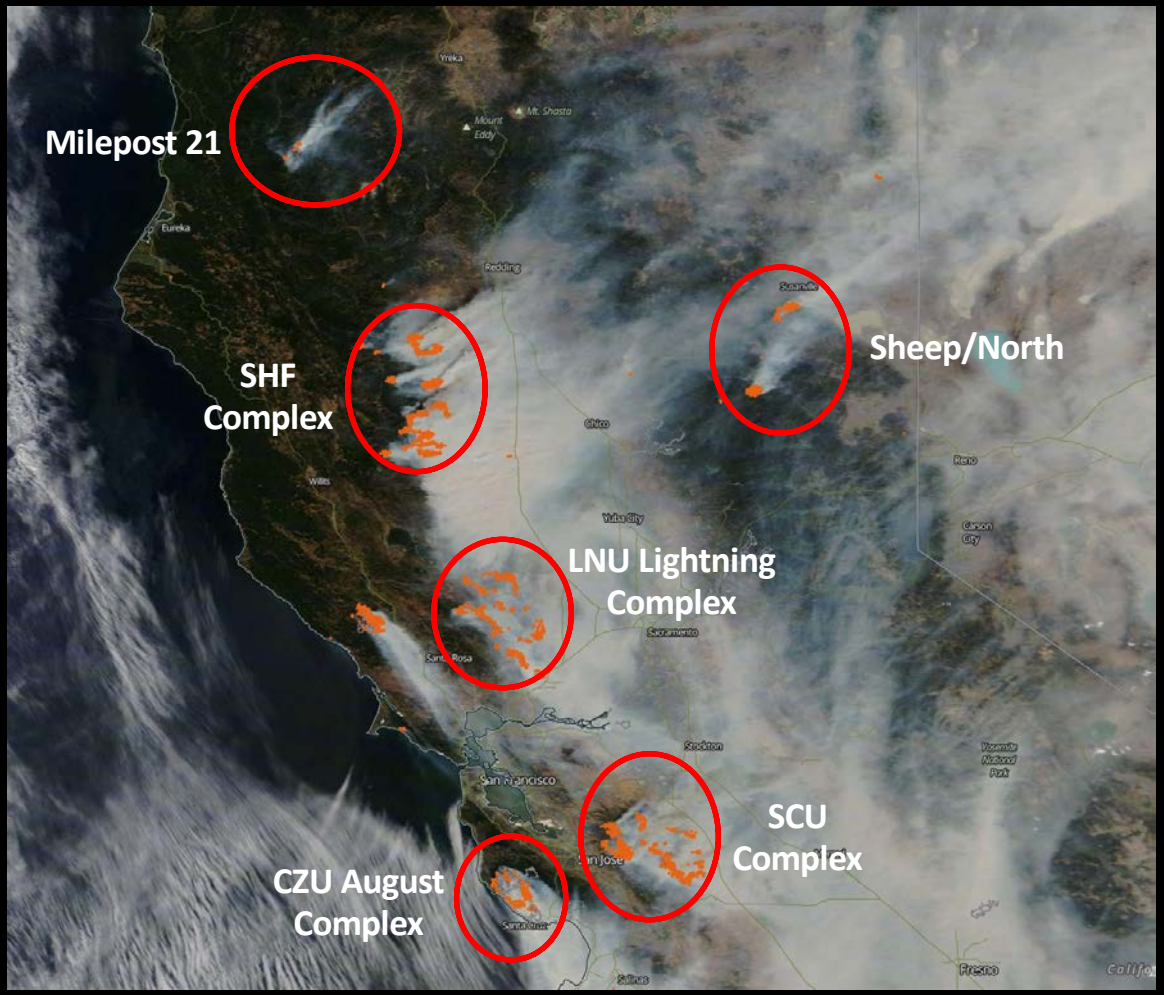
California fire plumes – *OVERVIEW – 20 August 2020*

MISR Active Aerosol Plume-Height (AAP) Project



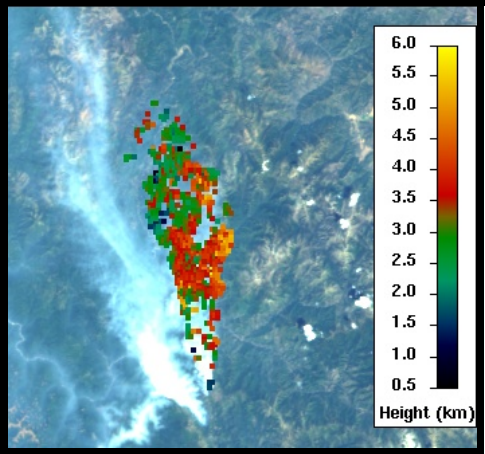
At least seven major wildfires were burning across California as early as ~10:30 AM local time on 20 August 2020. They are identified as hot-spots at 4 microns wavelength, highlighted as red dots and superposed on this true-color image from the ***MODIS*** instrument aboard the NASA Earth Observing System's Terra satellite. Wildfires tend to increase in intensity during the day, and fire activity usually peaks in the late afternoon.

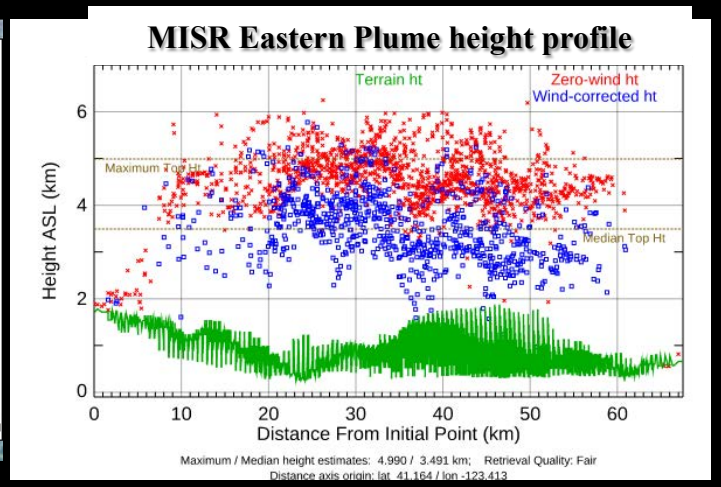
***K.J. Noyes, R. Kahn, J. Limbacher* / NASA GSFC**

California fire plumes – *Milepost 21 Fire*

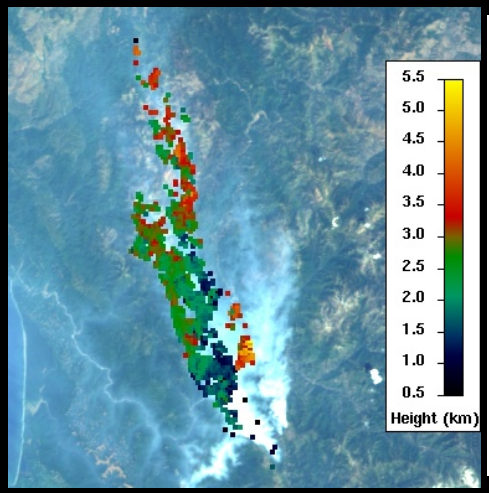
MISR Active Aerosol Plume-Height (AAP) Project 15 August 2020

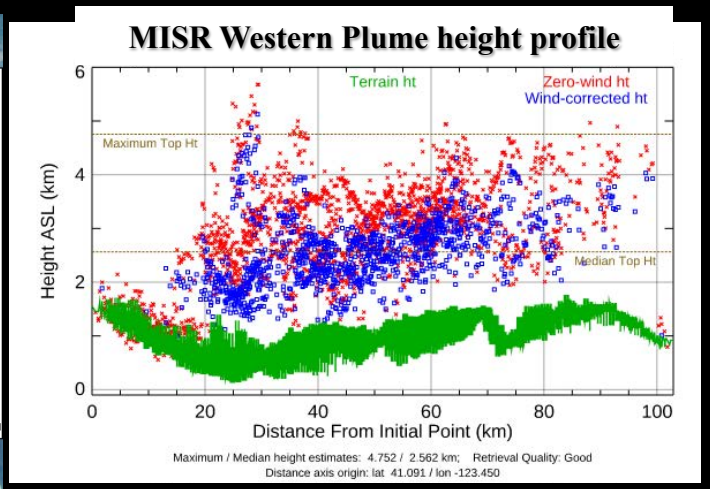
The Multi-Angle Imaging Spectro-radiometer (***MISR***), orbiting aboard NASA's Terra satellite, obtains less coverage than MODIS. However, MISR stereo imagery makes it possible to map ***injection heights*** and associated ***wind vectors*** for wildfire smoke and volcanic eruption plumes. With these data, we can also retrieve smoke ***particle properties***, track their evolution downwind, and distinguish them from metrological clouds.





On 15 August 2020, MISR observed the ***Milepost 21 fire*** *dispersing northward over Humboldt county in northern California*. Two hot spots are apparent in the imagery. The eastern part of the plume ***reached 4 km*** elevation, which is probably above the near-surface planetary boundary layer; up there, smoke tends to stay aloft longer and travel farther. The western part, at 2-3 km aloft, was apparently less intense, but it extended at least 60 km northward from the source. At plume elevation, ***winds were as high as 16 m/s***, based on the MISR retrievals.





Red = zero-wind height
Blue = wind-corrected height
Green = surface elevation

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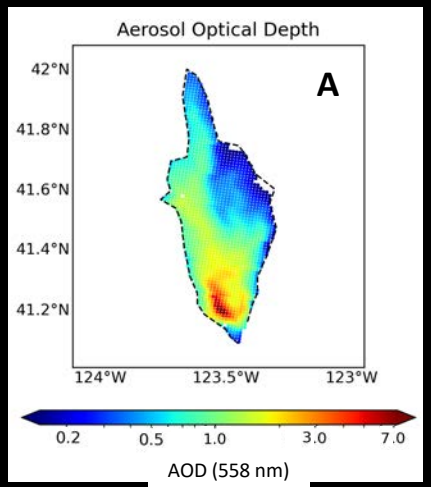
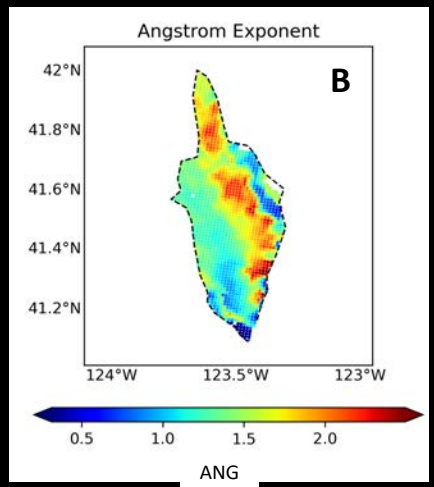
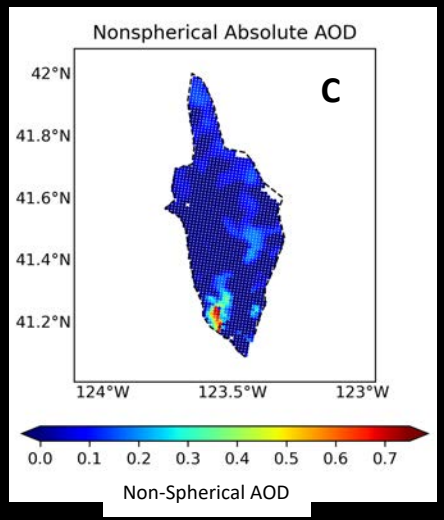
California fire plumes – *Milepost 21 Fire*

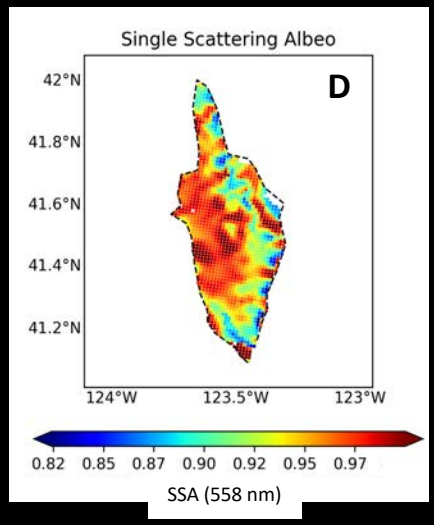
MISR Active Aerosol Plume-Height (AAP) Project 15 August 2020

MISR Research Algorithm (RA) – Aerosol Amount and Type Retrievals









The MISR Research Aerosol (RA) retrieval algorithm produced: (A) aerosol total-column amount (optical depth – AOD), (B) an aerosol size constraint (Angstrom Exponent (ANG), which *decreases* for increased effective particle size), (C) AOD of non-spherical particles, and (D) particle light-absorption (SSA, equal to 1 for non-absorbing particles, and <1 for darker particles).

In the Milepost 21 smoke plume, AOD reaches ~7 and the *particles tend to be large* (ANG ~0.5) *and dark* (SSA ~0.9) *very near the fire*. However, *AOD decreases rapidly* away from the source. Within 10 km downwind, differences between the two main sources are reflected in plume properties. The *eastern, more intense source, generated small* (ANG >2), *dark* (SSA ≤0.9) particles MISR identifies as black and brown carbon. The *western part* of the plume is *dominated by medium* (ANG ≤1.3), *brighter* (SSA ≥0.96) particles. The particles are *mostly spherical* throughout, except near the western source, where soil might be mobilized, and ≥50 km downwind, where background aerosol contributions are likely to be significant.

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