Haleakala Crater (HACR1) 2019 Site Report

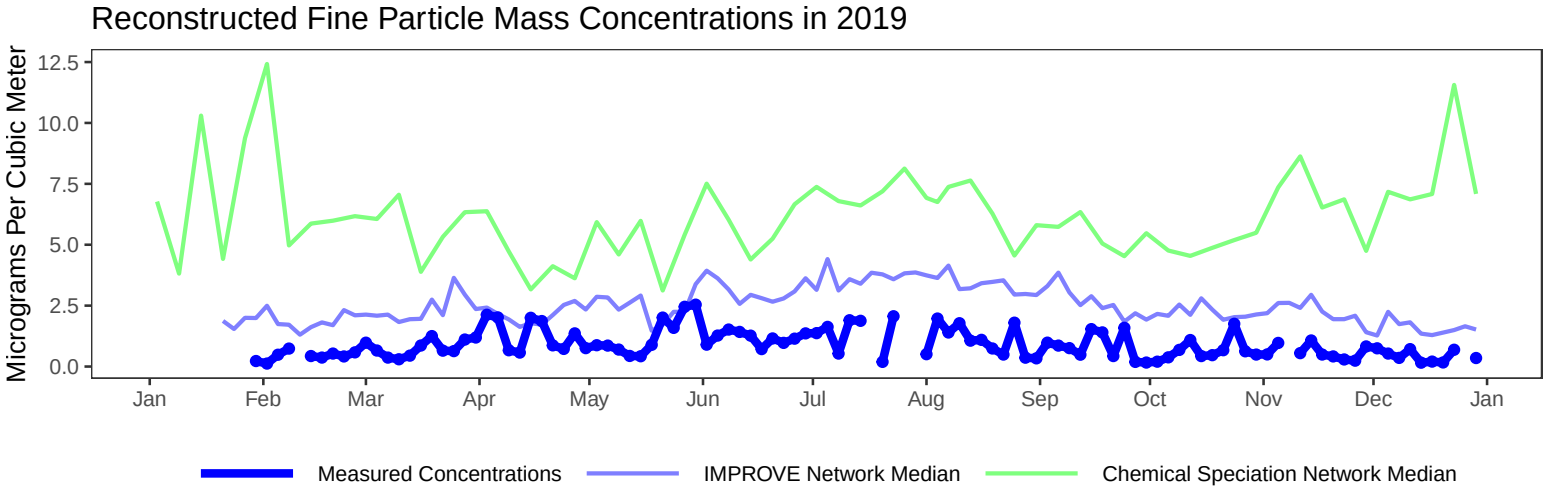
The Interagency Monitoring of Protected Visual Environments (IMPROVE) is a long-term air pollution measurement program designed to document and track visibility in protected areas. IMPROVE samples and analyzes the haze particles that impair visibility so their sources can be identified and addressed.

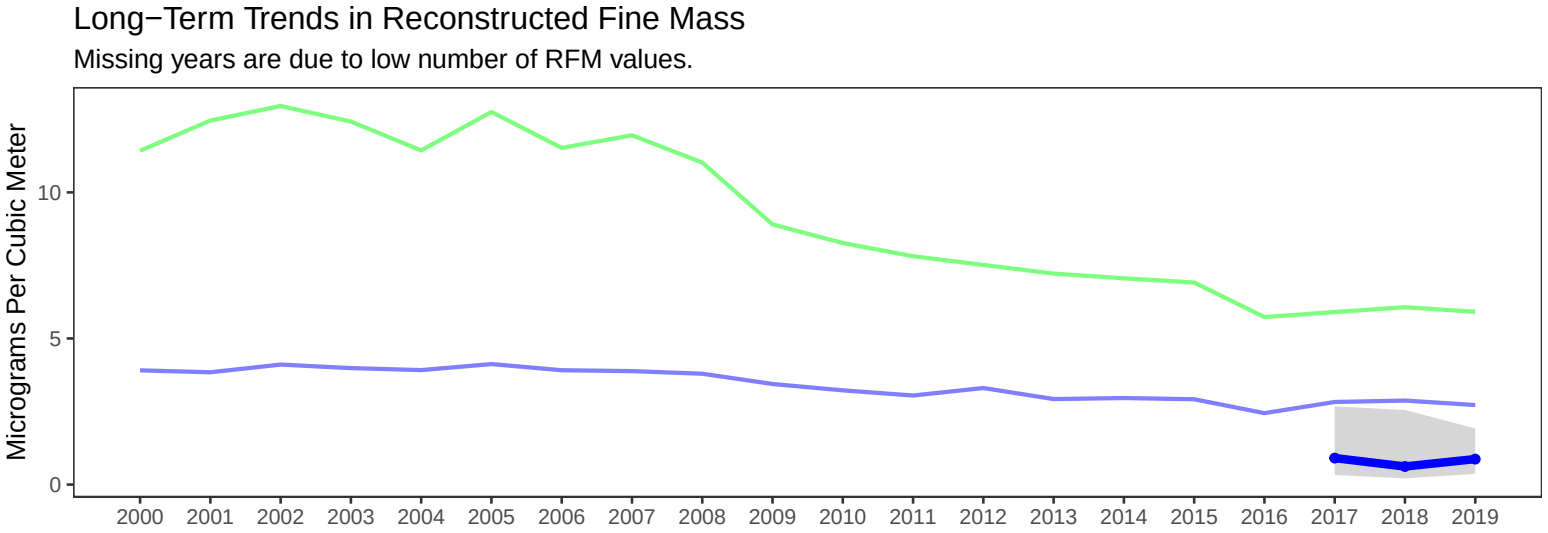
Percent of Samples from HACR1 Successfully Collected and Analyzed Per Year

2017	2018	2019
94	88	86

Samples Successfully Collected and Analyzed in 2019 by Filter Type. PTFE: 106 (87.6%), Nylon: 106 (87.6%), Quartz: 106 (87.6%)

In the plots below, mass concentrations measured at Haleakala Crater give a sense of the seasonal trends of air quality in the area as well as show significant air quality events such as wildfires and dust storms. These are plotted alongside the average measurements across the IMPROVE network as well as its related Chemical Speciation Network (CSN). The CSN sites are located in urban areas where the populations are highest. In general, lower concentrations would suggest better visibility. The lower plot shows annual median concentrations with a gray shaded region to represent the 10^{th} and 90^{th} percentiles.

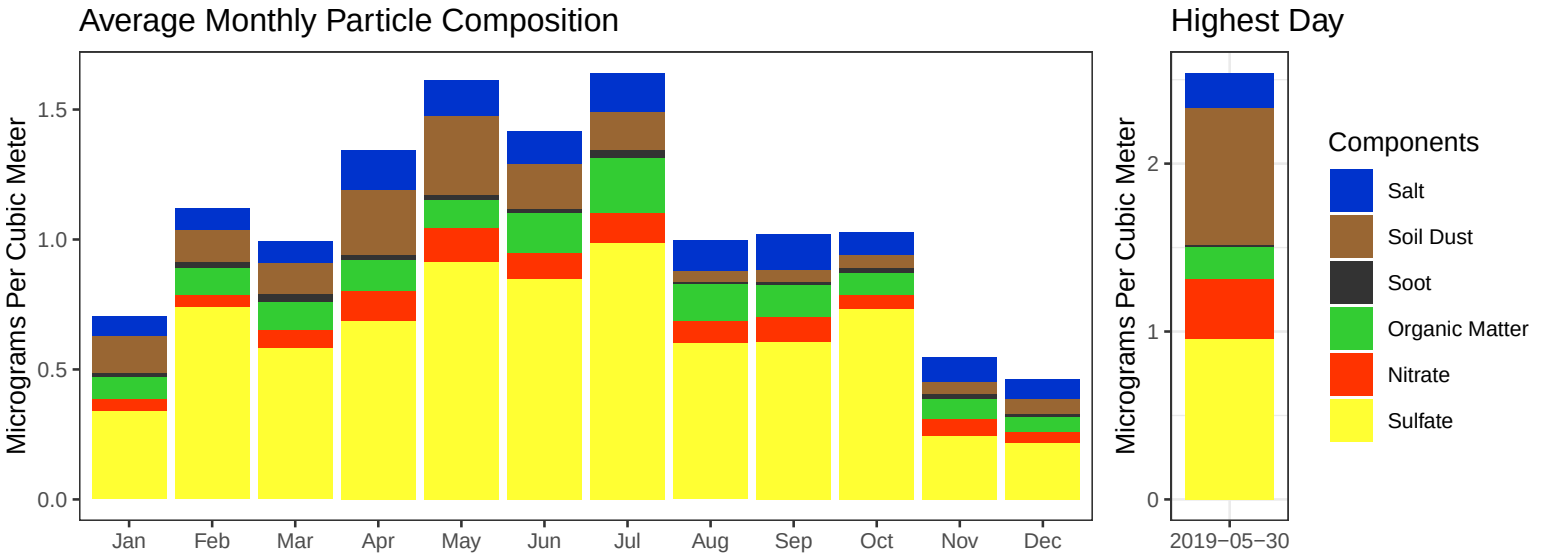




More Information

To view and download IMPROVE data, you can visit: https://www.epa.gov/outdoor-air-quality-data
The Univ. of California, Davis website with information about current research and publications: https://aqrc.ucdavis.edu/
The Colorado State Univ. website with data resources, literature, and visibility overviews: http://vista.cira.colostate.edu/Improve/
The EPA website with guidance documents and background information: https://www.epa.gov/amtic/chemical-speciation-network-csn
Real-time air monitoring data for the United States: https://www.airnow.gov/

The following plots summarize the chemical composition of particles collected at this site. The monthly averaged compositions calculated from 2017-2019 data are shown on the left while compositions for the day with the highest measured concentrations during 2019 are shown on the right.



Components	Calculation	Natural Sources	Anthropogenic Sources
Salt	$1.8 \cdot Chloride$	Ocean spray, dry lakebeds	Chemical manufacturing, lake consumption
Soil Dust	$2.2 \cdot Al + 2.49 \cdot Si + 1.63 \cdot Ca + 2.42 \cdot Fe + 1.94 \cdot Ti$	Soil resuspension, dust storms long-range transport	Construction, agriculture, deforestation, unpaved roads
Soot	$Elemental\ Carbon$	Wildfires	Motor vehicles, wood burning, smoking
Organic Matter	$1.4 \cdot Organic\ Carbon$	Plants, animals, wildfires	Motor vehicles, cooking oils, household cleaners
Nitrate	$1.29 \cdot Nitrate$	Plants, animals	Fertilizer, stock yards, chemical manufacturing
Sulfate	$4.125 \cdot Sulfur$	Volcanism	Coal-fired power plants, chemical manufacturing

The following map shows the average RFM concentrations for nearby sites in both CSN and the rural IMPROVE Network. The point shapes indicate which network the sites are associated with. The color bar indicates the average annual RFM concentration (micrograms per cubic meter) measured at each site in 2019.