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Continuous FTIR remote sensing measurements of the Popocatépetl plume composition

N.Taquet, I. Meza, A. Bezanilla, J. Baylon, W. Stremme, M. Grutter

[1]Centro de Ciencias de la Atmosféra, Universidad Nacional Autonoma de México, UNAM

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The composition of volcanic exhalations in open-conduit systems reflects both the deep/magmatic and surficial/ eruptive processes comprising the gross architecture of the magmatic plumbing system, partial replenishment episodes, magma ascension dynamics, or chemical interaction within the atmosphere. The delineation of their mutual influences requires long term, continuous monitoring of the main volatile species at a high temporal resolution during both quiescence and eruptive episodes. We propose here to demonstrate the applicability and performances of a monitoring procedure implemented recently at the Popocatépetl Volcano (Mexico), and which combines two complementary remote sensing techniques to continuously measure the volcanic emissions; high resolution FTIR spectroscopy used in solar absorption mode and low resolution thermal emission spectroscopy. The measurements were performed from the Altzomoni Observatory (19,12N, 98.65W), located at a safe distance of 12 km north of the Popocatepetl crater. This research platform, which pertains to the RUOA (www.ruoa.unam.mx) and NDACC (https://www2.acom.ucar.edu/irwg) observational networks, is dedicated to the study of gases and particles in both stratospheric and tropospheric levels. Therefore, this observatory constitutes a prefect tool to build a long term high temporal resolution database to investigate volcanic emissions and their impact on the atmosphere. We present here time-series of volcanic SO2, SiF4, HCl, HF species measured in Popocatepetl's plume, and their corresponding ratio. In the literature, increases in the SiF4/SO2 ratio is described as a possible precursor of the dome blowouts at the Popocatepetl and the HCl/SO2 ratio gives meaningful information about the deep magmatic and eruptive processes.