



Reactive bromine and chlorine chemistry in volcanic plumes

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Reactive halogen chemistry in volcanic plumes is a new focus of tropospheric halogen research since the detection of BrO in the plume of Soufriere Hills Volcano on Montserrat in May 2002 at mixing ratios up to 1 ppbv. The ground - based remote sensing technique - MAX-DOAS (Multi Axis Differential Optical Absorption Spectroscopy using scattered sunlight has in the meantime been applied to identify different trace gases - Halogen oxides and sulphur dioxide (SO₂) at several volcanic sites. The Mini-MAX-DOAS is a lightweight, compact, robust instrument and has very low power consumption so it can be deployed in remote regions at volcanoes. It provides valuable information about the chemical composition and its variability in volcanic plumes and allows studying plume dispersal and chemical transformation processes. Investigations presented here were carried out at volcanoes in Central and South America and in Italy during 2003 and 2004. Volcanoes appear to be a significant source of reactive halogens on a regional, perhaps even global scale. BrO has been found at significant levels at most studied volcanoes, BrO/SO₂ ratios are generally lower than the one found for Soufriere Hills in 2002. Measurements at different distances from the source indicate that BrO is produced in the plume from precursor species. Besides BrO also other halogen oxides (ClO, OClO and IO) were investigated and results will be shown. Possible pathways of halogen cycling in the plume will be discussed as well as effects of reactive halogen emissions by volcanoes on the chemistry of the lower and free troposphere.