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First results from infrared optical remote sensing of the Popocatepetl plume during a small eruption on December 1^{st} of 2007

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Gaseous emissions from volcanoes interact with urban pollution and play a key role in global atmospheric composition and particle formation. Simultaneous detection of various gases can give important information about their magmatic activity. Optical remote sensing measurements have been performed from a secure distance of 12 km on the degassing Popocatepetl volcano (19.02˚N, 98.62˚W, 5465 masl), located 60 km southeast of Mexico City. In the morning of December 1^{st}, a small explosion occurred and produced an ash plume that rose to an altitude of 7.4 km. Measurements and the first results from this field campaign using three different passive infrared spectroscopy methods are presented: 1.) Emission spectroscopic observations at relatively high spectral resolution (0.5 cm^{-1}) of the volcanic plume directly above the crater allowing to retrieve the ratios of SiF_4 and CO_2 relative to SO_2. 2.) Visualization at lower spectral resolution (4 cm^{-1}) by means of a scanning system producing a 2D representation of the SO_2 plume. This promising technique allows to monitor the changes in the spatial distribution of SO_2 degassing from the volcano during several hours and could play a key role in an automatic prediction and warning system and 3.) Solar-absorption spectroscopy which allowed us to calculate the slant column of gases in the plume and to obtain the ratios of other volcanic species absorbing at higher energies like HCl/SO_2 and possibly others. The calculated ratios of SiF_4, HCl and CO_2 with SO_2 are presented and compared with previously published results. Additionally, the vertical SO_2 column was monitored with a DOAS instrument, which documented the crossing of the plume above the observation site (Altzomoni 4000 masl, 19.12˚N,

98.65˚W).