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
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 meteoroological 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.
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.