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Measurement of SO_2 and BrO at Lastarria, Lascar, and Salar de Atacama

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In November 2014 the 12th CCVG (Commission of the Chemistry of Volcanic Gases) gas workshop took place in Northern Chile. Subject of the field trips were Lastarria ($25°10'$ S, $68°30'$ W) and Lascar ($23°22'$ S, $67°43'$ W), both stratovolcanoes with a height of 5700 and 5600 a.s.l., respectively. One of the goals was to investigate the SO_2 and BrO emissions of these volcanoes by remote-sensing using Multi-AXial Differential Optical Absorption Spectroscopy (MAX-DOAS). The used "mini MAX-DOAS" instrument measures scattered solar UV radiation recording spectra within a wavelength range of 294-437 nm and with a spectral resolution of 0.9 nm. The instrument took spectra sequentially at various elevation angles scanning the sky from horizon to zenith. The scanning geometry was adapted to each measurement location.
At Lastarria volcano we observed SO_2 slant column densities (SCDs) in the order of 10^{18} molecules/cm^2 and BrO SCDs up to $5 \cdot 10^{13}$ molecules/cm^2. At Lascar volcano we observed SO_2 SCDs up to $4 \cdot 10^{17}$ molecules/cm^2 but no significant BrO absorption features (in a preliminary evaluation). We will present SO_2 fluxes and upper detection limits of BrO, and present maxima BrO/SO_2 ratios of Lastarria and Lascar. Those ratios will be compared to BrO/SO_2 ratios of other - previously studied - Andean volcanoes (e.g. Villarica).
Furthermore, we measured the SO_2 and BrO SCDs above the Salar de Atacama ($23°30'$ S, $68°15'$ W), a salt pan with an area of 3000 km^2. Spectra were taken in a direction where the Salar de Atacama has an extension of about 50 km and no other obvious emission sources were contributing to the SO_2 and BrO absorption signals. At the Salar de Atacama we observed SO_2 SCDs up to $2 \cdot 10^{17}$ molecules/cm^2 and BrO SCDs of up to $7 \cdot 10^{13}$ molecules/cm^2.