Aerosol chemistry of the 2018 Kīlauea Lower East Rift Zone eruption – from source to exposed communities

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In 2018, an opportunity arose to characterise the size-resolved chemistry and air quality impacts of a significant ash-poor volcanic plume when a sequence of fissures opened in a populated area on the Lower East Rift Zone (LERZ) of Kīlauea Volcano, Hawai'i. During a 3-week campaign in July-August 2018, we sampled the plumes associated with the active Fissure 8 (F8) vent and the lava ocean entry. Fluxes of metal and metalloid elements were approximately two orders of magnitude greater than when measured in 2009 for emissions from Halema`uma`u lava lake at Kīlauea's summit (e.g., for Cu, 211±80 kg/day in 2018 *vs*. ≤8.6 kg/day in 2009 [1]). However, element/SO_2 ratios are similar between the two eruptive periods.

A monitoring network was established in populated areas around the Island of Hawai'i during the field campaign and we sampled the aerosol every 2–3 days (at Kona, Ocean View, Pahala, Volcano Village and the NOAA Mauna Loa Atmospheric Observatory). At up to 60 km distant from the eruption site, relatively low aerosol concentrations were recorded (maximum 24 hr average = 25 $\mu g/m^3$). Higher concentrations of up to 58 $\mu g/m^3$ (comparable with the 35 $\mu g/m^3$ EPA National Ambient Air Quality Standards level for PM2.5) were recorded ~100 km from F8. We also clearly demonstrate the conversion of sulfur in the plume from ~100% SO_2 gas at source to up to ~25% particulate sulfate (SO_4^{2-}) at downwind stations. We find evidence of metal depletion in the volcanic plume downwind, with variability in the metal/SO_2 ratios between near- and far-field sites beyond that which can be attributed to plume dilution, addition of ash and SO_2 dissolution or oxidation.

[1]Mather *et al*. (2012), *GCA* **83**, 292-323.