



BrO formation in the plume of Pacaya volcano, high resolution plume chemistry at early plume ages

Leif Vogel (1), Nicole Bobrowski (1), Victoria Cáceres Espinoza (2), Christoph Kern (3), Holger Sihler (1,4), and Ulrich Platt (1)

(1) University Heidelberg, Institute of Environmental Physics, Heidelberg, Germany (leif.vogel@iup.uni-heidelberg.de), (2) formerly Instituto Nacional de Seismología, Volcanología, Meteorología e Hidrología, Guatemala City, Guatemala, (3) now at U.S. Geological Survey, Vancouver, Washington, U.S.A., (4) Max-Planck-Institute for Chemistry, Mainz, Germany

During February 2010 we carried out gas emission studies of the plume of Pacaya volcano (Guatemala). The subduction zone volcano Pacaya which is characterized by basaltic to basaltic andesitic lava is located 20 km south of Guatemala City. Recent unrest from this volcano consisted of several events in the last decades in form of lava flows and strombolian explosions as well as larger explosive eruptions. Recent major events occurred in 1998 and May 2010 with debris and ash ejected up to 5000m and subsequent ash fall on nearby cities, including the capital Guatemala City and its international airport La Aurora.

Measurements were performed with two stationary ground based Multi-Axis Differential Optical Absorption Spectroscopy (MaxDOAS) systems and a zenith looking DOAS system mounted on a car. The car traverses were conducted downwind to the east of the volcano and determined a total sulphur dioxide (SO₂) flux of about 125 tons/day. The MaxDOAS instruments were placed side by side on the north-north-eastern flank of Pacaya at a distance of 1 km from the crater. We investigated volcanic emissions at early plume ages (< 5 min) in vertical as well as horizontal direction, mapping ongoing bromine chemistry at high temporal resolution. We report the first detection of Bromine monoxide (BrO) at Pacaya volcano and the hitherto first capture of volcanic BrO chemistry at high resolution at very early plume ages. An expected increase of BrO/SO₂ ratio from below the detection limit of $2.5 \cdot 10^{-5}$ to $1.5 \cdot 10^{-4}$ was observed.

Alerted by some inconsistencies in a first order evaluation of the BrO concentrations, we discovered a noticeable formaldehyde (HCHO) abundance in the lower atmosphere around Pacaya. Although not of volcanic origin, it highlights possible artifacts and pitfalls of previous spectroscopic measurements of BrO in the lower troposphere due to cross correlations between the absorption cross sections of BrO and HCHO.