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SO_2 emissions from Popocatépetl volcano: emission rates and plume imaging using optical remote sensing techniques

M. Grutter[1], R. Basaldud[1], C. Rivera[2], R. Harig[3], W. Junkerman[4], E. Caetano[1], and H. Delgado-Granados[5]

[1]Centro de Ciencias de la Atmósfera, Universidad Nacional Autónoma de México, Mexico

[2]Department of Radio and Space Science, Chalmers University of Technology, Sweden

[3]Technische Universität Hamburg-Harburg, Germany

[4]Institut für Meteorologie und Klimaforschung, Forschungszentrum Karlsruhe, Germany

[5]Instituto de Geofísica, Universidad Nacional Autónoma de México, Mexico

Abstract. Sulfur dioxide emissions from the Popocatépetl volcano in central Mexico were measured during the MILAGRO field campaign in March 2006. A stationary scanning DOAS (Differential Optical Absorption Spectrometer) was used to monitor the SO_2 emissions from the volcano and the results were compared with traverses done with a COSPEC from the ground and a DOAS instrument on board an ultra-light aircraft. Daytime evolutions as well as day-to-day variation of the SO_2 emissions are reported. A value of 2.45±1.39 Gg/day of SO_2 is reported from all the daily averages obtained during the month of March 2006, with large variation in maximum and minimum daily averages of 5.97 and 0.56 Gg/day, respectively. The large short-term fluctuations in the SO_2 emissions obtained could be confirmed through 2-D visualizations of the SO_2 plume measured with a scanning imaging infrared spectrometer. This instrument, based on the passive detection of thermal radiation from the volcanic gas and analysis with FTIR spectrometry, is used for the first time for plume visualization of a specific volcanic gas. A 48-h forward trajectory analysis indicates that the volcanic plume was predominantly directed towards the Puebla/Tlaxcala region (63%), followed by the Mexico City and Cuernavaca/Cuautla regions with 19 and 18% occurrences, respectively. 25% of the modeled trajectories going towards the Puebla region reached altitudes lower than 4000 m a.s.l. but all trajectories remained over this altitude for the other two regions.

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