

The Tropospheric Chemistry of Volcanic Plumes

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The potential consequences of major releases of volcanic volatiles are well known - for example, the devastating agricultural and animal and human health impacts across Europe of the 1783-84 Laki fissure eruption in Iceland have been widely reported. The development of models to predict the environmental and environmental health impacts of such eruptions requires a better understanding of the atmospheric chemistry of tropospheric volcanic plumes and the rates at which they deposit volatile components (S, Cl, F, heavy metals, etc). We report here preliminary results obtained from an intensive field campaign at Masaya volcano, Nicaragua, conducted in December 2001. This volcano sustains high emissions of sulfur and halogen gases, and sulfate particles, and its low elevation and surrounding topography permit a range of upwind-downwind and diurnal experiments. The overall aim of our work is to clarify the chemical partitioning between the coupled aerosol/liquid droplet and gaseous phases of the plume. Filter packs, diffusion tubes, a 10-stage impactor and a miniature ultraviolet spectrometer were deployed in order to characterize the concentration, composition and fluxes of gas emissions; and concentration, composition, fluxes and size range of aerosols over a variety of timescales, and in different parts of the plume. These data, together with the results from previous campaigns, will be used to parameterize and test a dispersion and atmospheric chemistry-transport model for Masaya, leading to a greater understanding of the atmospheric impact of such passively degassing volcanoes.