 2020 16:00 (2 minutes)*

Volcanic activity is usually connected to volcanic gas emissions. Observations of volcanic gas plumes could thus provide important information for studying the magmatic system and for risk assessment. Sulphur dioxide ($SO_2$), being directly emitted by volcanoes, and bromine monoxide (BrO), which is a secondary product from volcanic emissions of hydrogen bromine (HBr), are constituents of volcanic plumes and are good tracers to quantify volcanic degassing fluxes and degassing parameters. The network for observation of volcanic and atmospheric change (NOVAC) provides data for remote sensing of $SO_2$ and BrO slant column densities (SCD) via differential absorption spectroscopy (DOAS). We here present recent advances in the Heidelberg evaluation algorithm for BrO/$SO_2$ molar ratios in volcanic gas plumes.

The spectroscopes of NOVAC scan the sky from horizon to horizon by recording a spectrum every 3.6°. We apply a DOAS fit to each spectrum of the scan to retrieve $SO_2$ SCDs. The $SO_2$ SCDs within the plume follow roughly a gaussian distribution. We co-add the spectra within its 1-sigma range to a mean plume spectrum. Similarly, we add the 10 spectra with the lowest $SO_2$ SCDs to a mean reference spectrum. Subsequently, more robust $SO_2$ and BrO SCDs are retrieved from these spectra by another DOAS fit. By using the new python based software HEIDOAS, the runtime of the retrieval algorithm is significantly shorter compared to the traditional DOASIS software. This allows to retrieve wavelength dependent instrument line functions from the NOVAC data. Using these data, we can further improve the BrO and $SO_2$ SCD retrieval. Furthermore, the convolution of high resolution trace-gas absorption cross-sections with the instrument line function can be executed as part of the DOAS fit, thus making approximations unnecessary, which are usually made in traditional DOAS with the software DOASIS. We evaluate data of Masaya and compare the results of HEIDOAS with traditional DOAS results.

**Author:** KLEINBEK, Timo (Universität Heidelberg)

**Co-authors:** DINGER, Florian (Max Planck Institute for Chemistry, Mainz, Germany); Prof. PLATT, Ulrich (Institute of Environmental Physics, Heidelberg University, Germany); FRIESS, Udo

**Presenter:** KLEINBEK, Timo (Universität Heidelberg)

**Session Classification:** Atmospheric Processes

**Track Classification:** Atmospheric Processes