Contribution ID: **28** Type: **Oral**

Spatial distribution of bromine monoxide in the plume of Mount Etna during the Christmas 2018 eruption derived from S5-P/TROPOMI

Tuesday 11 February 2020 14:18 (18 minutes)

Bromine monoxide (BrO) is a halogen radical altering –inter alia –the atmospheric ozone and radical chemistry. High BrO/SO_2 ratio was seen at the outer part of the plume, while in the center region of the plume BrO/SO_2 ratios were found to be lower. These measurements obtained from ground-based as well as airborne instruments suggest that the formation of BrO –a secondary product of volcanic gas –might be hindered in the center region of the plume, where it is limited by the mixing in of ambient ozone.
Here, we present BrO and SO_2 column densities of the volcanic plume of Mount Etna on Christmas 2018 measured by the TROPOspheric Monitoring Instrument (TROPOMI) onboard ESA's Sentinel-5P satellite using the Differential Optical Absorption Spectroscopy (DOAS) technique. The high spatial resolution of S5-P/TROPOMI (up to 3.5x5.5km²) allows to resolve spatial variation of the BrO/SO_2 ratio in the volcanic plume and thus to differentiate between different plume parts. Dense, i. e. SO_2 rich parts in the center of the early plume (several 100kms distance from volcanic vent) show low BrO/SO_2 ratios in the order of several 10^{-5}. The BrO/SO_2 ratio increases for the 8-20h older , more diluted plume, where it reaches several 10^{-4} in the center (for distances up to 1500km from the vent). Throughout the whole plume we observe an increase in the BrO/SO_2 ratio towards the edges of the plume, where the BrO/SO2 molar ratio is 3-6x10^{-4}. These data indicates the relevance of ambient ozone (and free radical) intrusion also for older volcanic plumes thousand kilometer downwind from the volcanic vent.

Author: Mr WARNACH, Simon (Max-Planck-Institut für Chemie (MPIC), Mainz, Germany and Insitut für Umweltphysik, Universität Heidelberg, Germany)

Co-authors: Dr SIHLER, Holger (Max-Planck-Institut für Chemie); Mr BORGER, Christian (Max-Planck--Institut für Chemie); Dr BOBROWSKI, Nicole (Institute of Environmental Physics, Heidelberg University, Germany); Dr SCHMITT, Stefan (Institut für Umweltphysik, Uni Heidelberg); SURL, Luke (Laboratoire Atmosphères, Milieux, Observations Spatiales, Service d'Aéronomie (LATMOS), CNRS, Institut Pierre Simon Laplace, Pierre et Marie Curie University, Paris, France AND Laboratoire de Physique et Chimie de l'Environnement et de l'Espace (LPC2E), UMR 7328 CNRS and Université d'Orléans, 3 Avenue de la Recherche Scientifique, 45071 Orléans, France); Dr ROBERTS, Tjarda (CNRS, LPC2E and LATMOS); Dr BEIRLE, Steffen (Max-Planck-Institut für Chemie); Prof. PLATT, Ulrich (Institute of Environmental Physics, Heidelberg University, Germany); Prof. WAGNER, Thomas (Max Planck Institute for Chemistry, Mainz, Germany)

Presenter: Mr WARNACH, Simon (Max-Planck-Institut für Chemie (MPIC), Mainz, Germany and Insitut für Umweltphysik, Universität Heidelberg, Germany)

Session Classification: Atmospheric Processes

Track Classification: Atmospheric Processes