Air quality impacts of the 2018 Kīlauea eruption

LEVI GOLSTON[12*], DA PAN[1], XUEHUI GUO[1], NATHAN LI[1], RUI WANG[1], LEI TAO[1], JAMES MCSPIRITT[1], EMMA YATES[23], AND MARK ZONDLO[1]

[1] Department of Civil and Environmental Engineering, Princeton University, Princeton, NJ, USA
[2] Atmospheric Science Branch, NASA Ames Research Center, Moffett Field, CA, USA (correspondence: levi.m.golston@nasa.gov)
[3] Bay Area Environmental Research Institute, Moffett Field, CA, USA

From May to August 2018, residents of the Island of Hawai'i were affected by a major eruption of Kīlauea with activity at the summit and lower East Rift Zone (LERZ). Sulfur dioxide (SO_2) emissions significantly increased throughout the LERZ, causing localized hazardous conditions and enhanced fine particulate matter ($PM_{2.5}$) downwind, worsening air quality. Here, we analyze multiple available surface network and satellite datasets to better understand the air quality impact of the eruption. Observational data are compared to a Lagrangian transport model, which bridges spatial and temporal gaps to estimate average SO_2 and $PM_{2.5}$ concentrations throughout the island. Orographic influence led to degraded air quality mainly in downwind coastal areas, especially the populated western coast of Hawai'i. During June and July SO_2 concentrations in Ocean View (100 km from Fissure 8) exceeded the 75 ppbv 1-hr NAAQS standard 13% of the time. Also, $PM_{2.5}$ levels in Ocean View and Kona increased threefold compared to pre-May 2018 conditions. OMI and OMPS column SO_2 retrievals showed evidence of an increase in May with relatively constant emissions in June and July. Air quality significantly improved when the eruption winded down in early August, with <5 ppbv SO_2 and <5 μg m^{-3} $PM_{2.5}$ reflecting low volcanic emissions. The approach coupling SO_2 satellite and ground-based measurements with air quality modeling could be applied to future eruptions, providing more accessible information relevant to specific locations.