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Halogens and sulphur emissions of volcanoes and their atmospheric effects

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Volcanoes are a major source for a number of atmospheric gases – in particular species containing hydrogen, carbon, sulphur and halogens. Volcanoes inject tens of terragrams of chemically and microphysically active gases and solid aerosol particles into the atmosphere and they can affect the earth's radiative balance and climate. Gaseous emissions of sulphur compounds are of greater importance for the climate on long time scales than ash laden eruption columns which are often observed during large eruptions. Beside sulphur compounds, other trace gases relevant for atmospheric chemistry such as bromine and chlorine compounds are also emitted from volcanoes. The understanding of the chemistry in volcanic plumes is a topic which is being investigated with the growing interest of atmospheric scientists as well as volcanologists, the latter of which try to use the gained information for improving eruption forecasting and hazard assessment.
In the beginning of this presentation, a historical overview of past research on volcanic halogen emissions into the atmosphere will be given. Then we will shortly introduce the measurement technique of ground based UV spectroscopy and describe modern instrumentation (Multi-Axis Differential Absorption Spectroscopy instruments (MAX-DOAS) working with scattered sky light and direct moon and sun light, Active DOAS instruments (working with artificial light sources) and the SO2 camera) we are using to investigate volcanic SO2 and halogen oxide emissions. Afterwards an overview will be presented about our current understanding of the halogen chemistry taking place inside volcanic plumes. This will be underlined by measurement results taken during the last 8 years.