



Particle sizes and concentrations of volcanic aerosols of the 2018 Kilauea Lower East Rift Zone Eruption

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In May 2018, Kīlauea volcano erupted in the Lower East Rift Zone on the Island of Hawai'i, 24 fissures opened and lava was carried in a relatively stable ~ 13 km channel to the ocean. Two main volcanic plumes were produced; one from degassing at the active Fissure 8 and the other from interaction of lava and sea water creating a "laze" plume. During the time of the eruption a significant increase in volcanic air pollution (vog) was experienced in downwind areas, particularly on the leeward side of the island, along the Kona coast. This project investigates the aerosols at the volcanic source and downwind in the impacted communities.

During a 3-week field campaign in July-August 2018, we sampled volcanic aerosols at near-source and downwind locations. Measurements within both the Fissure 8 and laze plumes were made in-situ using an optical particle counter mounted on a UAS (Unmanned Aircraft System). Significantly higher concentrations of particulate were measured in the laze plume than in the Fissure 8 plume. Fifty-four % of the particles measured within the Fissure 8 plume were found to be $< 1 \mu\text{m}$ in diameter. In contrast, the predominant (71%) particle size within the laze plume was between $1 \mu\text{m}$ to $2.5 \mu\text{m}$ in diameter.

Additionally, eight temporary monitoring stations were established in populated areas around the island to investigate the distribution of volcanic aerosols at ground-level. Downwind stations, up to 60 km distant from the eruption site, recorded relatively low aerosol concentrations (maximum 24-hour average of $25 \mu\text{g}/\text{m}^3$). However, higher concentrations of up to $35 \mu\text{g}/\text{m}^3$ (24 hour average) were recorded in Kona and Ocean View stations, ~ 100 km distant. This is comparable with the EPA National Ambient Air Quality Standards for PM_{2.5}*. Analysis of Hawai'i Department of Health aerosol measurements in Kona throughout the eruption period shows that 24-hour average aerosol concentrations spiked at $58 \mu\text{g}/\text{m}^3$ in late May 2018.

* United States Environmental Protection Agency National Ambient Air Quality Standards, available at <https://www.epa.gov/criteria-air-pollutants/naaqs-table>.