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Evaluating SO2 Lifetime and Sulphate aerosol Production in tropospheric Volcanic Plumes: A Combined Analysis of OMI and POLDER-3 Observations for a Case Study of Kilauea Volcano

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This study focuses on quantitative analysis of the formation, evolution, and dispersion of tropospheric volcanic sulphate aerosol. In pursuit of this objective, we collaborated on an extensive examination of polar-orbiting satellite data, with a particular focus on the Ozone Monitoring Instrument (OMI) to monitor sulphur-rich emissions and track the propagation of volcanic plumes. Furthermore, we utilized multi-wavelength, multi-angle, and polarization POLDER satellite observations, which have a superior sensitivity to fine mode particles, including sulphate aerosols. These observations were retrieved using the advanced GRASP/Component [1] algorithm, which facilitated the characterization of the aerosols and their optical properties, thereby enabling us to gain insight into the dynamics and lifecycle of Kilauea Volcanic sulphate Aerosols and ash presence in the volcanic plume over Kilauea. Additionally, the unique geographical and meteorological features of Kilauea, a volcano located in Hawaii, USA, offered an ideal opportunity to study the physicochemical properties of volcanic origin sulphate aerosols and ash particles.

Our in-depth analysis of Kilauea volcano's degassing activities from 2006 to 2012, encompassing passive and eruptive periods, offers valuable insights into the formation, evolution, and dispersion of tropospheric volcanic sulphate aerosol under various conditions, including seasonal variations, degassing intensity, and prevailing meteorological factors such as cloud fraction, relative humidity, and wind speed. These findings contribute greatly to our understanding of the complex mechanisms influencing the lifecycle and formation of volcanic secondary sulphate aerosol and detection of volcanic ash in the troposphere.
Keywords: volcano, aerosol, sulphate, Aura/OMI, PARASOL/POLDER, GRASP/Component, Kilauea

References

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