

High latitude dust in Alaska

Jingqiu Mao, Zhiwei Dong, Tianlang Zhao
University of Alaska Fairbanks

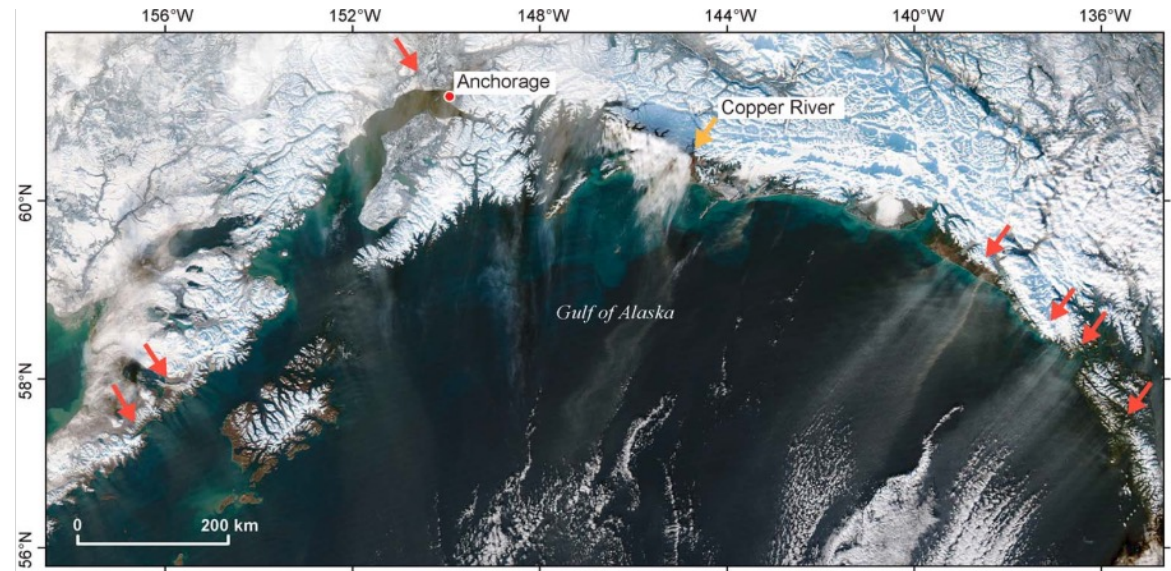


High latitude dust has become a major challenge for air quality and climate

Dust cloud at Copper River Valley, Alaska



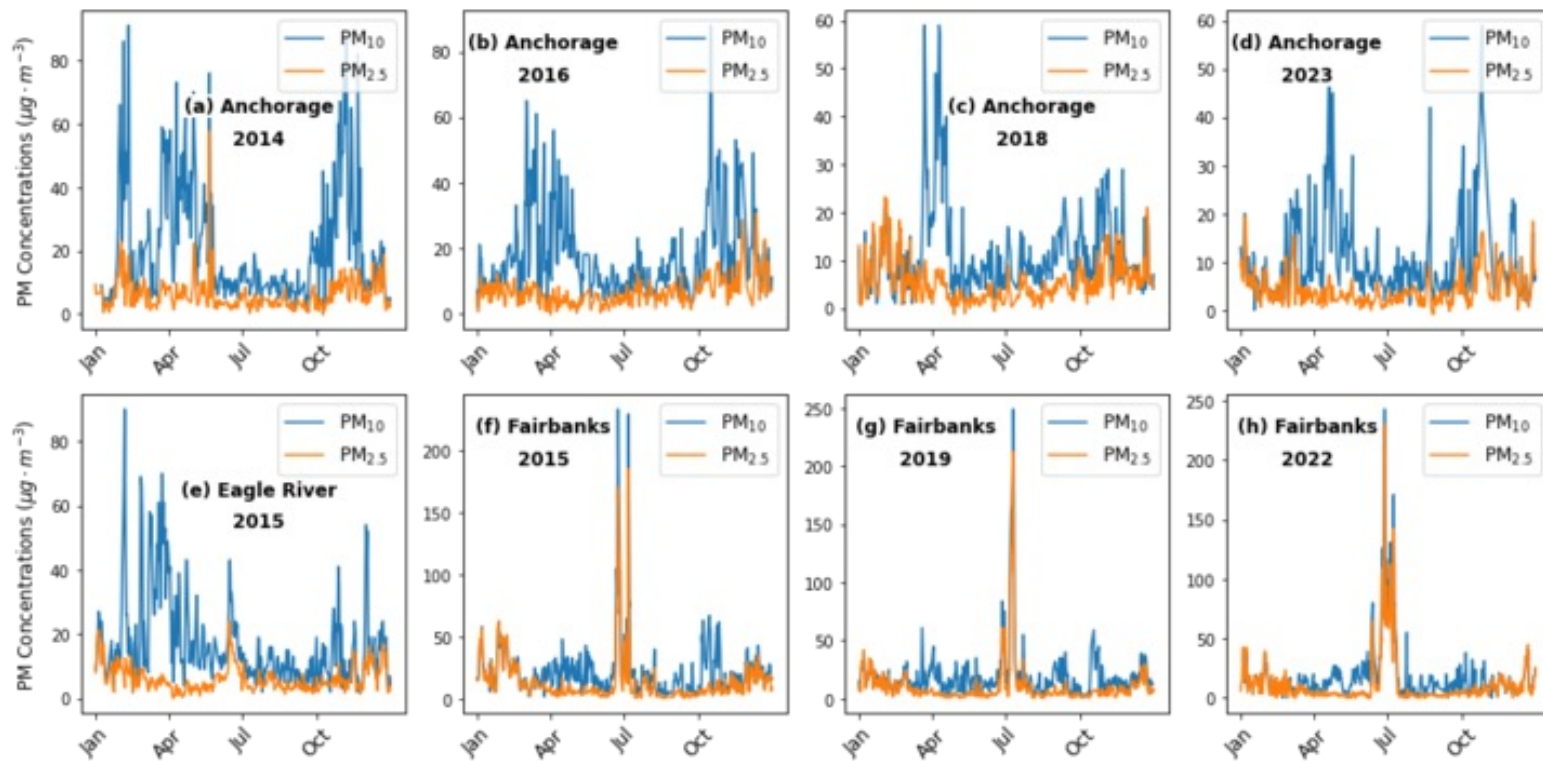
Glacier dust provides nutrient to the ocean phytoplankton



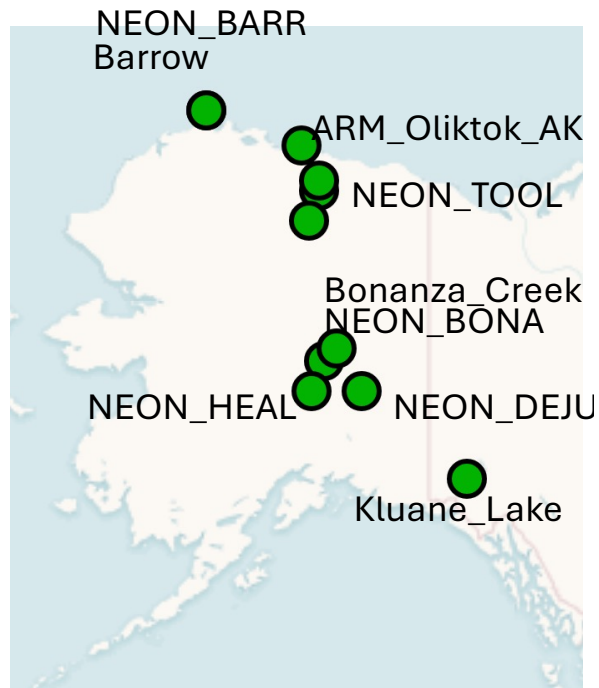
(Bullard et al., 2016)

<https://eos.org/science-updates/assessing-the-many-influences-of-high-latitude-dust>

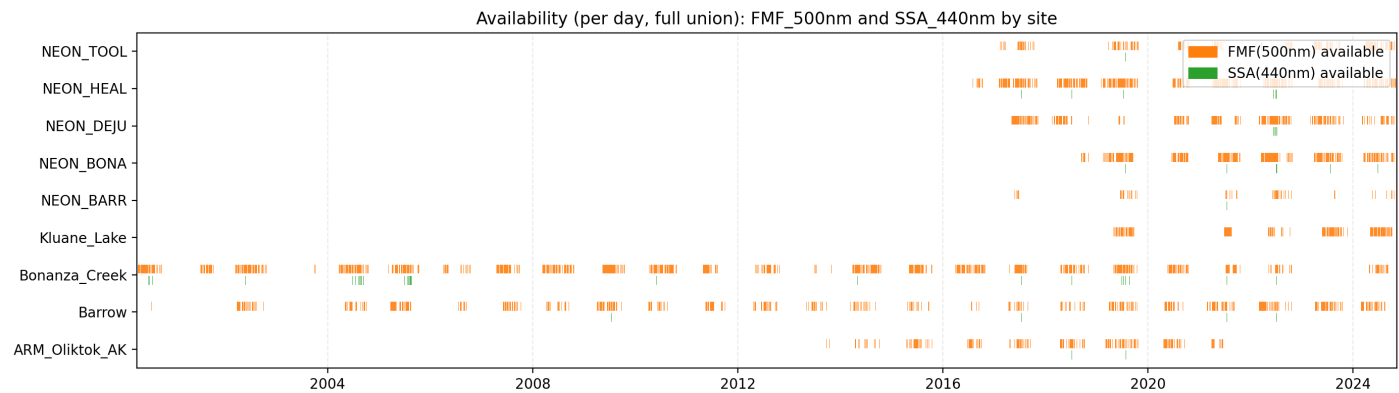
We can see dust from ground-based measurements



How much dust information we can get from AERONET in Alaska?



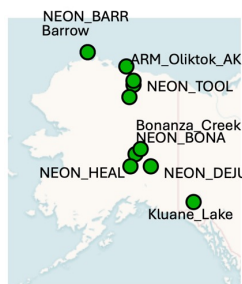
AERONET sites in Alaska



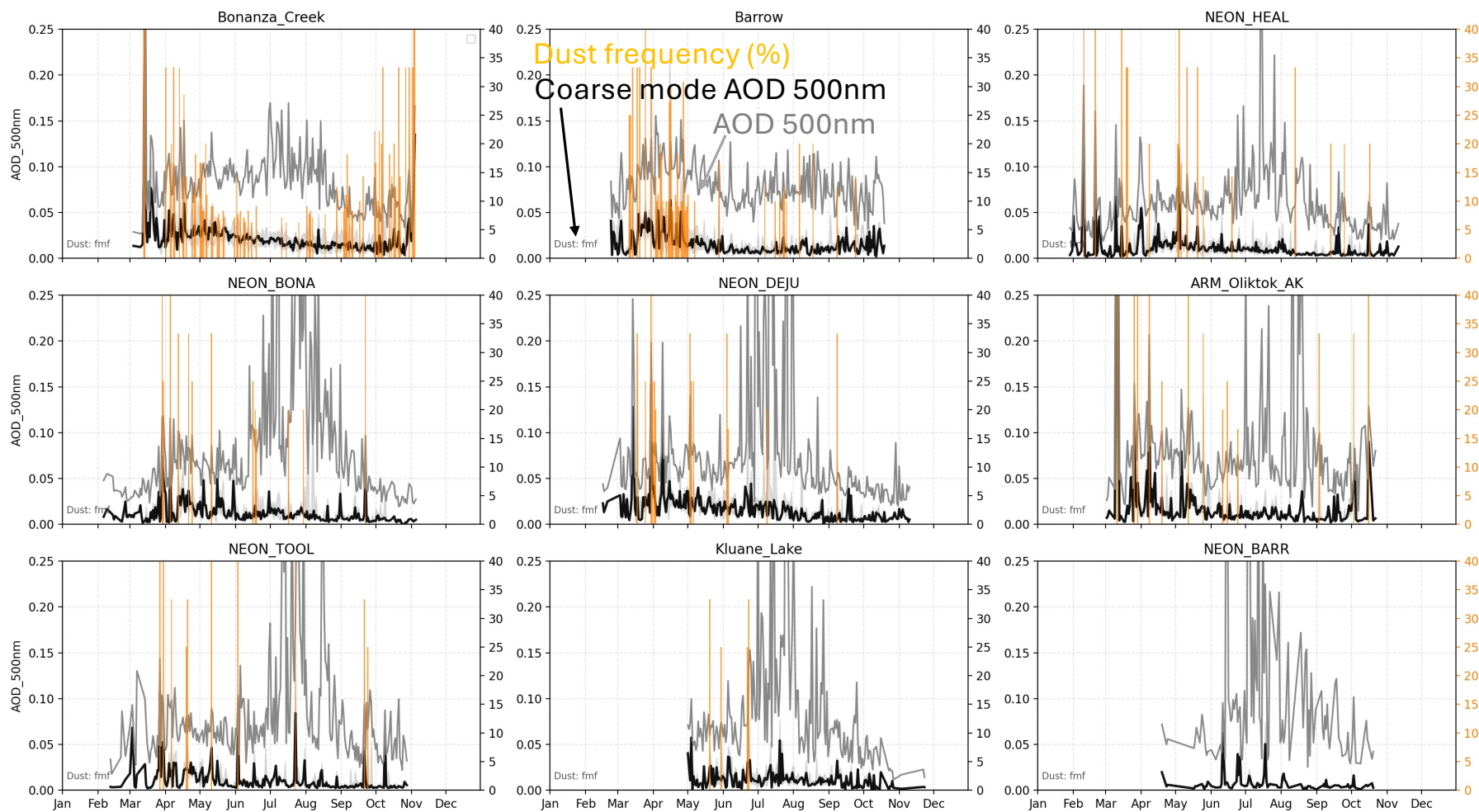
FMF_500nm is from the AERONET Spectral Deconvolution Algorithm (SDA) Retrievals

SSA_440nm is from the AERONET Aerosol Inversion Products (Version 3)

Dust events are frequent in Alaska in Spring and Fall



AERONET sites in Alaska



The Automated Surface Observing System (ASOS) in Alaska

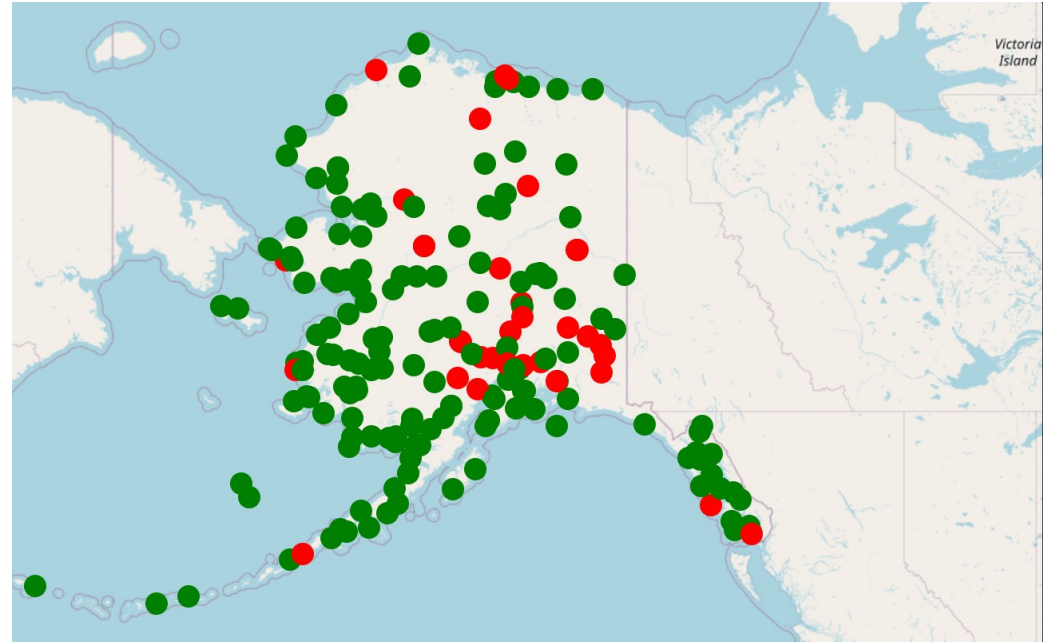
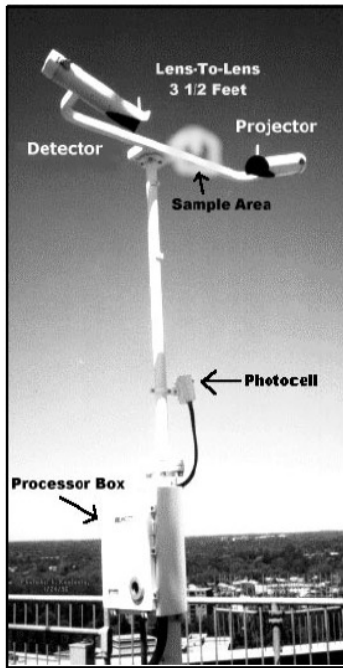
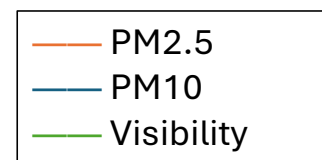
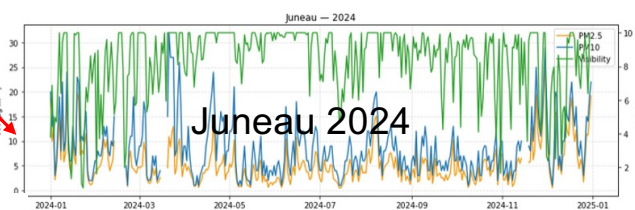
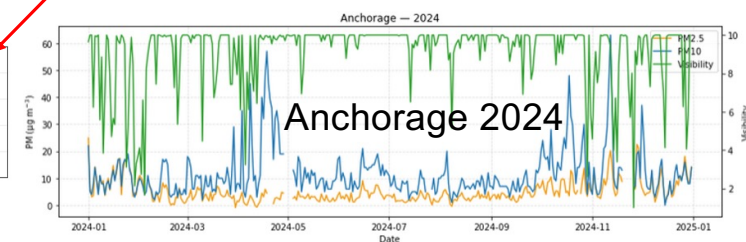
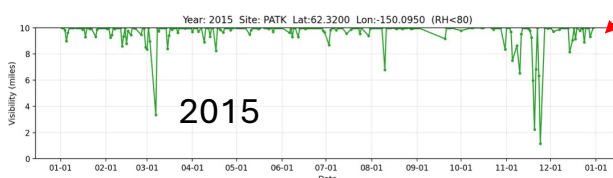
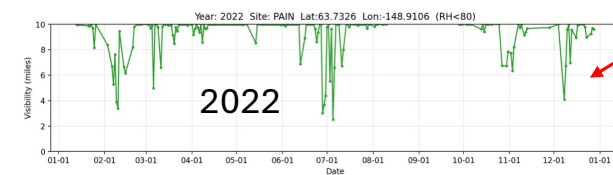
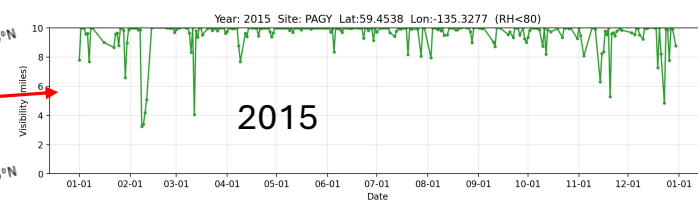
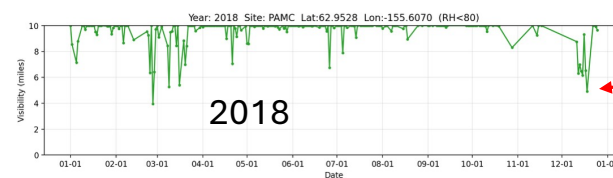
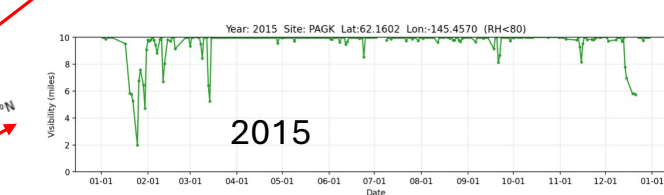
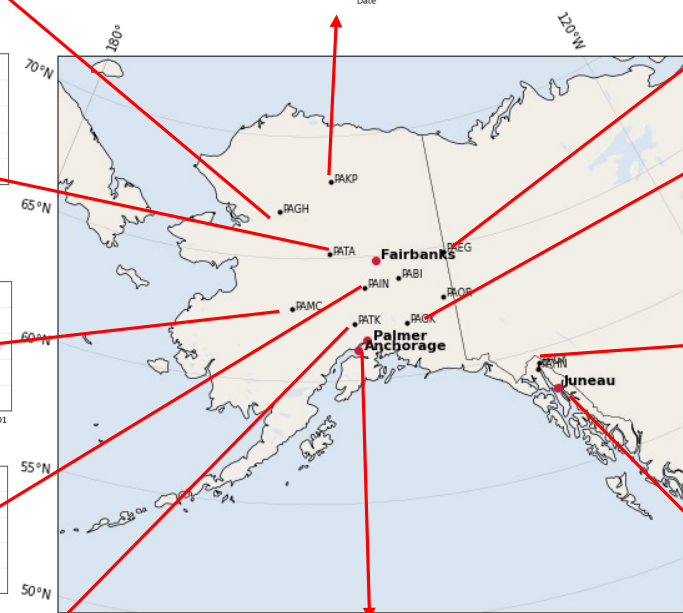
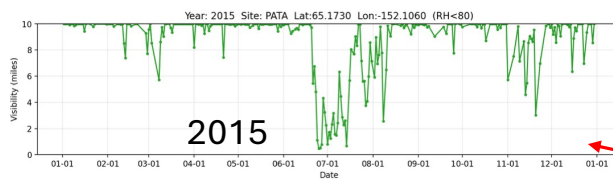
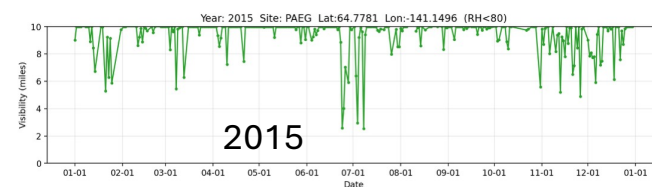
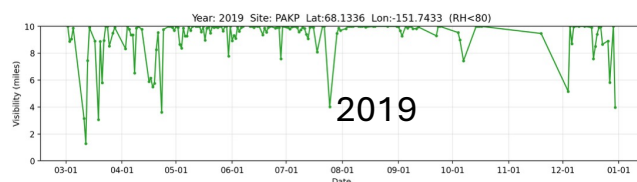
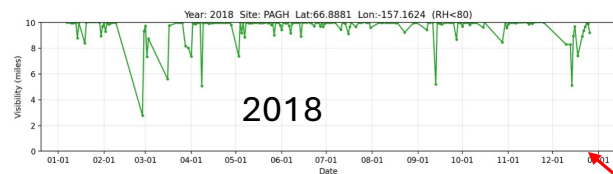


Figure 13. Forward Scatter Visibility Sensor



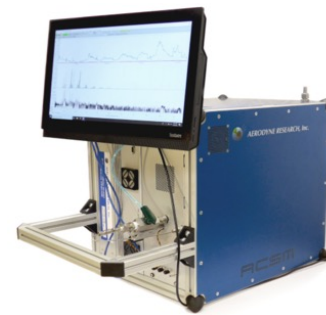
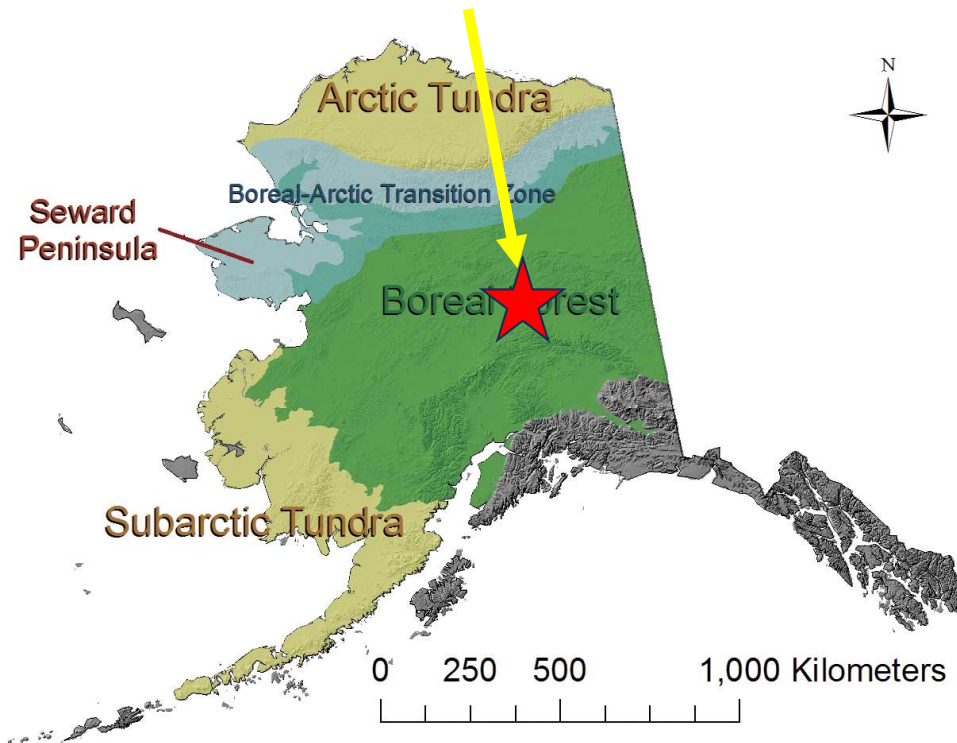
ASCENT site in Alaska boreal forest starts running since June of 2023

Co-located with NSF National Ecological Observatory Network (NEON)

Co-located with NASA AERONET network

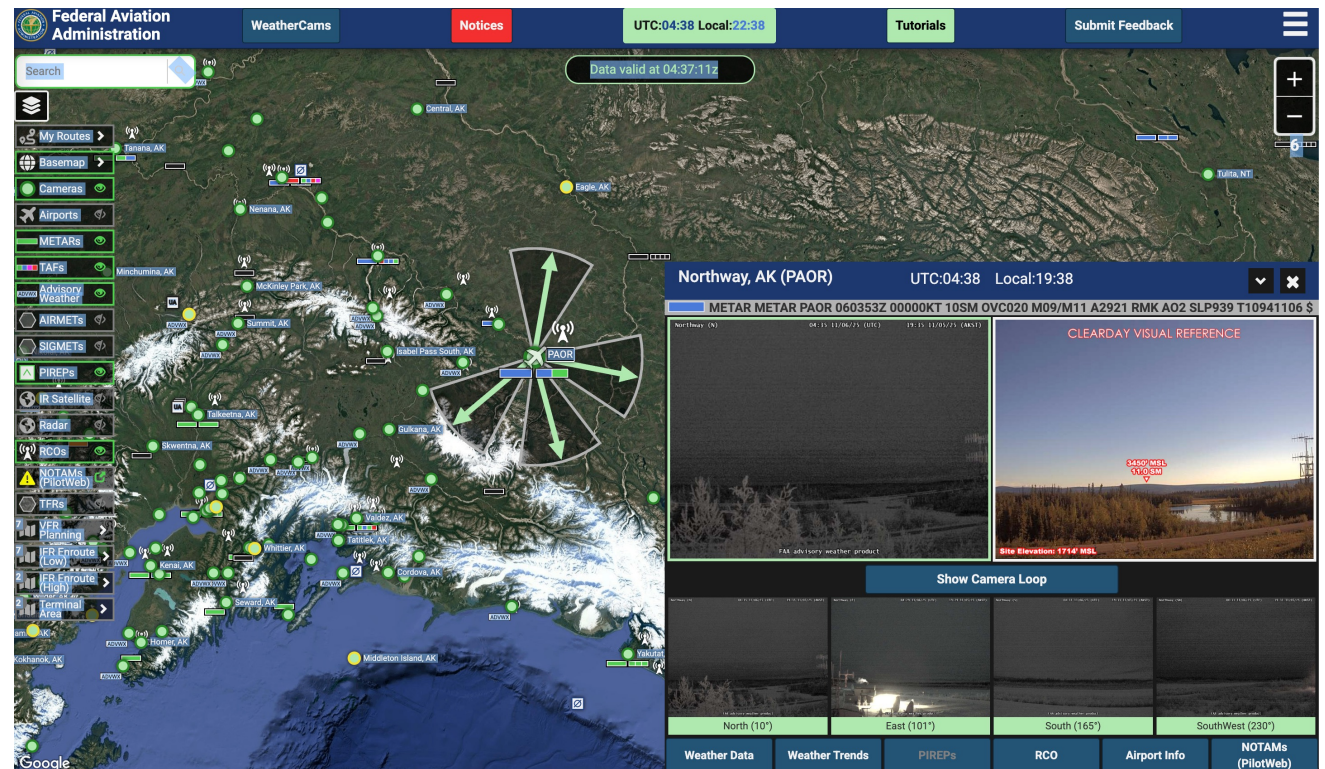
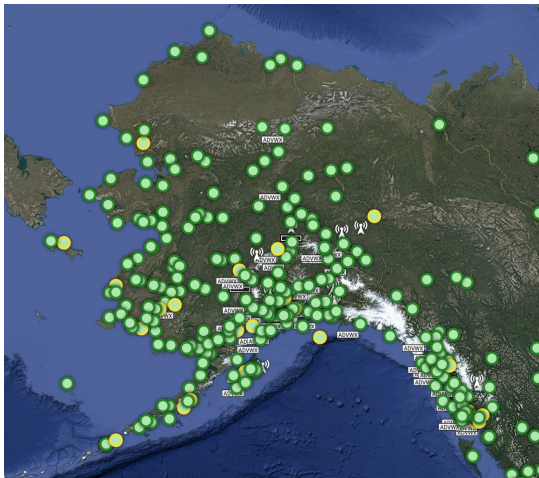
Continuous measurements of CO₂, CH₄, H₂O, HCHO, NO₂ (MAX-DOAS) etc.

Solar Induced Fluorescence measurements

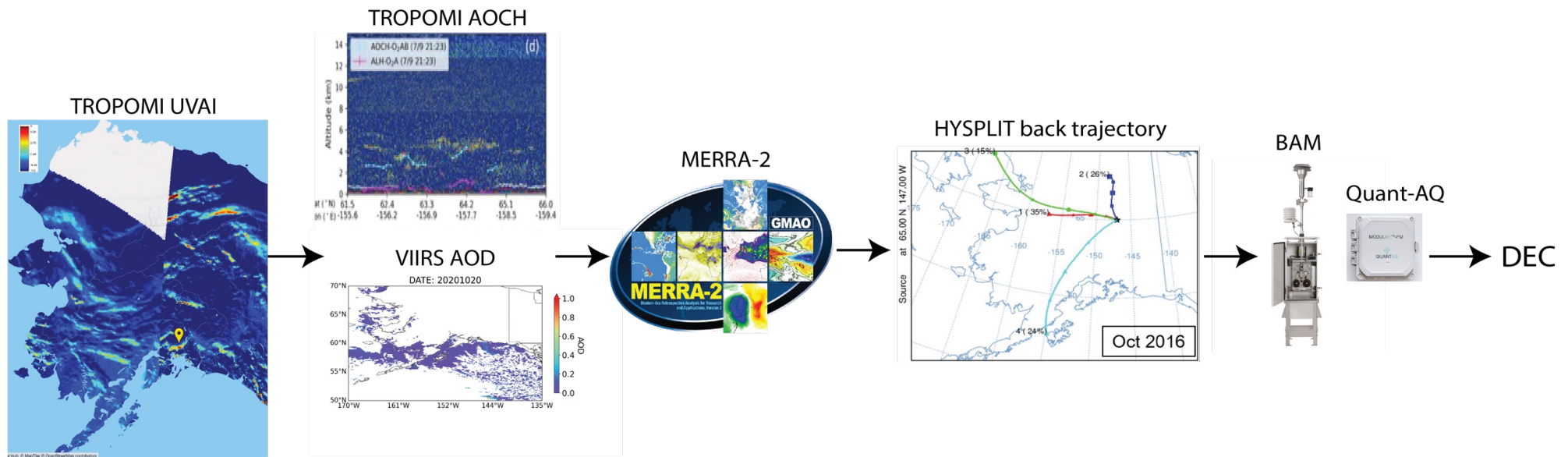


Another new way to identify dust events through FAA cameras

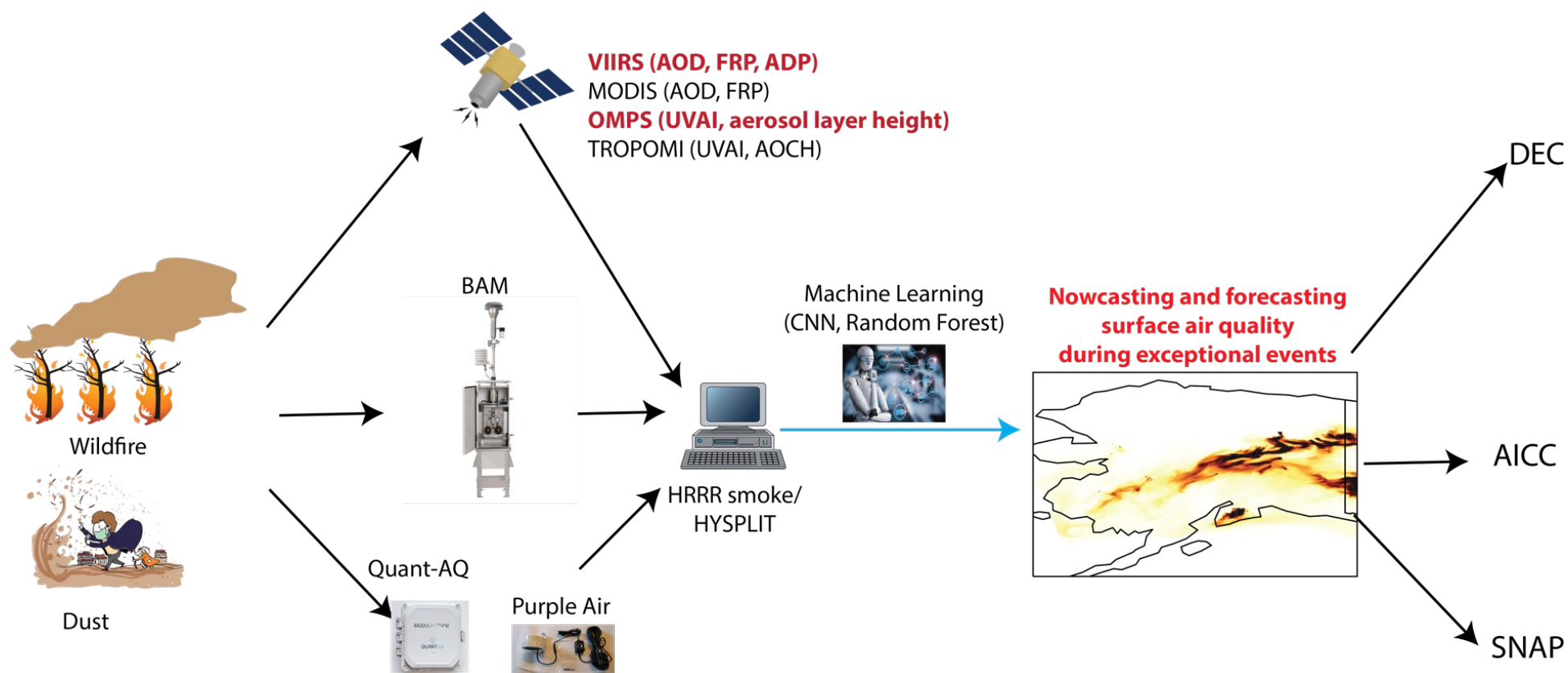
Visibility Estimation through Image Analytics developed by Mike Matthews at MIT Lincoln Lab



Can we use satellite to identify dust events?



Develop reliable air quality nowcast and forecast for Alaska



1. Direct broadcast from VIIRS for near-real-time nowcast.
2. Expanding low-cost sensor network with DEC.