

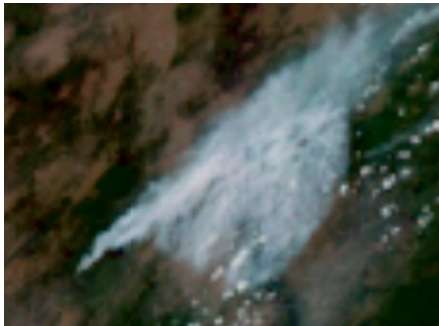
Mission Science Report
FIREX-AQ DC8
20190816
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Main targets:
Sheridan fire, AZ

Remote Sensing Targets:
Sheridan fire, AZ
Castle fire, AZ
Ike fire, AZ
Boulin fire, AZ
Little Bear fire, AZ

The main focus of the flight was joint observations (DC8 and ER-2) of the Sheridan fire in Arizona (which had been sampled the day before after generating a complex plume in stagnant conditions that also generated some pyroCu). With a late takeoff time (4:30 pm local) to a southern location, we also hoped to be able to characterize the changes in chemical processes caused by removal of sunshine. Before takeoff the ER-2 provided information that the smoke plume was definitely high enough to sample at Sheridan, and conditions were clear. The late takeoff time (~4:30 pm local) and the use of only one air conditioner lead to a very hot cabin, which affected some instruments early in the flight. En route to the fire, we were able to observe the Trumbull fire (quite small, un-organized plume).

Satellite imagery and the ER-2 showed that the plume from Sheridan spread widely after gaining intensity at 21:27 UTC. The plume appeared to generate a “pie wedge” of smoke such that smoke at every radius from the fire was of similar age; our sampling however, was not radial, and thus individual transects contained fairly distinct smoke with a well-aged portion (to the south), and a younger portion (on the northern side of the plume). Our initial investigation of the plume with the remote sensing instrumentation provided longitudinal lidar runs over the different sections of the southern plume. At that time the satellite image showed:

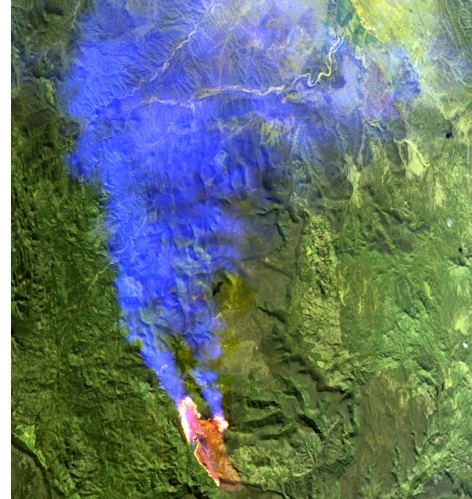


Sheridan at 24:21 UTC from GOES-EAST. College of Dupont
page.

The southern portion of the plume was spread out over a narrow depth, but long distance, such that transects further East from the fire extended over ~70 km with near-continuous smoke sampling over the whole length. Altitudes were chosen to maximize the value of the in situ data from this thin “sheet”.

We then conducted a thorough in-situ sampling regime with a ladder to the north east (with two repeated transects for aerosol testing and additional checks on smoke inhomogeneities. One small cumulous cloud was embedded within the smoke, and was sampled on one of these transects. Due to the length of the eastern transects, this only finished around sunset, and near the Boulin fire. We therefore overflew Boulin for MASTER before starting an ascent for an addition RS run.

By this point the fire had lost a lot of intensity, as revealed by satellite images up to sunset and by the RS run, which showed a long distance between the last significant smoke emitted and the fire. We initiated a second round of sampling in the IFR block, and attempted to capture the “last significant” smoke emitted, at the west end of the remaining plume, as well as a good portion of the plume to the west. We kept sampling in situ until we had more than 1-hour in-smoke data by 04:45 20190817 UTC. The return to Boise included MASTER/DIAL overflights to the north of Boulin, Ike, Castle, and Little Bear fires. Little Bear was not associated with a detectable IR signature, so was not recorded. En route to Boise, the DC8 rose to 38 kft to sample in situ a persistent layer of thin pollution that had been noted by the DIAL/HSRL team on previous flights.



eMAS image from the ER-2 overflight of the Sheridan fire on 20190816