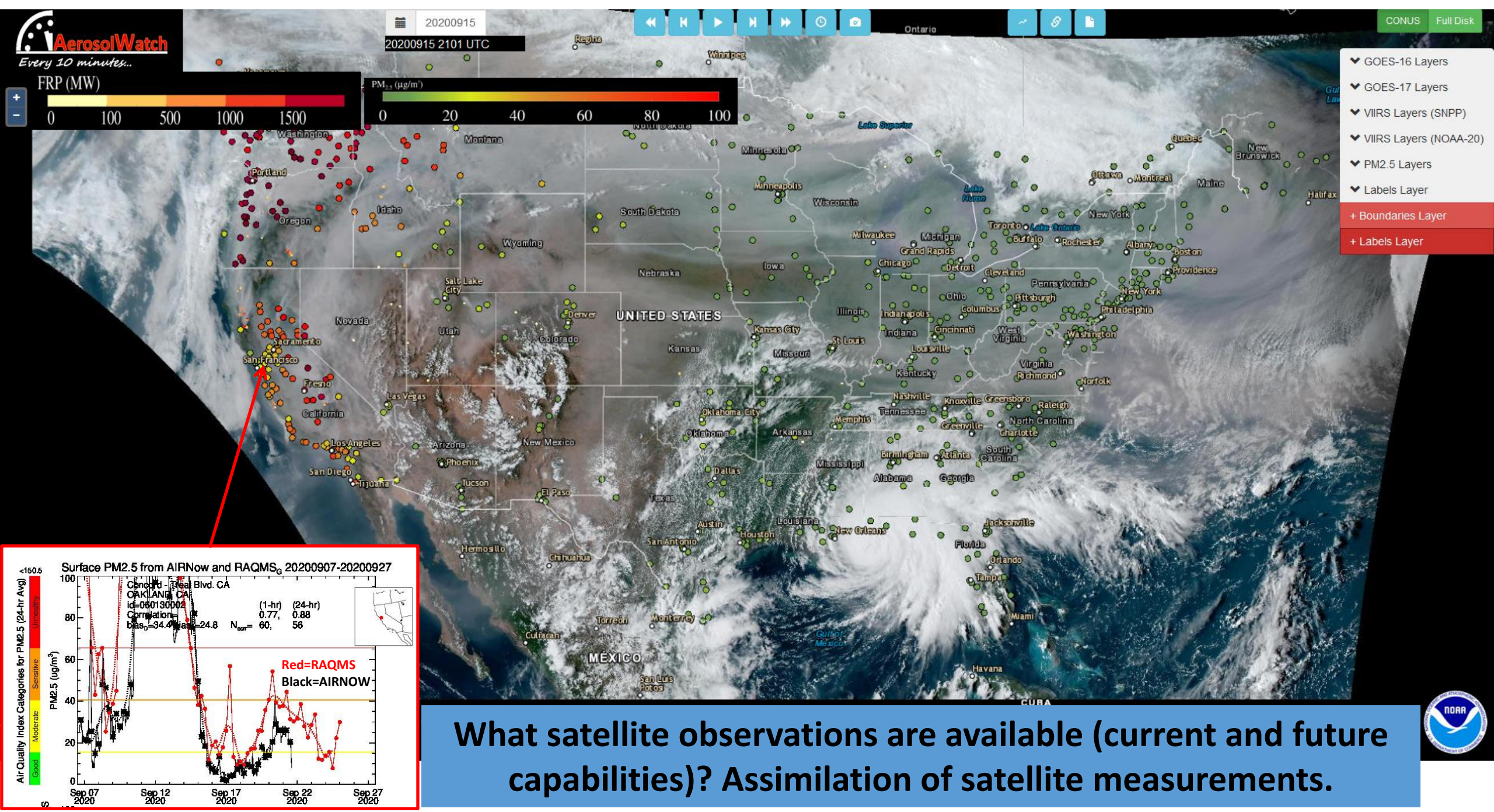
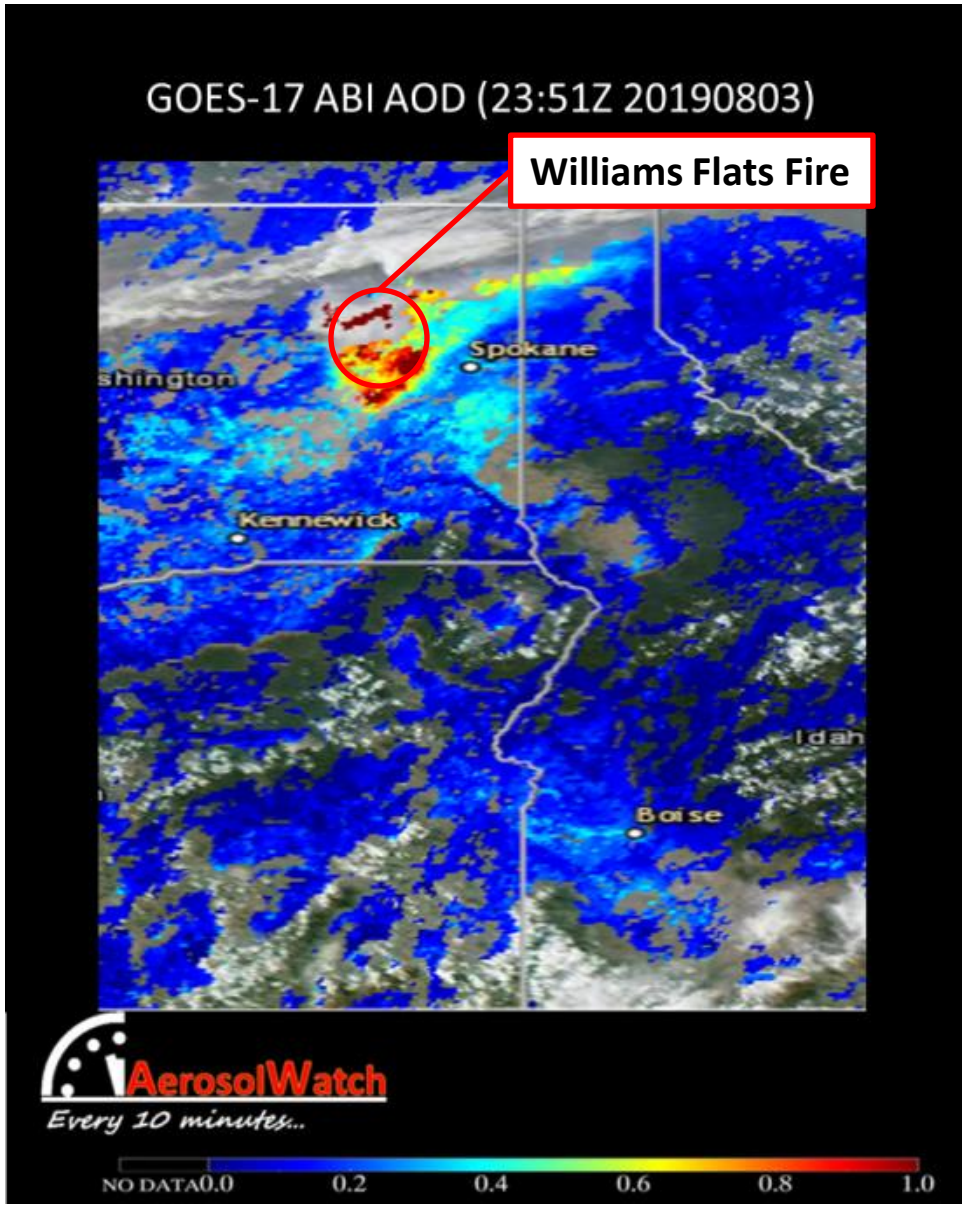
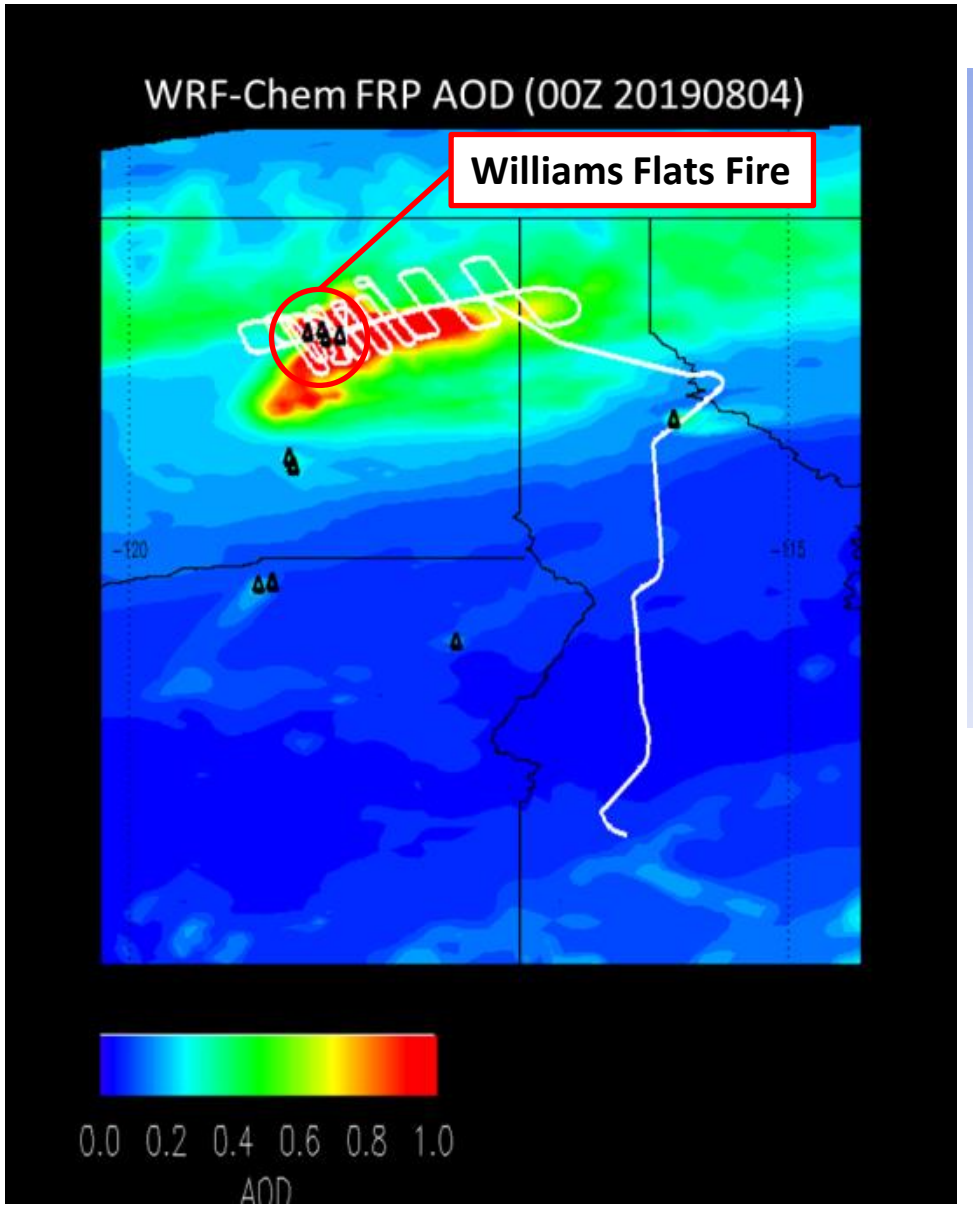


What satellite observations are available (current and future capabilities)? Assimilation of satellite measurements.

GOES ABI Aerosol Optical Depth (AOD) and WRF-Chem Fire Radiative Power (FRP) Experiments, August 03, 2019

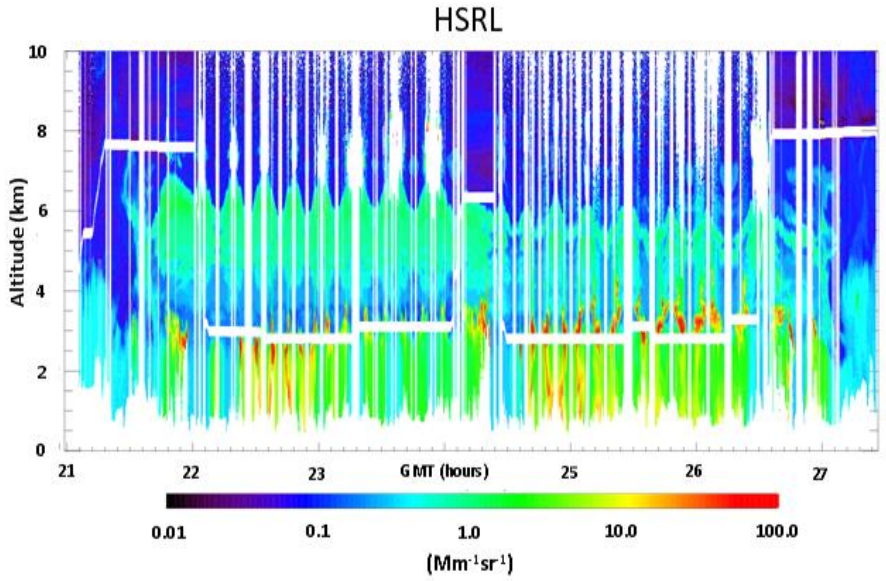




- Use of of 5-minute ABI FRP for wildfire emissions and injection heights following approach VIIRS in HRRR-Smoke
- High resolution (8km) WRF-Chem FRP based aerosol AOD forecasts are in good agreement with ABI

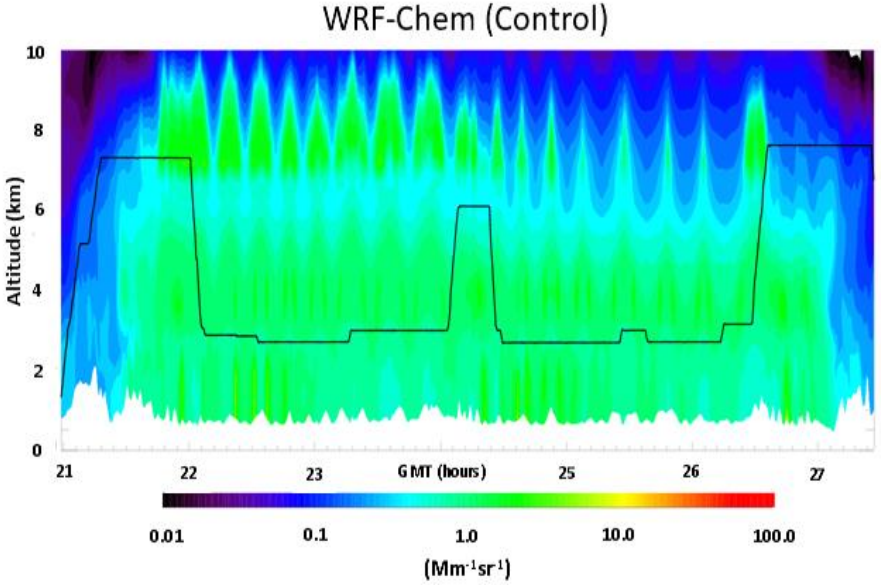
Aditya Kumar (UW-Madison)

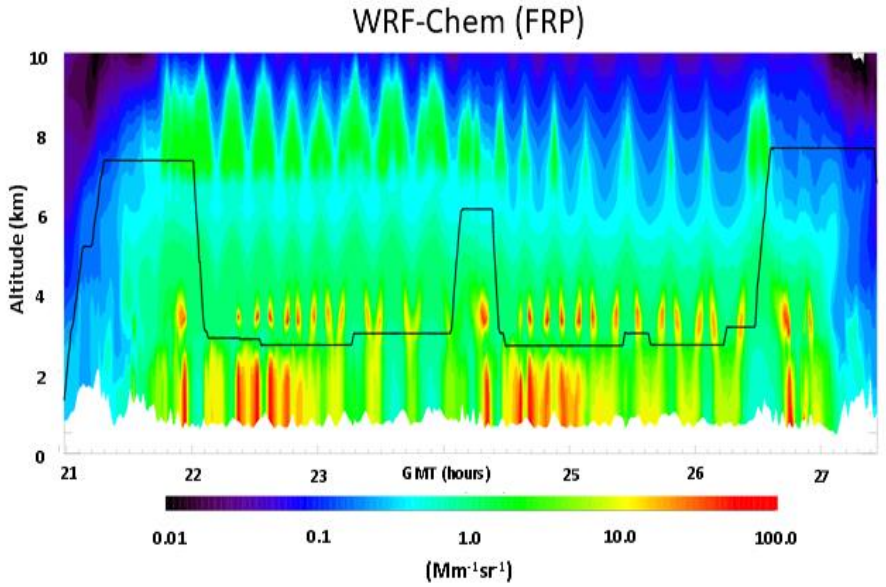
FIREX-AQ High Spectral Resolution Lidar (HSRL) and WRF-Chem Control and FRP Experiments, August 03, 2019



FIREX-AQ HSRL
John Hair (NASA LaRC)

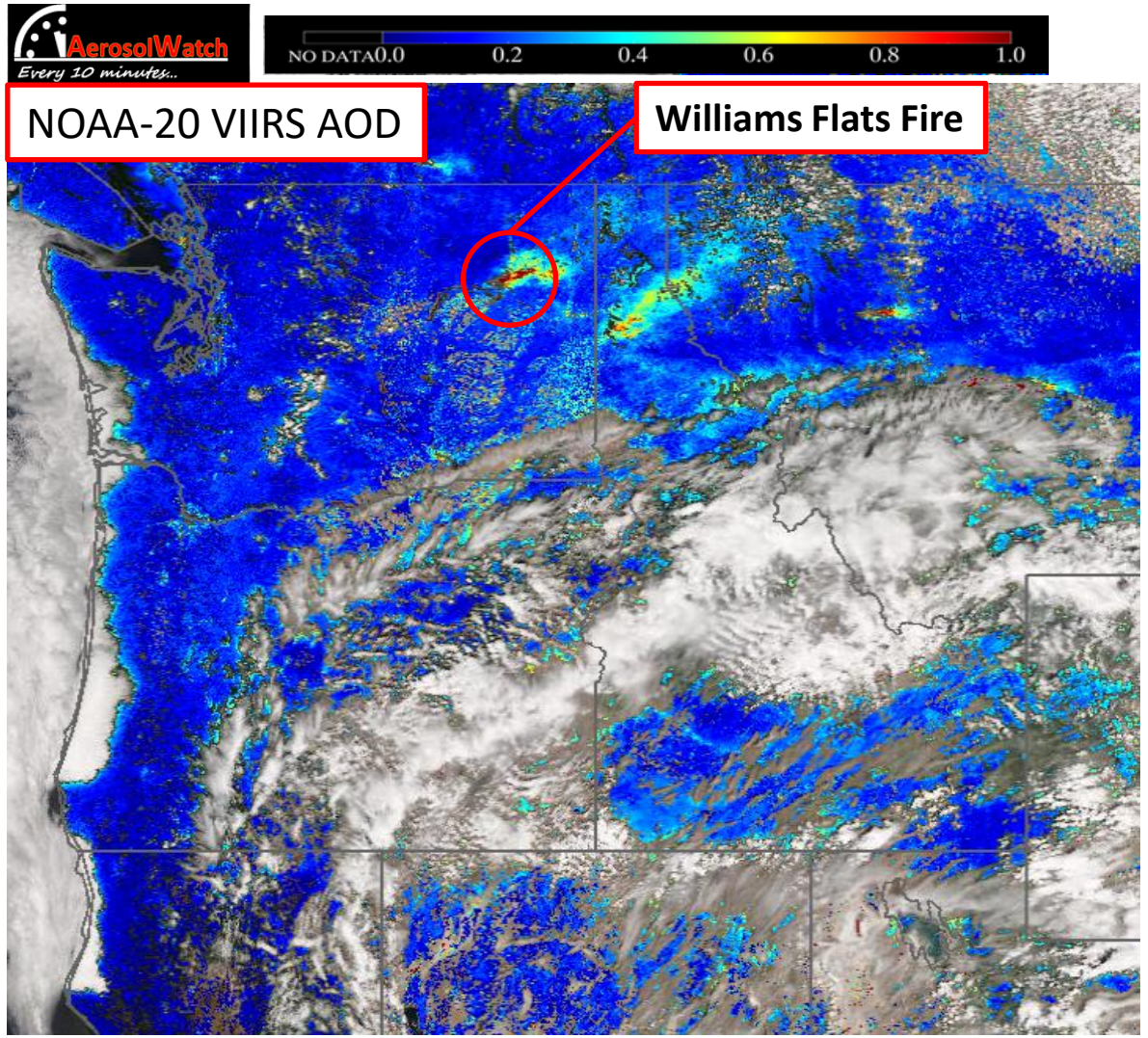
- Use of of 5-minute ABI FRP for wildfire emissions and injection heights following approach VIIRS in HRRR-Smoke
- Significant improvement in predicted aerosol backscatter and injection heights

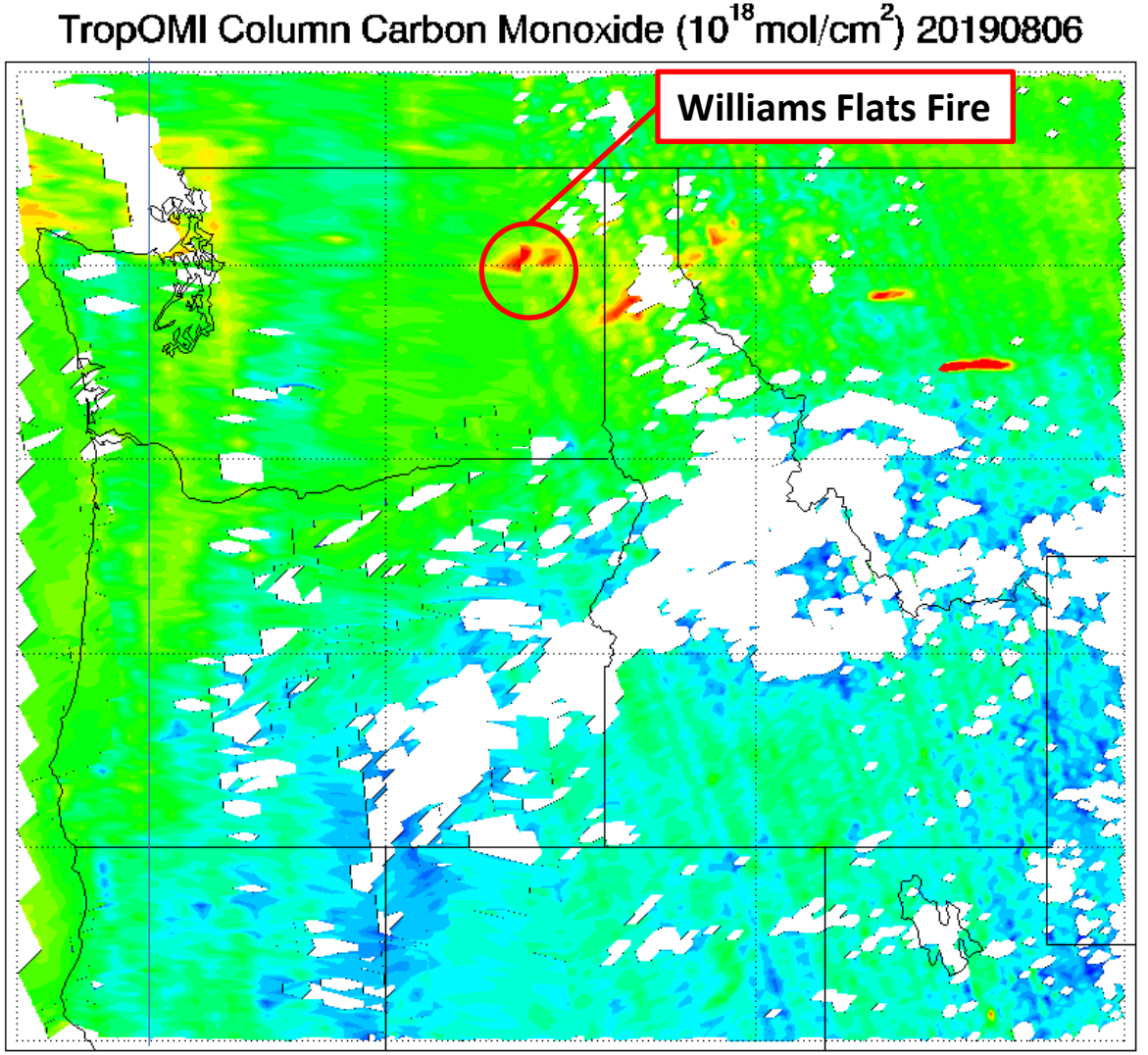




Aditya Kumar (UW-Madison)

NOAA-20 VIIRS Aerosol Optical Depth (AOD) and TROPOMI Carbon Monoxide (CO) August 06, 2019

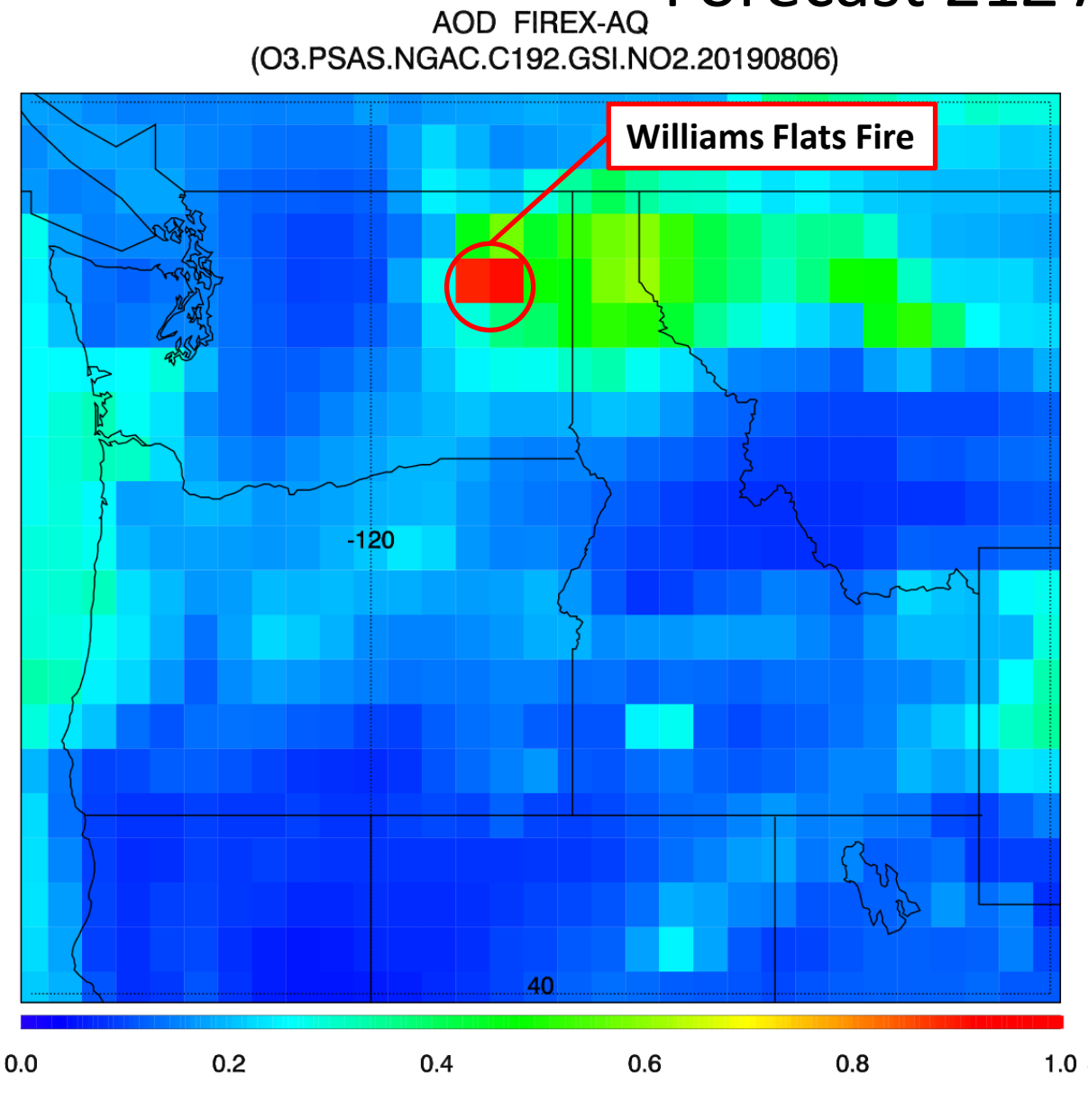


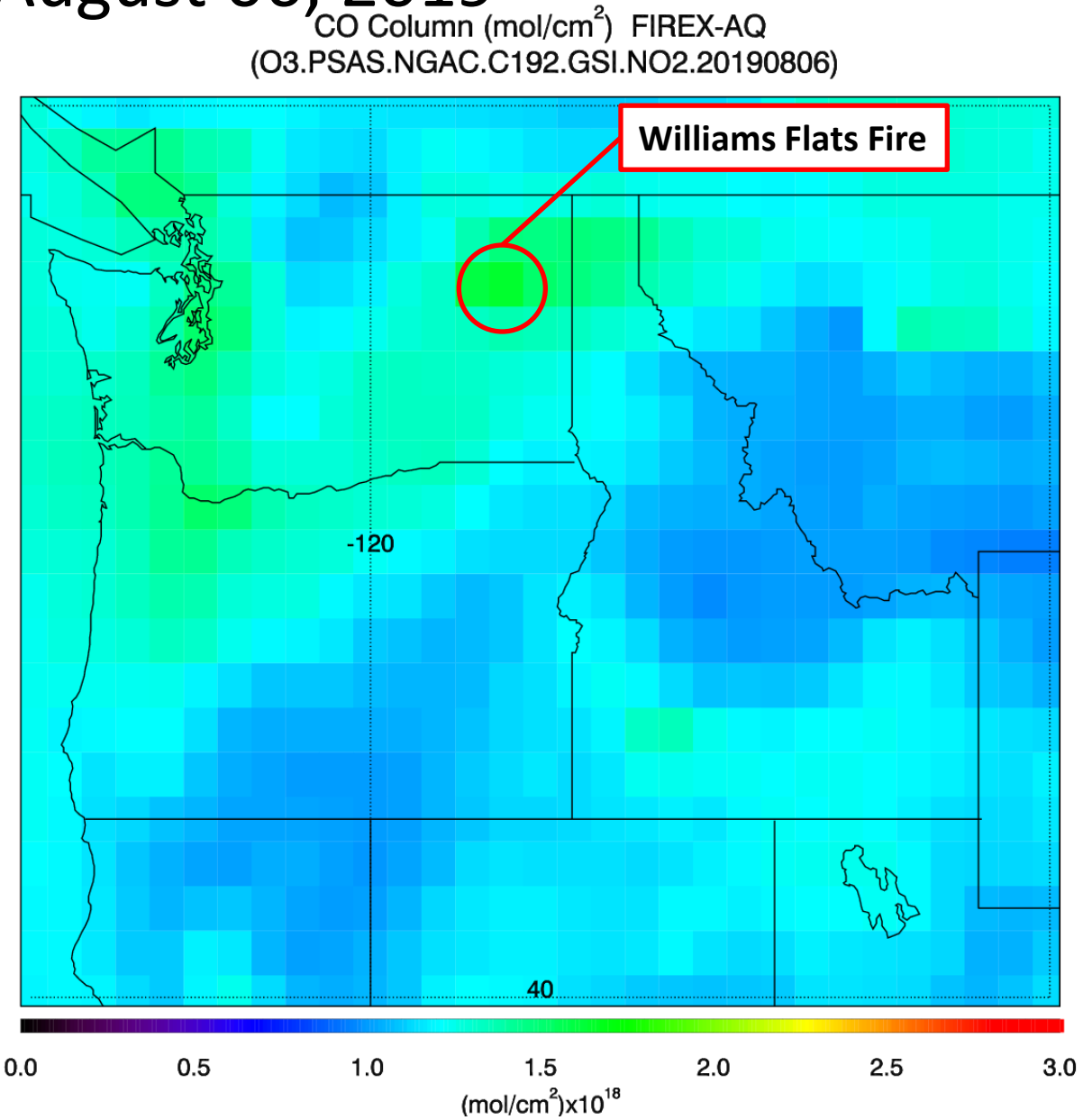


https://www.star.nesdis.noaa.gov/smcd/spb/aq/AerosolWatch/

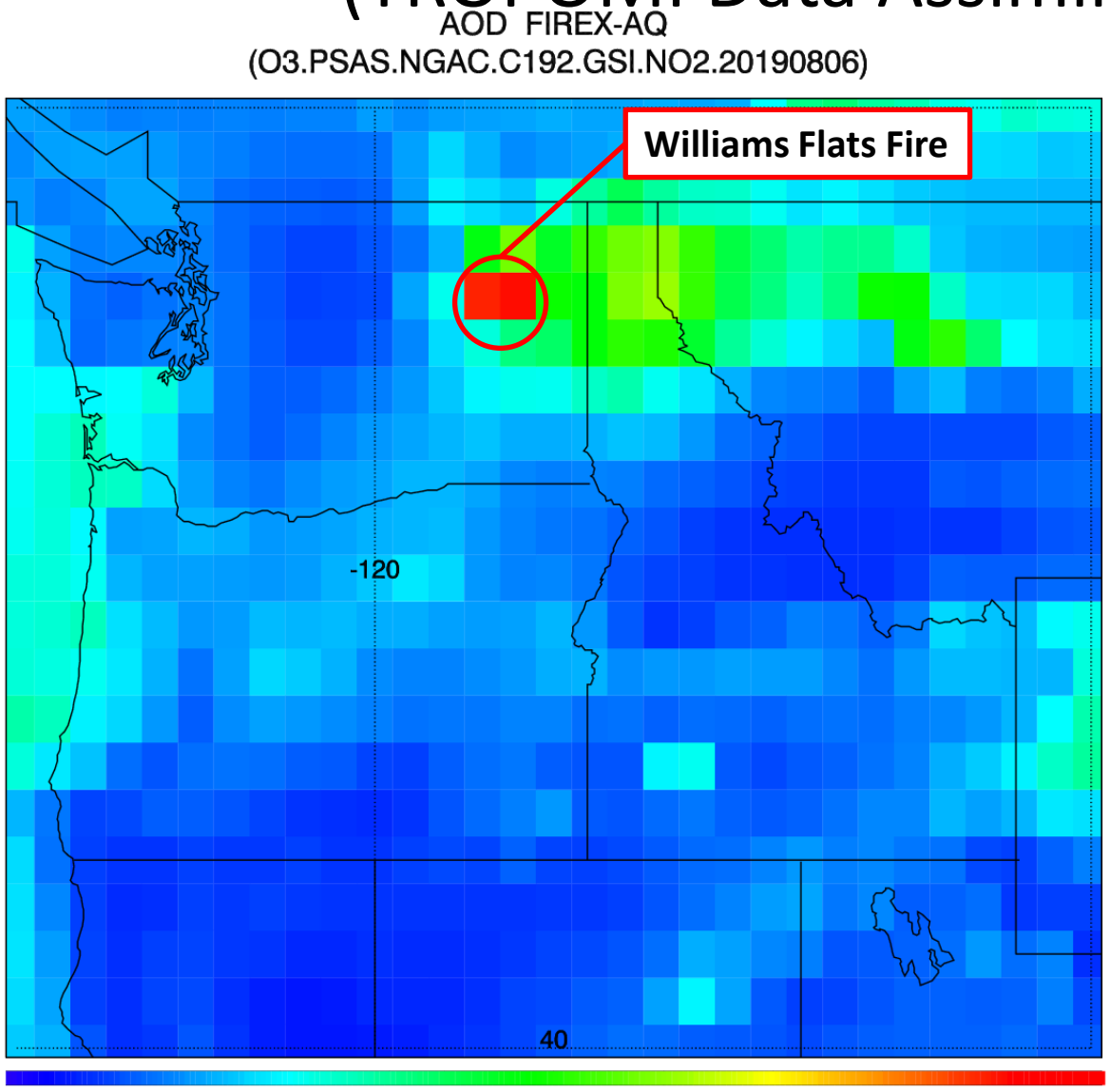
NOAA UFS-RAQMS Aerosol Optical Depth (AOD) and Carbon Monoxide

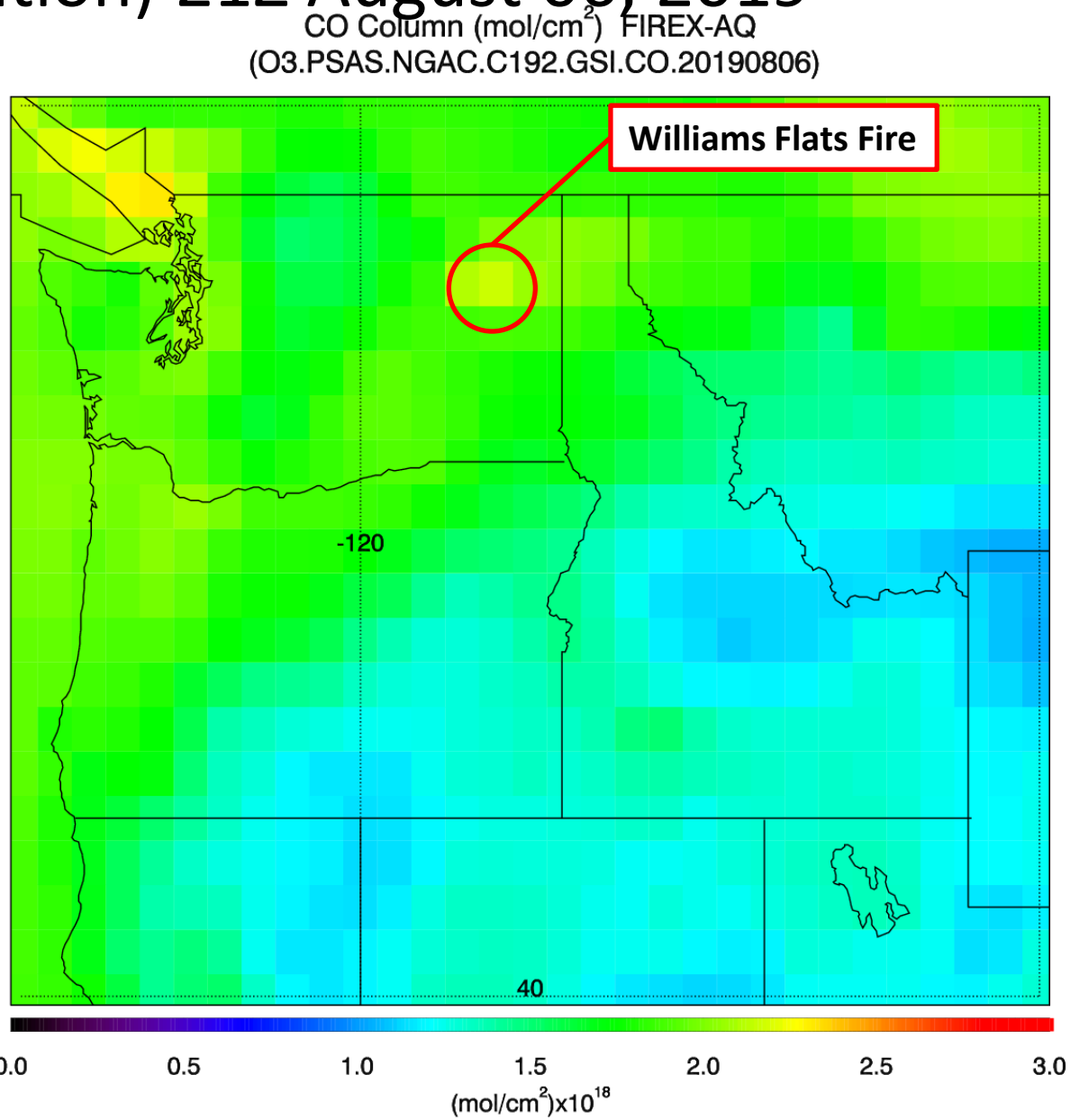
Forecast 21Z August 06, 2019



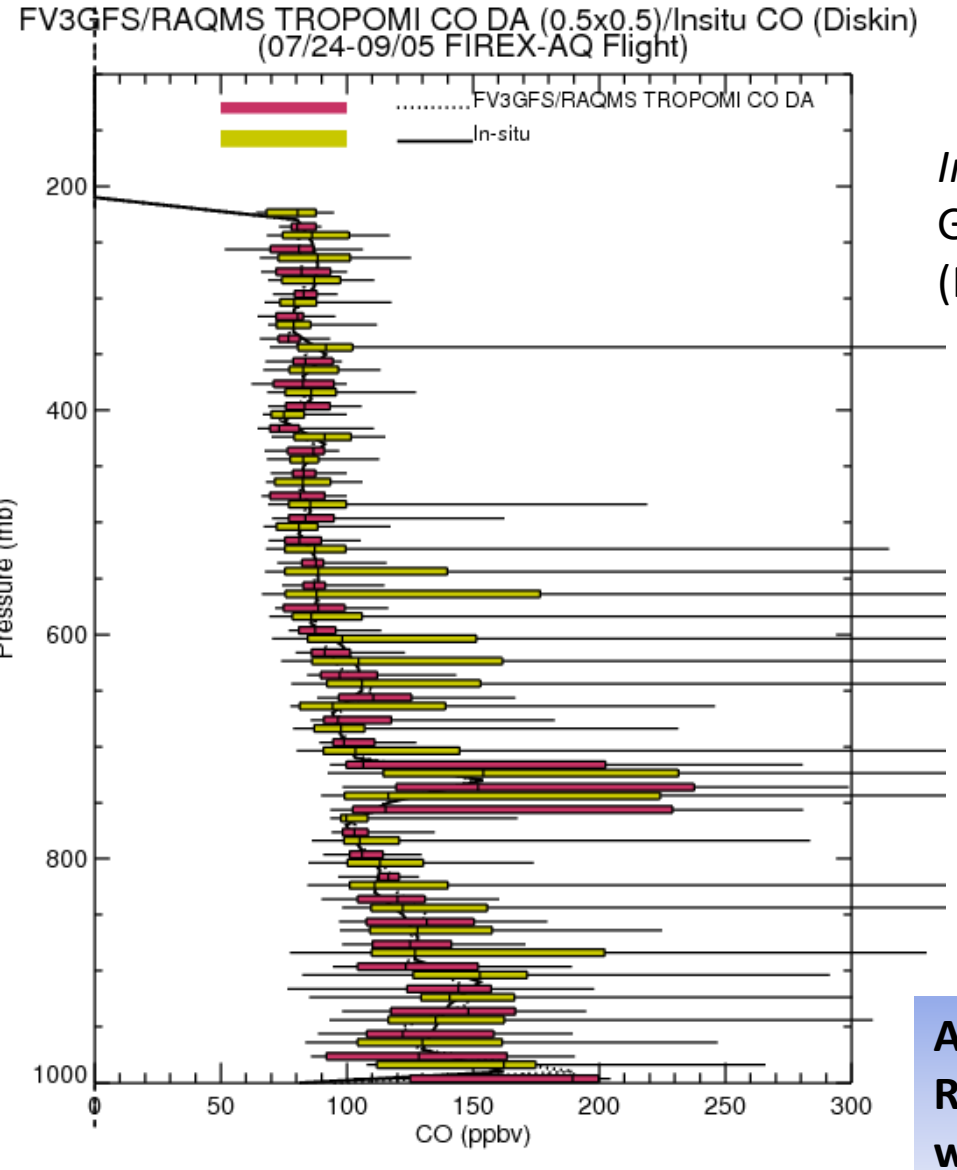


NOAA UFS-RAQMS Aerosol Optical Depth (AOD) and Carbon Monoxide (TROPOMI Data Assimilation) 21Z August 06, 2019



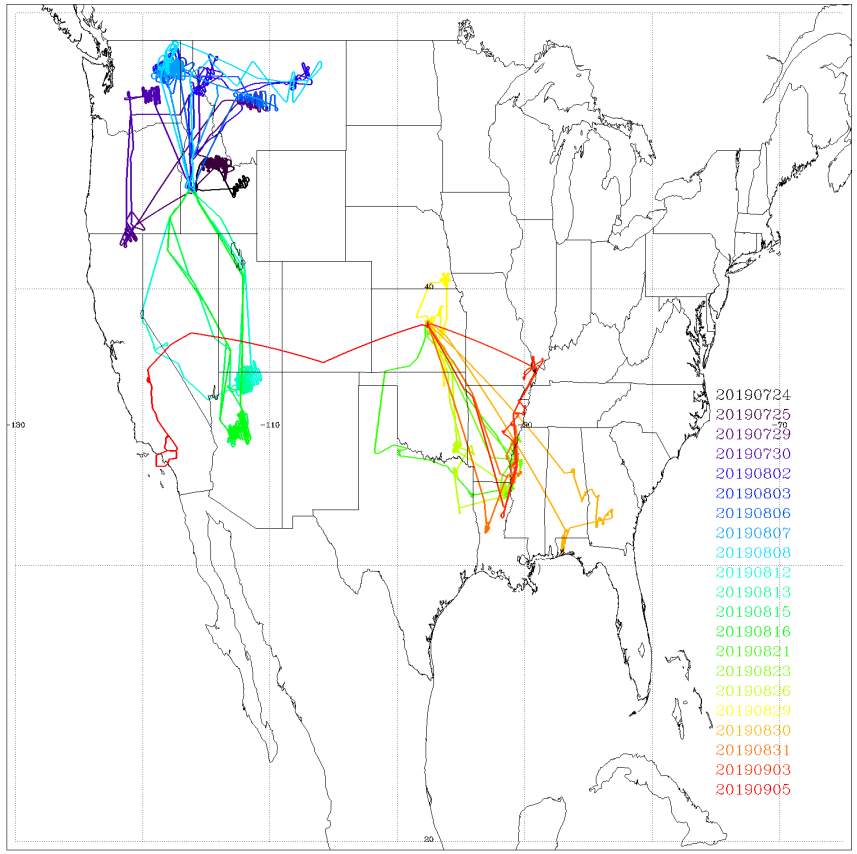


FIREX-AQ insitu CO and UFS-RAQMS TROPOMI CO Data Assimilation Experiments, FIREX-AQ 2019



Insitu CO from Glen Diskin (NASA/LaRC)

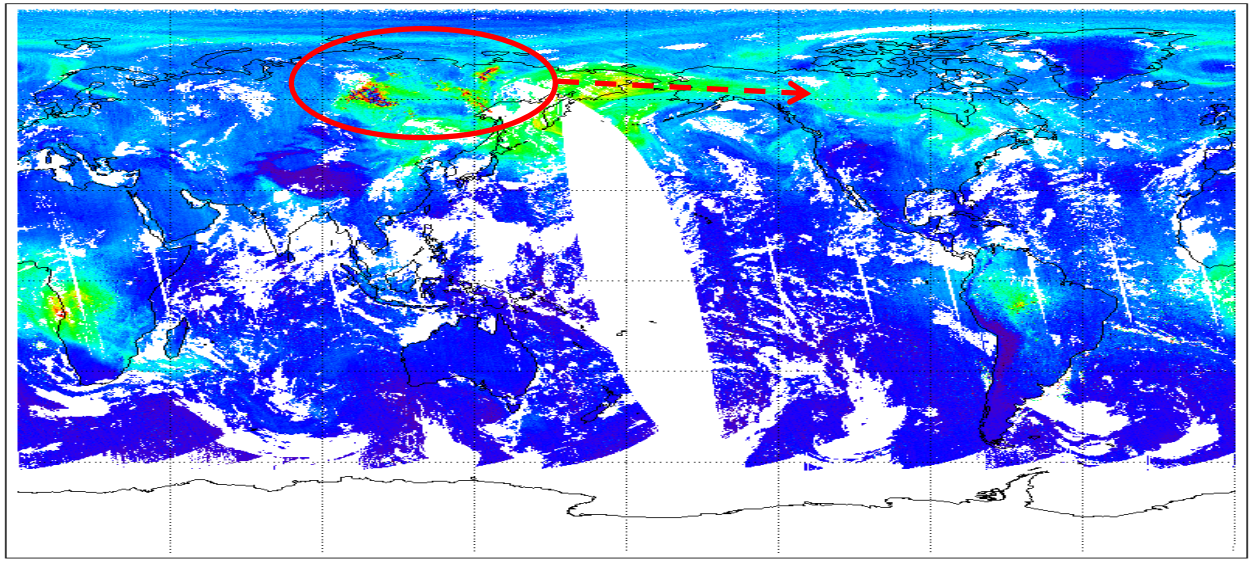
FIREX-AQ DC8 Flight Tracks

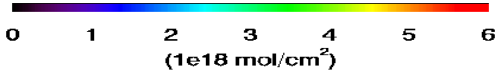


Assimilation of TROPOMI CO column leads to significant improvements in UFS-RAQMS CO analysis (reduced bias, improved representation of variance within wildfire plumes) and very good agreement with *insitu* CO measurements

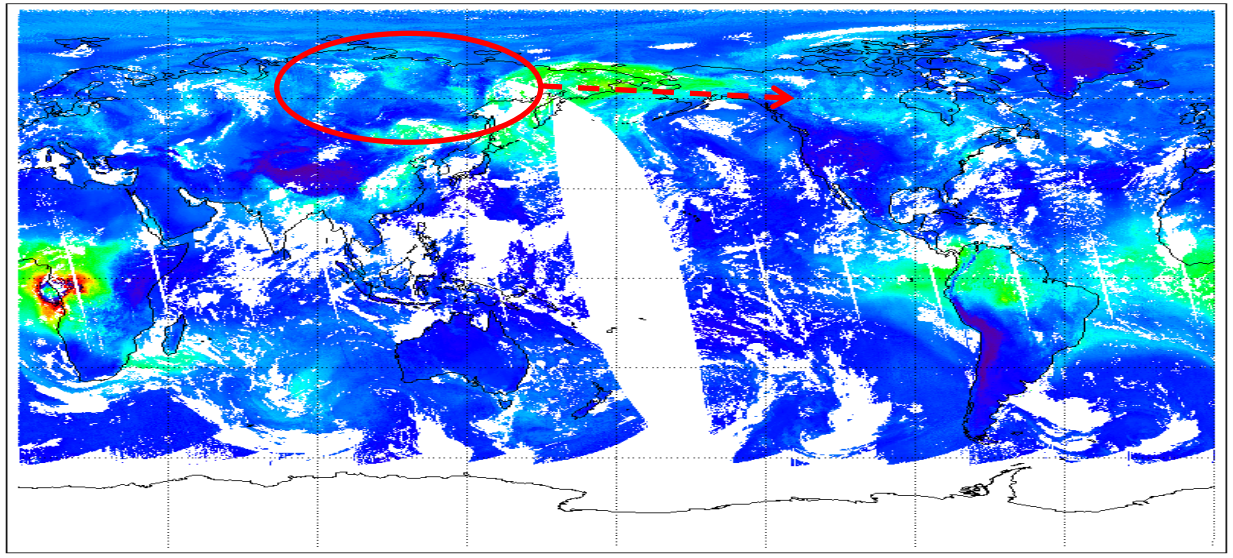
Long-range transport of wildfires can influence regional air quality

TROPOMI Column CO (August 08, 2019)

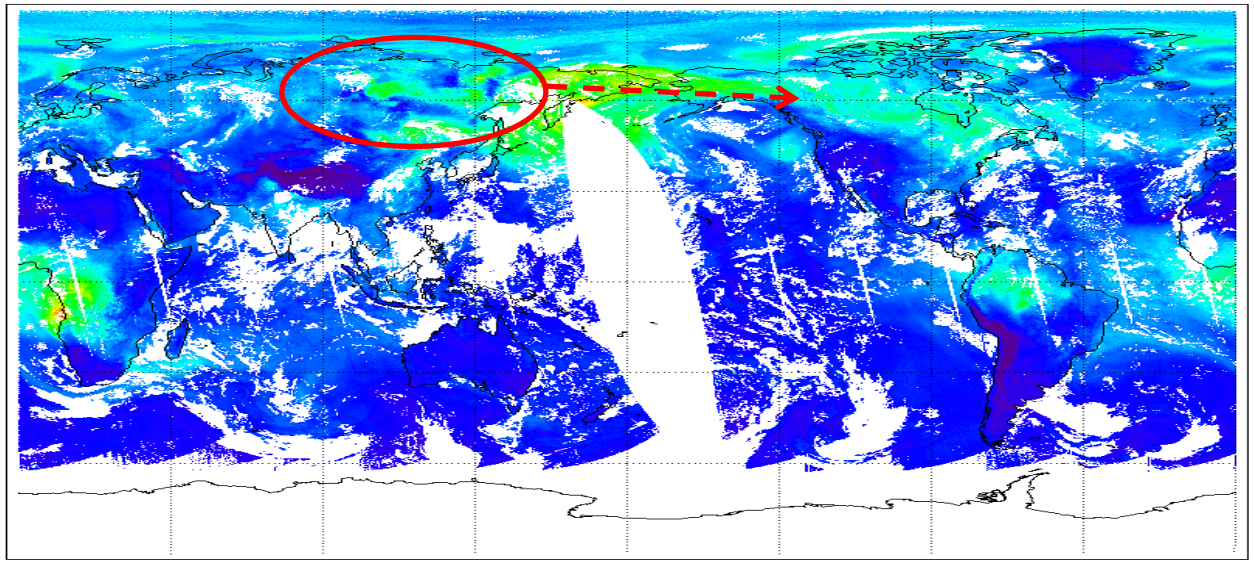




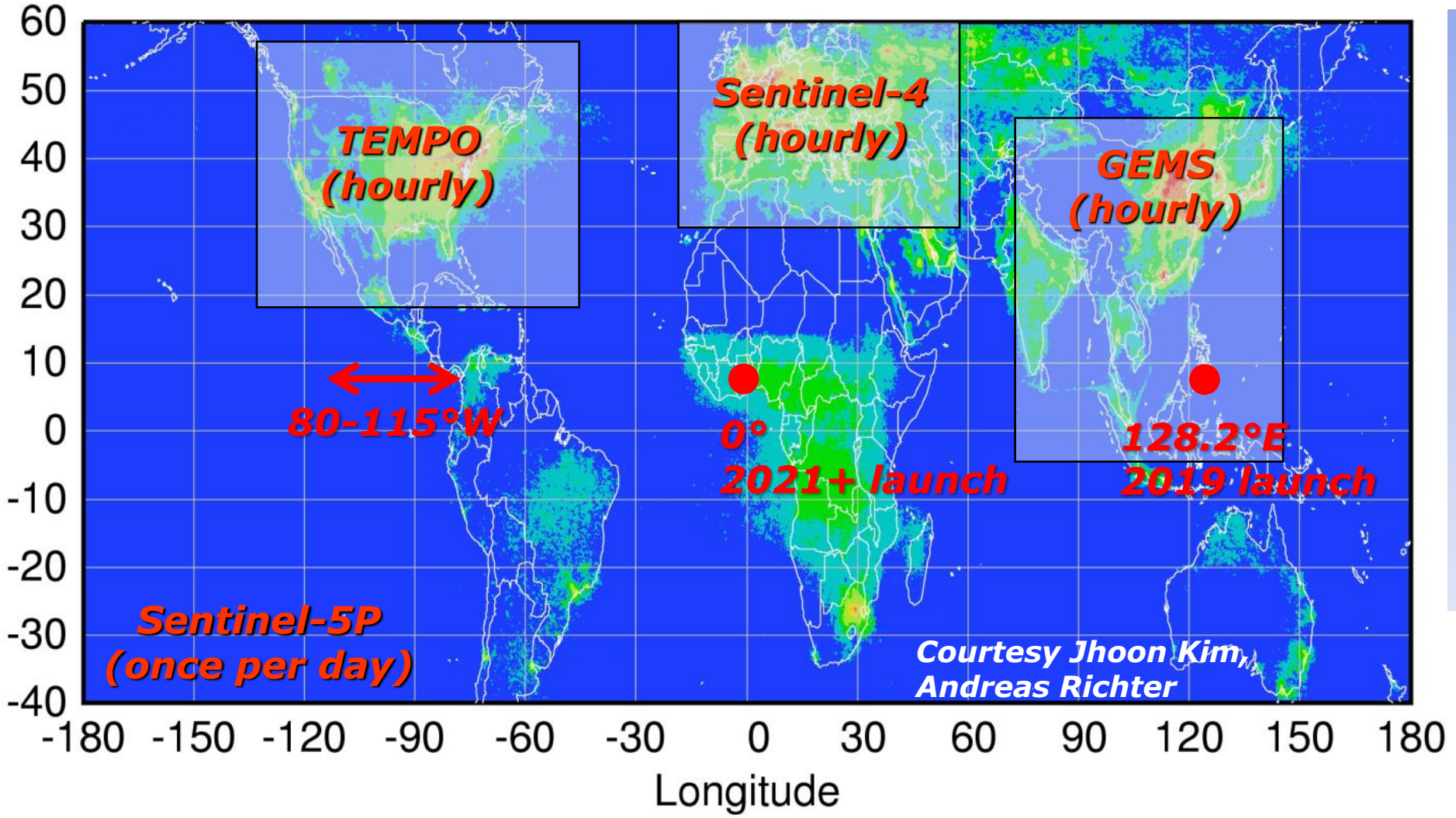
UFS-RAQMS (Control)



UFS-RAQMS (TROPOMI DA)



Future: Global GEO/LEO pollution monitoring constellation



- The suite of NO_2, H_2CO, $C_2H_2O_2$, O_3, H_2O, and aerosol measurements from TEMPO will help constrain secondary formation of VOCs and ozone.
- TEMPO (GEMS) trace-gas retrievals will complement ABI (AHI) fire detection and aerosol measurements.

Kelly Chance (Harvard/SAO)

Summary for discussion:

The new Geostationary imagers (ABI/AHI) are comparable to MODIS and VIIRS Polar orbiting satellites: These new sensors provide new temporal information regarding the day-time evolution of wildfire emissions (through FRP) and aerosol loading (through AOD) that can be used to constrain regional air quality forecast models.

The new TROPOMI UV/NIR instrument provides high-resolution trace gas retrievals: This new sensor provides high resolution information about wildfire chemistry through retrievals of CO, HCO, and NO2 that can be used to constrain global air quality forecast models.

Sentinal-5P follows NOAA-20 by only 5 minutes: This allows combined use of TROPOMI, VIIRS, CrIS, and OMPS retrievals for cloud clearing and multi spectral (UV/NIR/TIR) of O3 and CO with improved sensitivity to boundary layer concentrations that are critical for wildfire air quality impacts.

The next generation of UV/VIS Geostationary sensors (TEMPO/GEMS/Sentinal-4) will be comparable to TROPOMI: Combined, these new LEO and GEO satellites will provide unprecedented monitoring of global pollution, including wildfires.

A hyperspectral GEO infrared sounder similar to CrIS or IASI would allow hourly multi-spectral (UV/TIR) of O3 with improved sensitivity to boundary layer concentrations that are critical for wildfire air quality impacts.