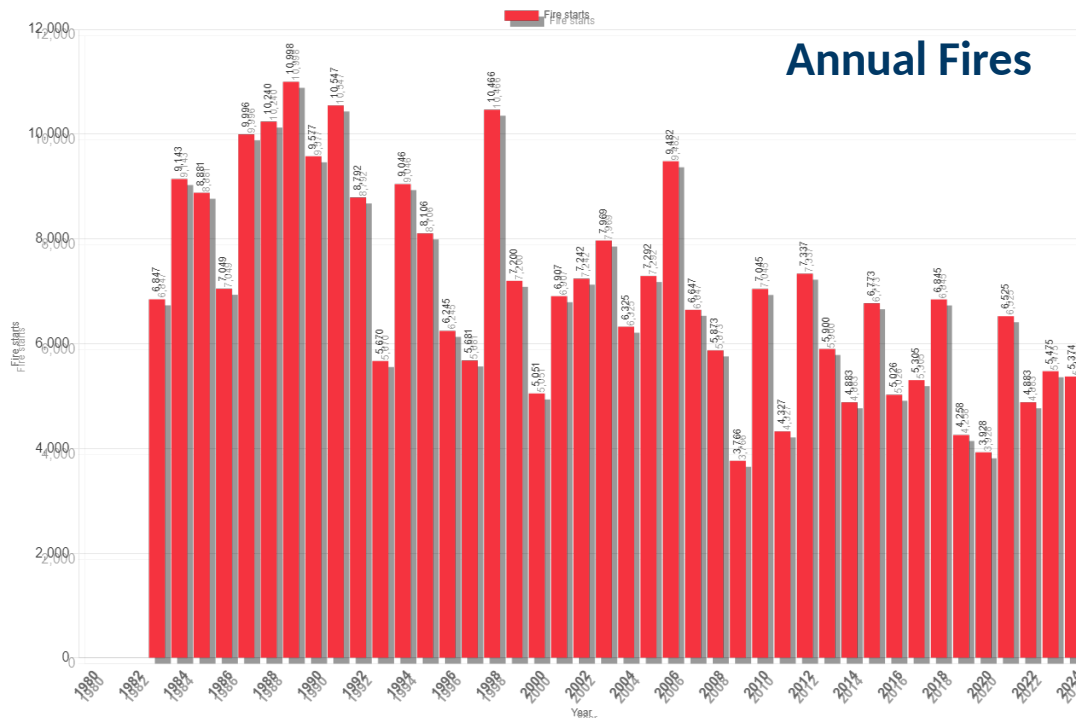


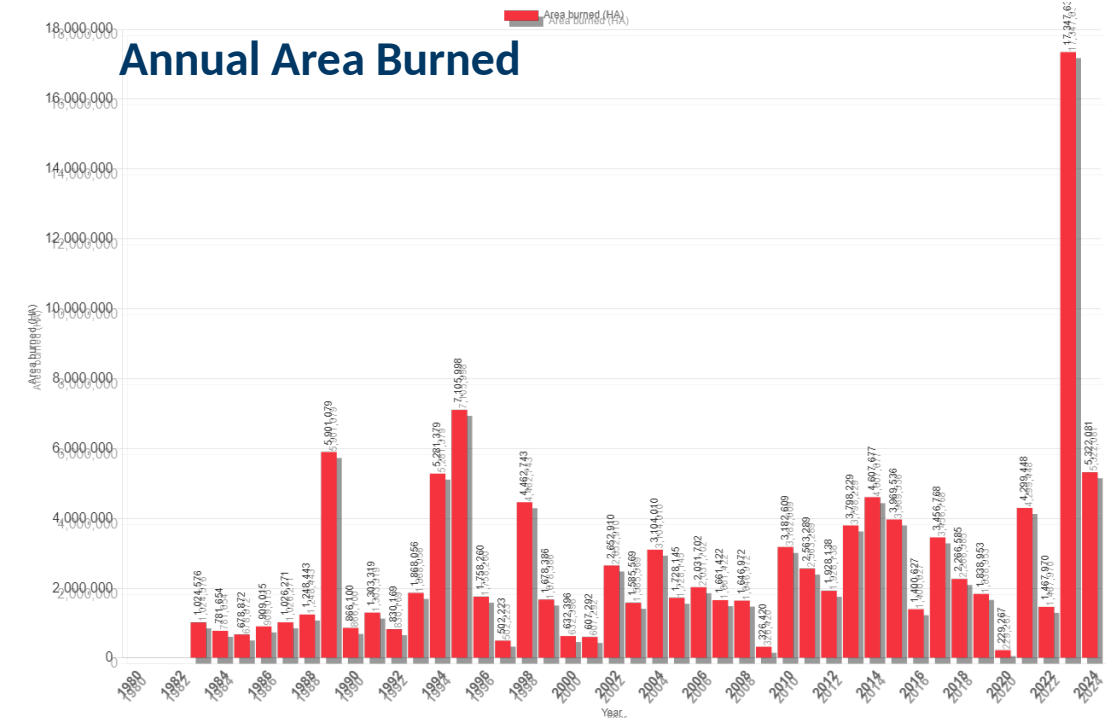
Evaluating RRFs smoke forecasts during 2024 wildfire season

2024 Wildfire Season

- 2024 Canadian wildfire statistics
 - 5,374 fire starts



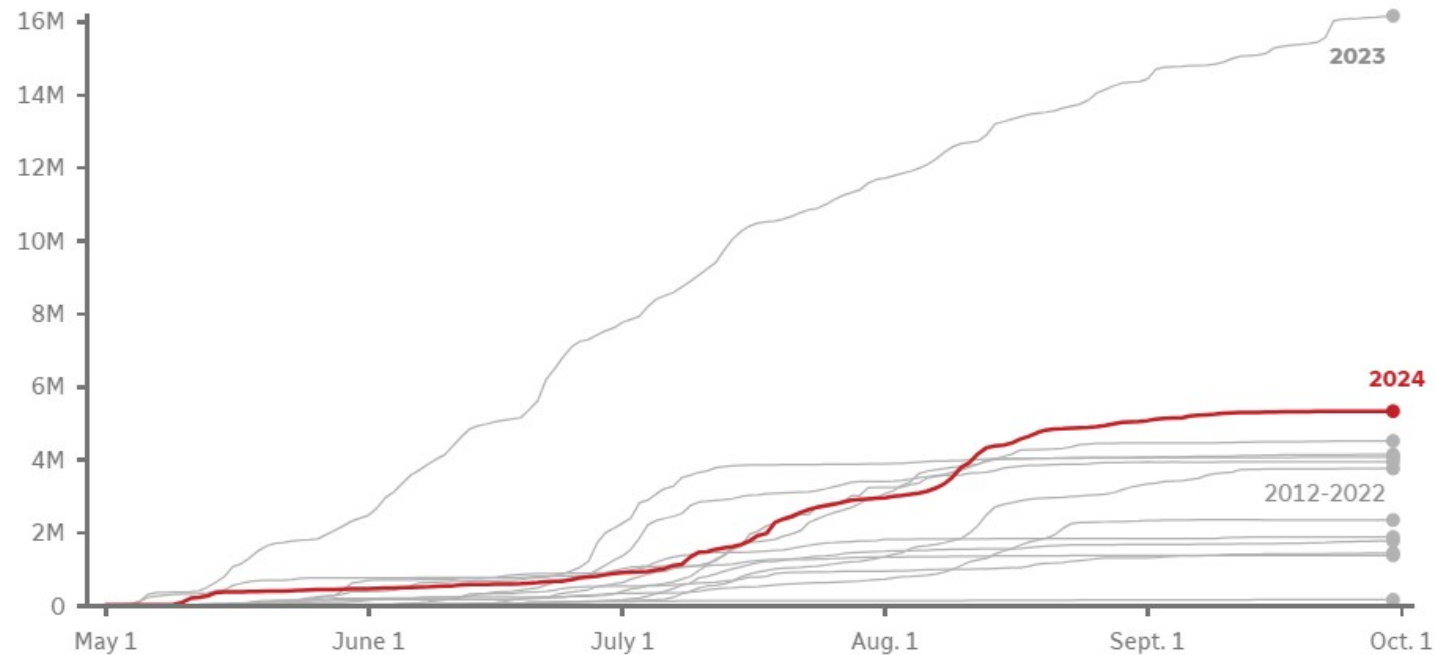
- 5,322,081 hectares burned
- 4th highest on record



2024 Wildfire Season

How much has burned so far this year in Canada

Estimated cumulative hectares burned in wildfires from satellite-detected hotspots



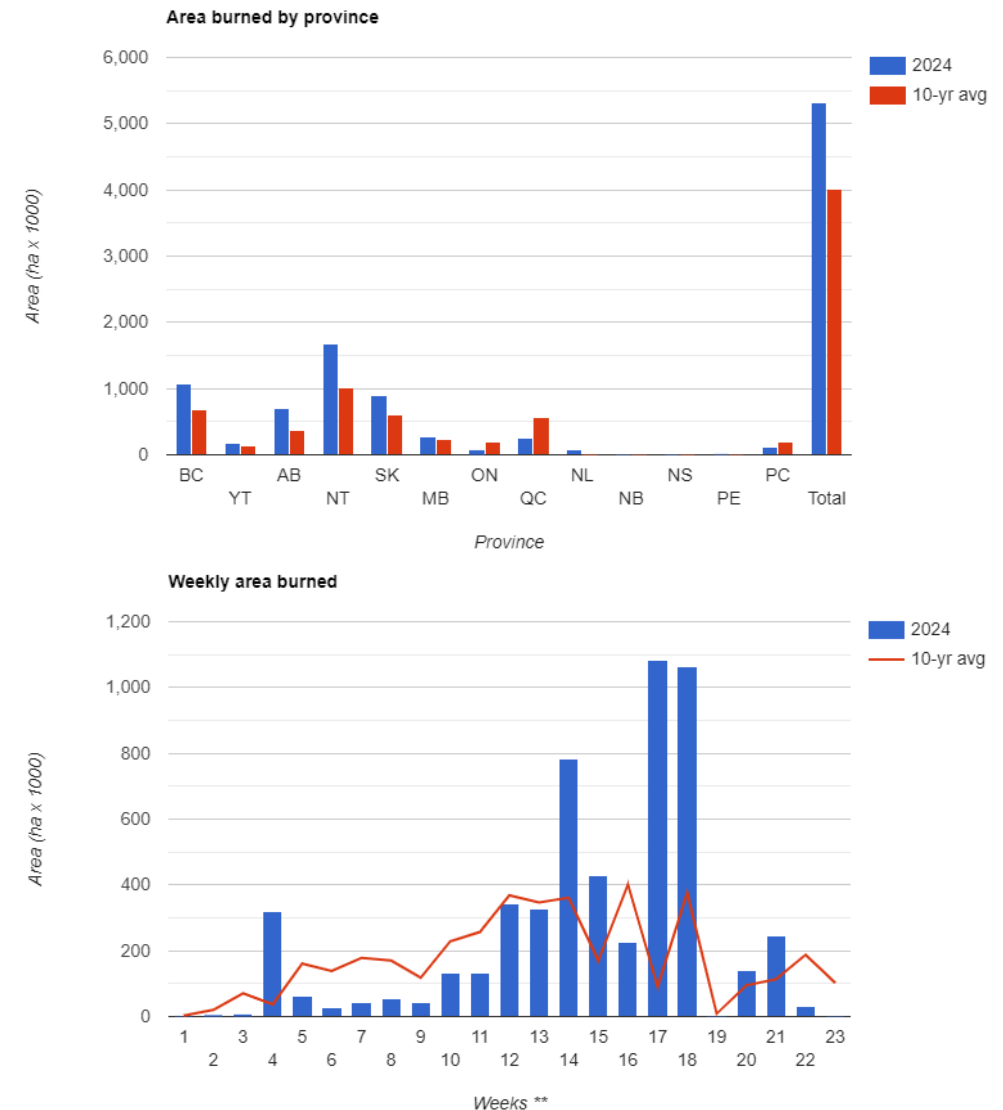
Updated on Oct. 4, 2024, at 9:15 a.m. ET

Source: Canadian Wildland Fire Information System (Graeme Bruce/CBC)

<https://www.cbc.ca/news/climate/wildfires-2024-charts-1.7341341>

2024 Wildfire Season

- Northwest Territories and British Columbia had most area burned
- Saskatchewan fires had most impact on air quality in the Northern Plains of the U.S.

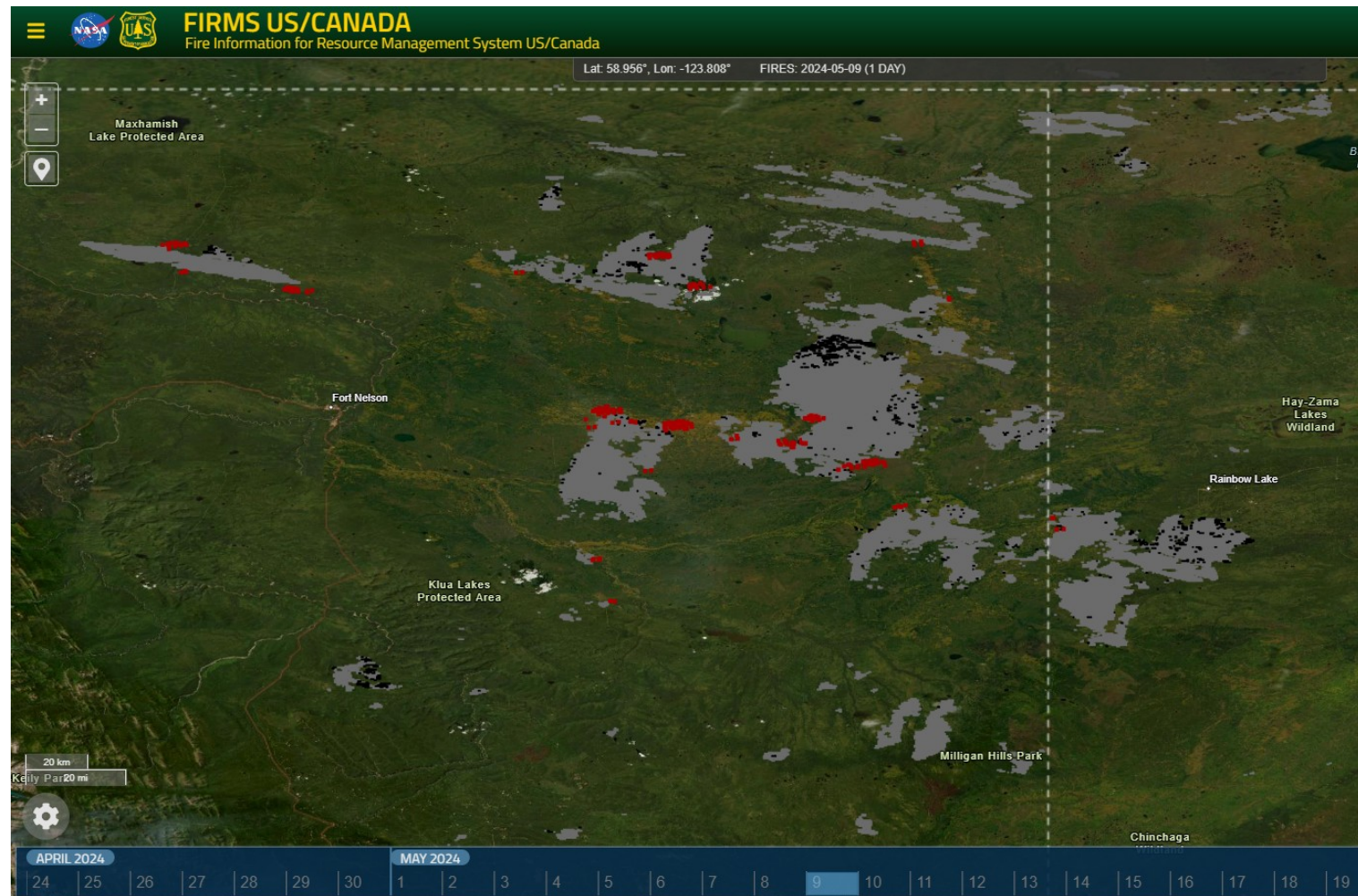


MN Wildfire Smoke Summary

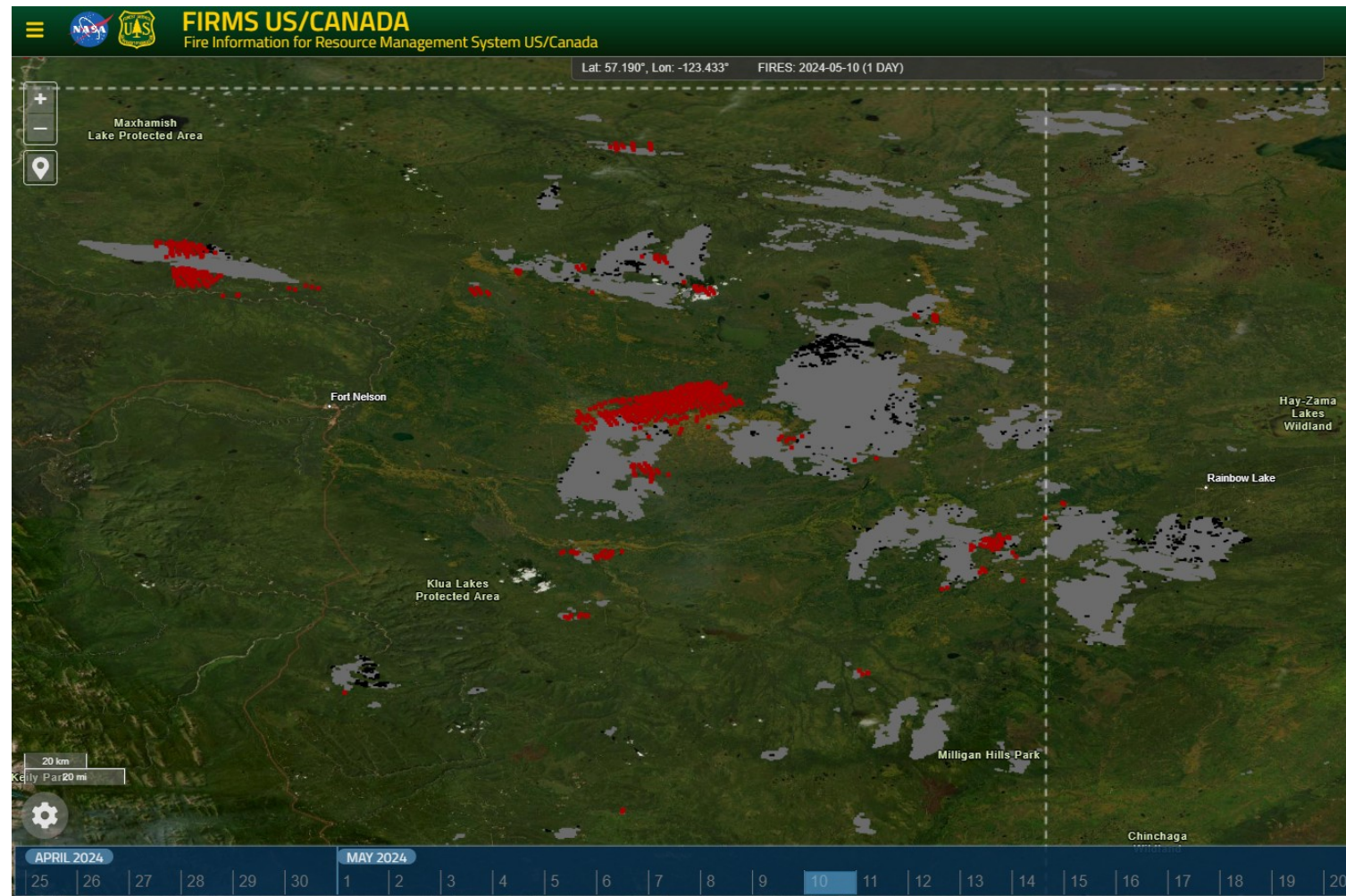
Number of days with Orange or higher AQI	7
Maximum 24-hr average PM2.5 concentration (ug/m ³)	92.5
Number of Air Quality Alerts issued	4

Date	Maximum PM2.5 Concentration (ug/m ³)
05/12/2024	92.5
05/13/2024	61.9
08/13/2024	45.1
08/14/2024	35.7
09/01/2024	36.2
09/02/2024	36.7
09/11/2024	39.8

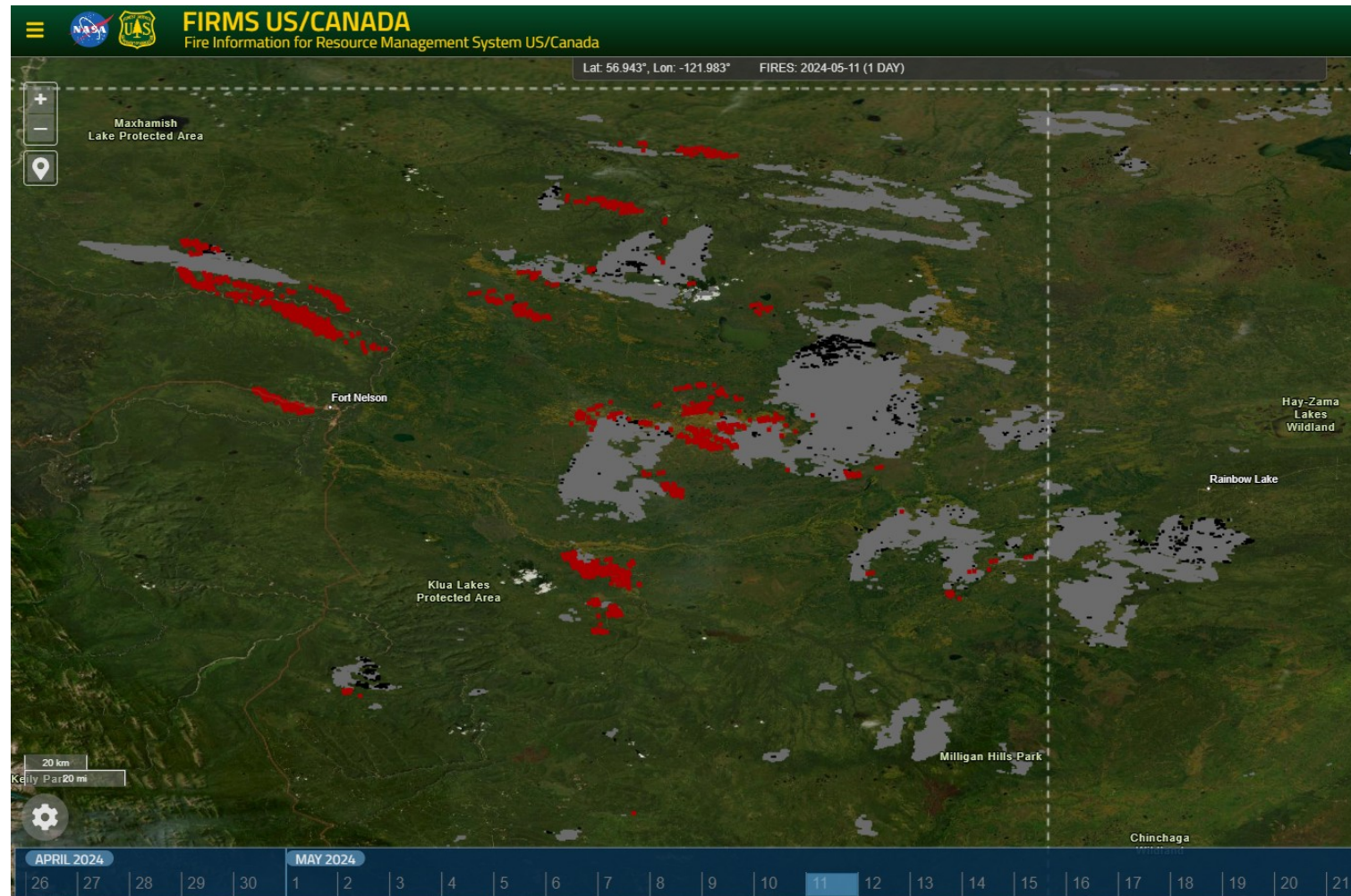
BC Holdover Fires – May 9, 2024



BC Holdover Fires – May 10, 2024



BC Holdover Fires – May 11, 2024

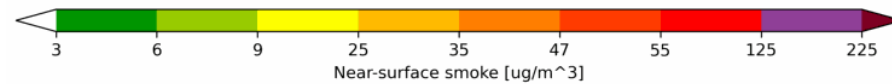
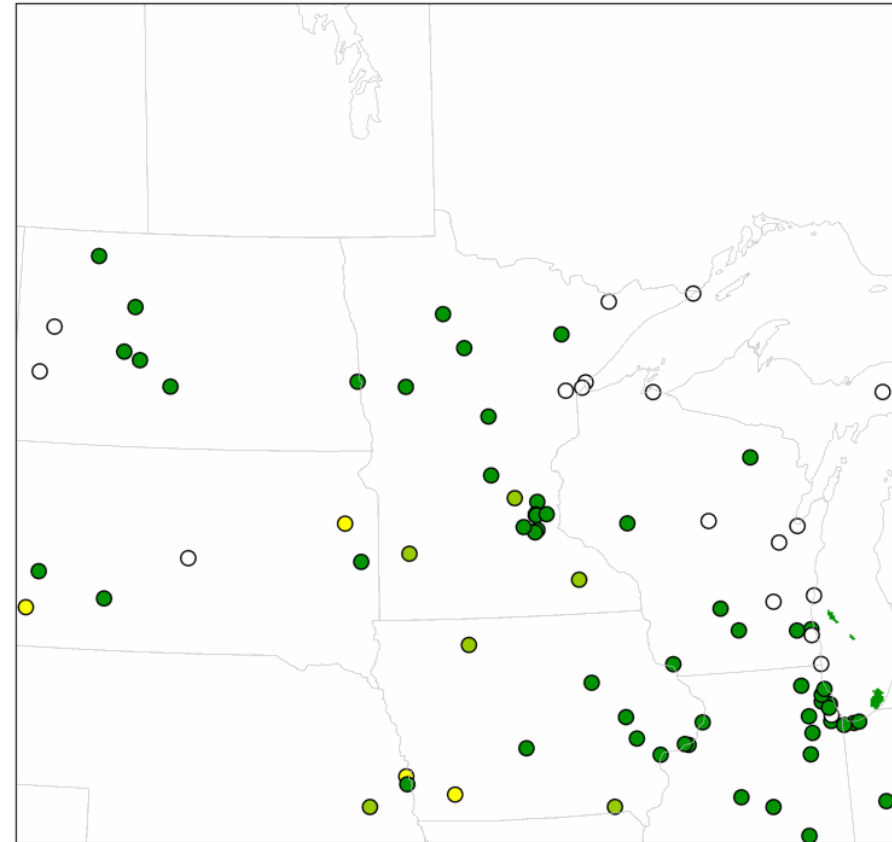


RRFS Smoke Forecast Initialized 05/11 12Z

Experimental RRFS_A: Near-surface smoke, instantaneous

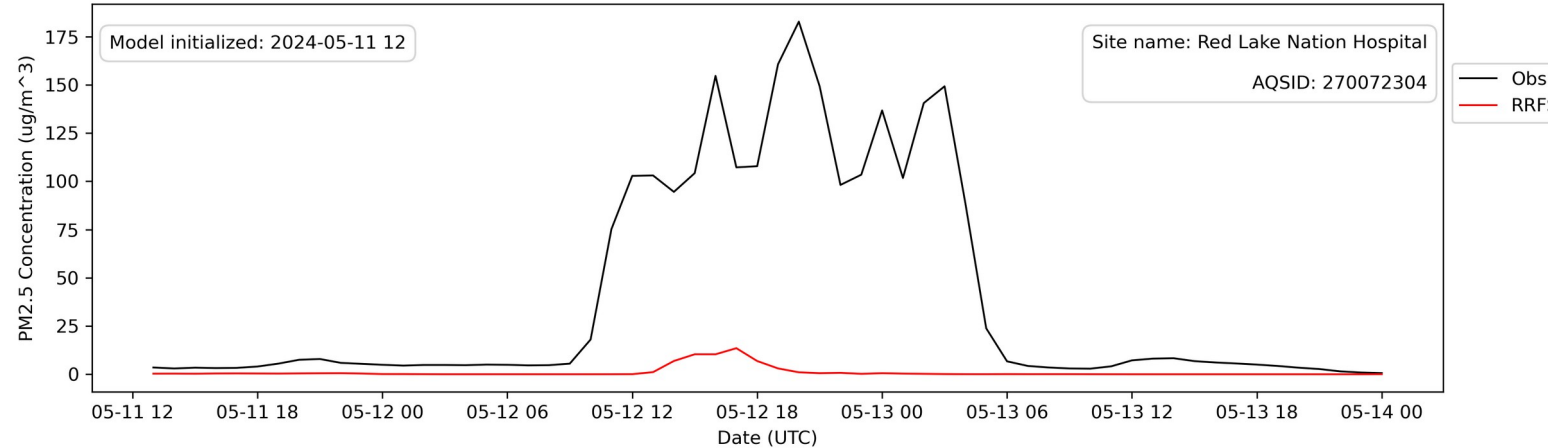
Initialized: 2024-05-11 12 UTC

Valid Time: 2024-05-11 13 to 2024-05-11 14 UTC

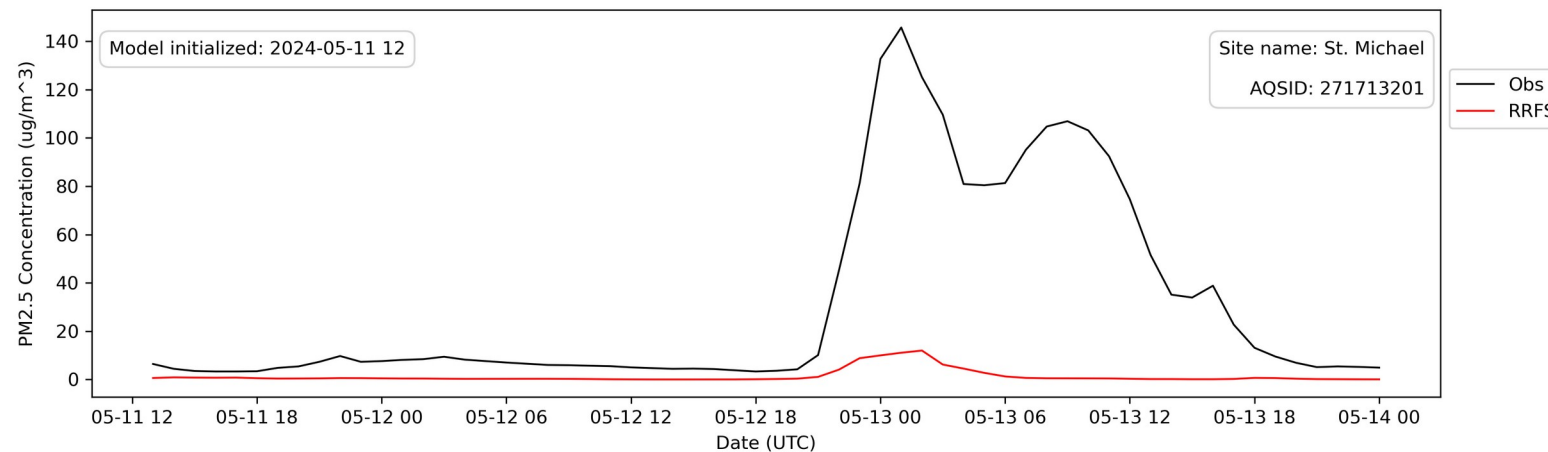


RRFS Smoke Forecast Initialized 05/11 12Z

Hourly PM2.5 observations and RRFS smoke forecast

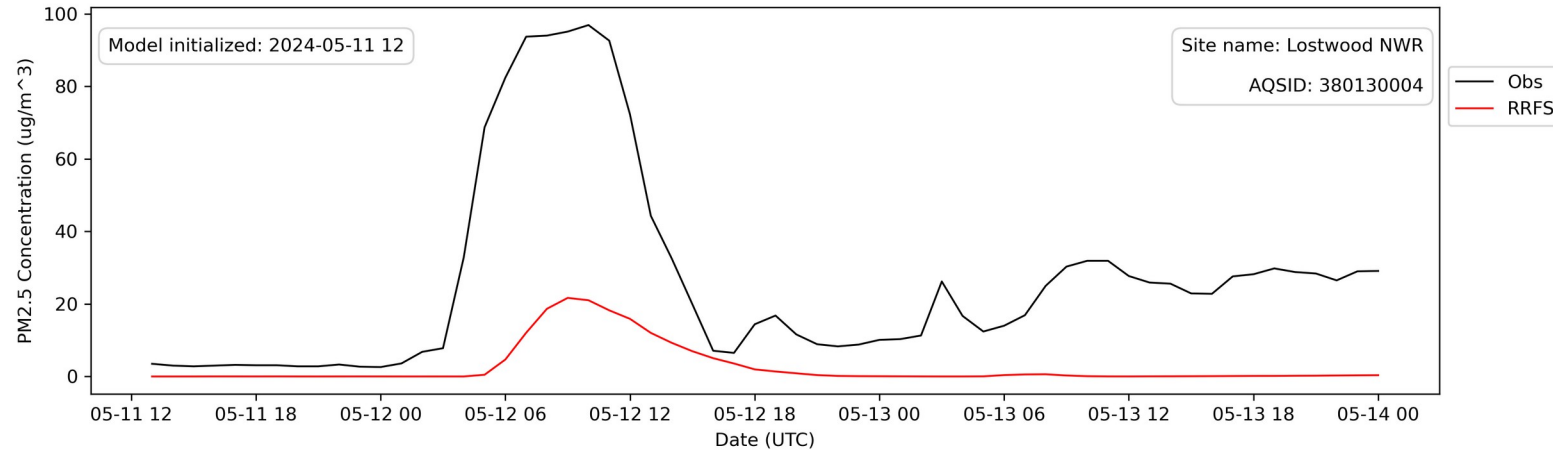


Hourly PM2.5 observations and RRFS smoke forecast

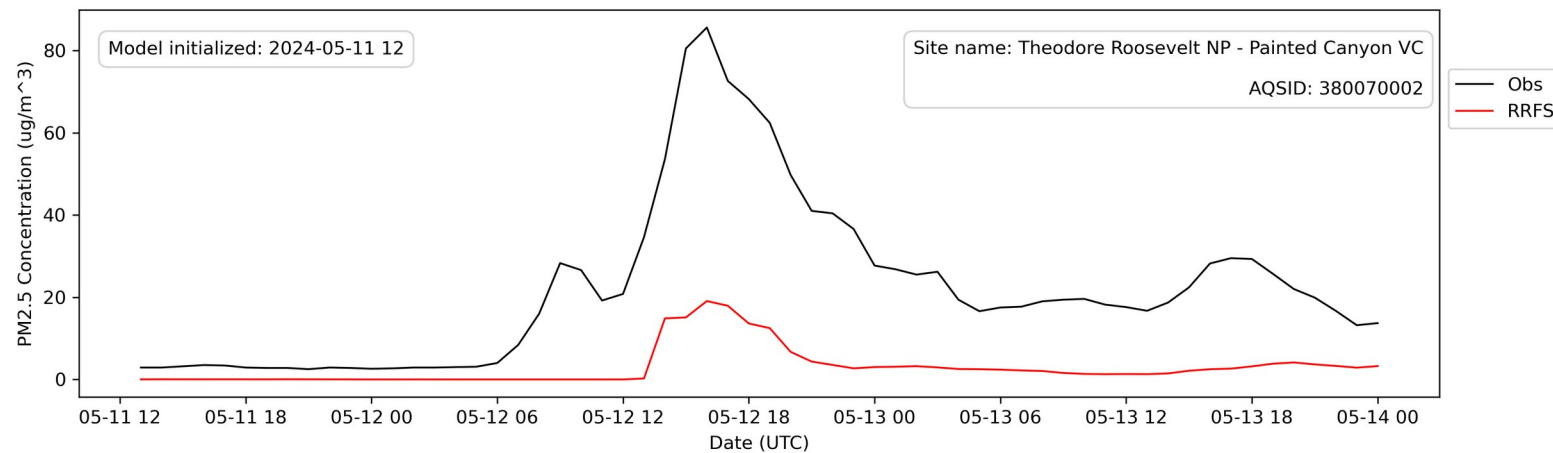


RRFS Smoke Forecast Initialized 05/11 12Z

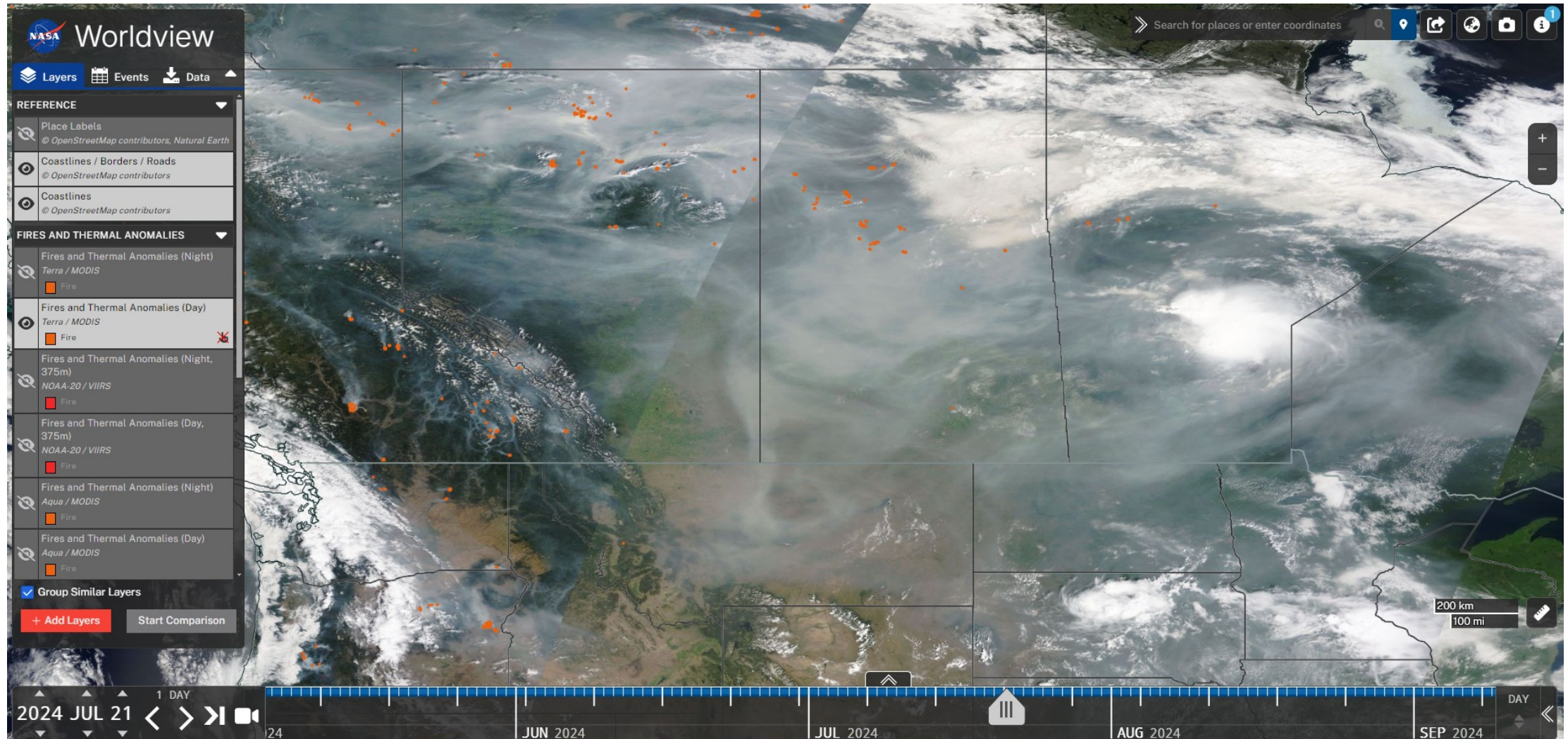
Hourly PM2.5 observations and RRFS smoke forecast



Hourly PM2.5 observations and RRFS smoke forecast



July 21-24 Wildfire Smoke Event Impacts Dakotas

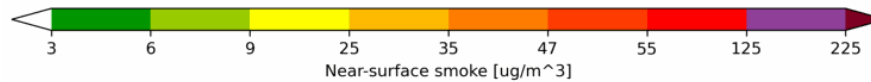
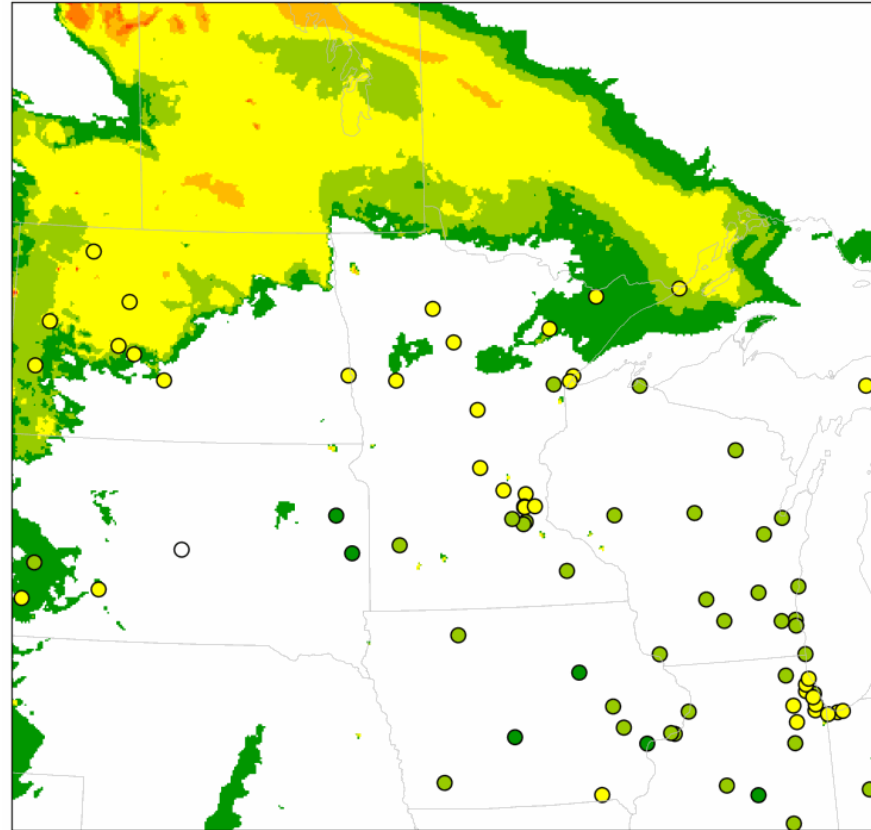


RRFS Smoke Forecast Initialized 07/20 12Z

Experimental RRFS_A: Near-surface smoke, 1 hour average

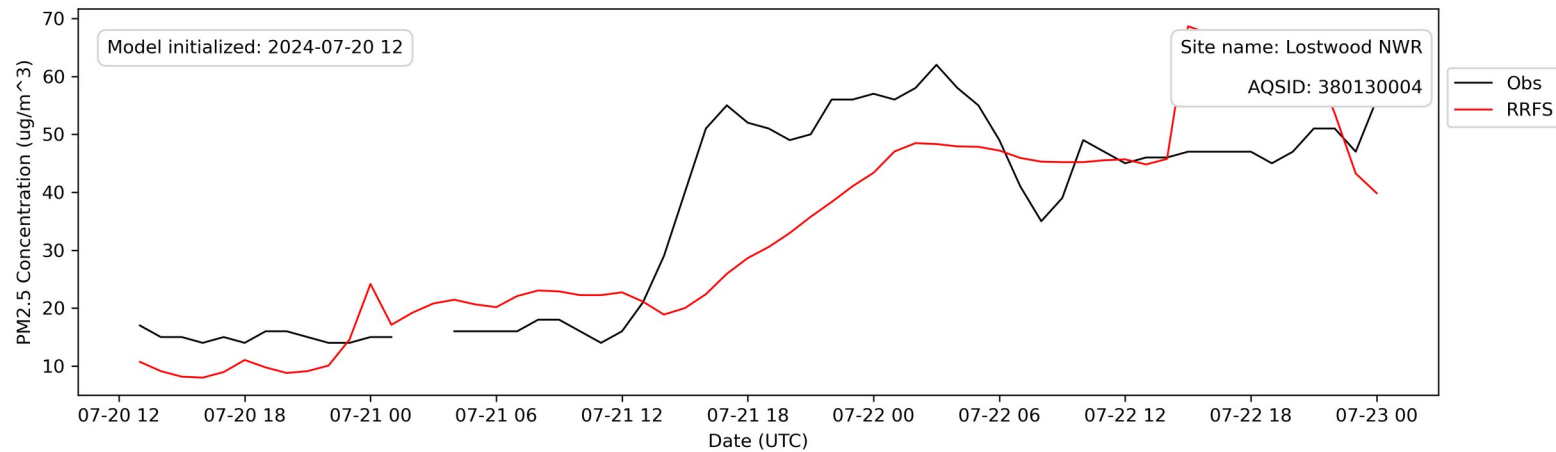
Initialized: 2024-07-20 12 UTC

Valid Time: 2024-07-20 13 to 2024-07-20 14 UTC

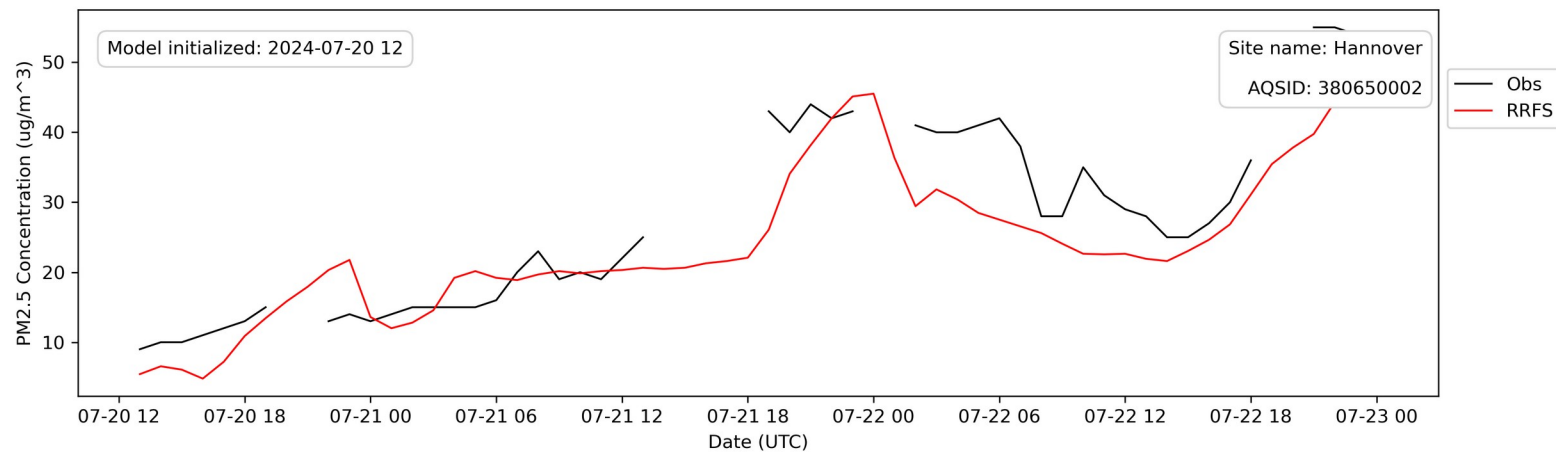


RRFS Smoke Forecast Initialized 07/20 12Z

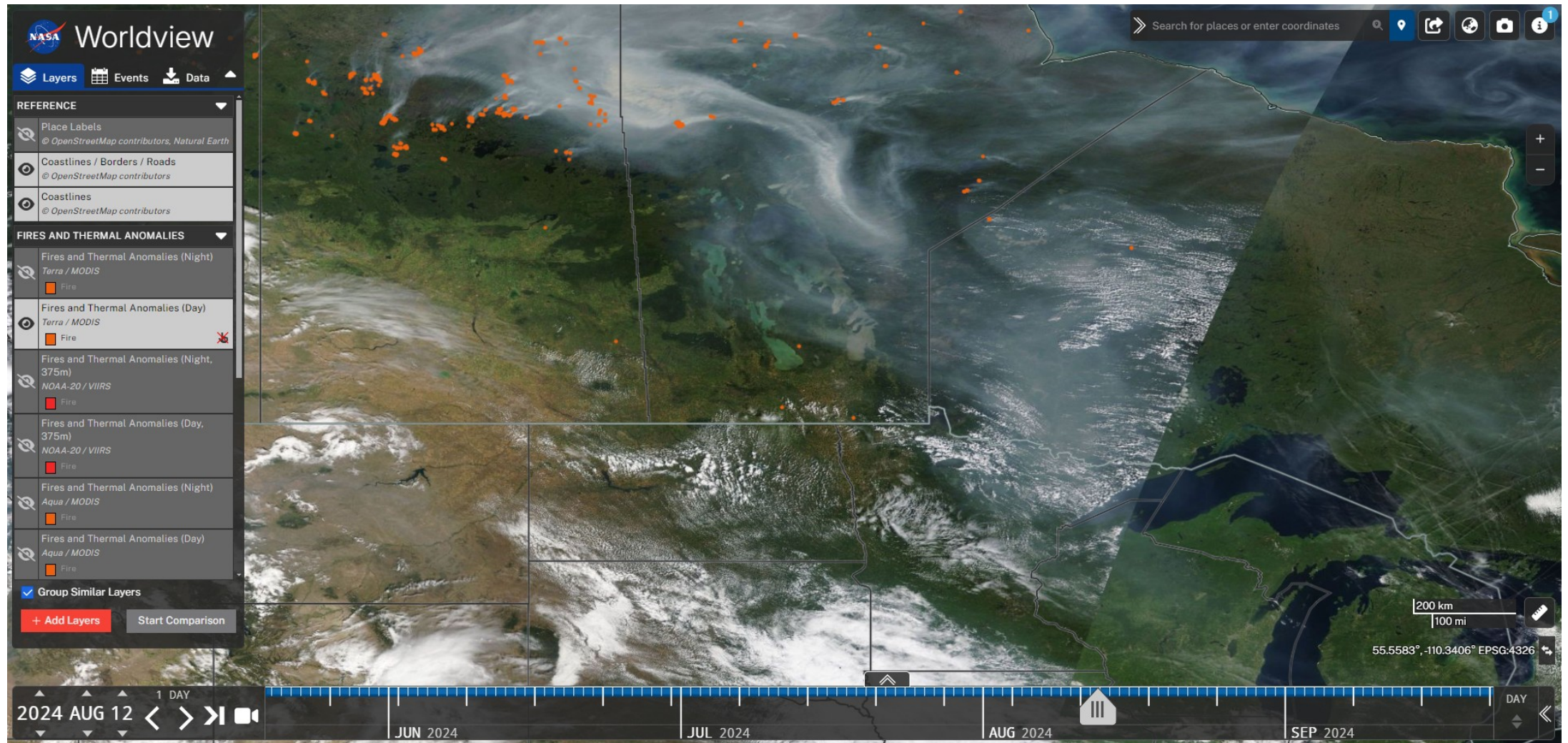
Hourly PM2.5 observations and RRFS smoke forecast



Hourly PM2.5 observations and RRFS smoke forecast



Aug 12-14 Wildfire Smoke Event Impacts North Shore

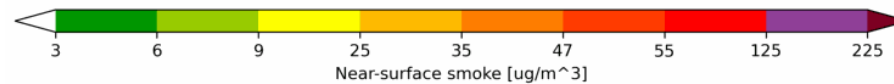
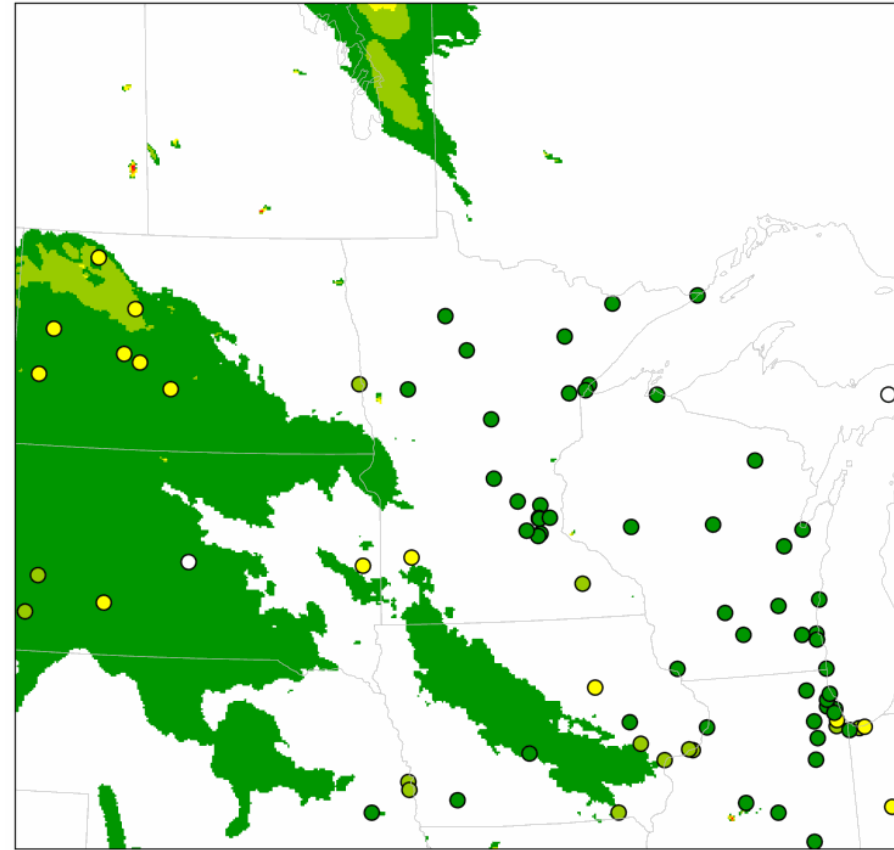


RRFS Smoke Forecast Initialized 08/11 12Z

Experimental RRFS_A: Near-surface smoke, 1 hour average

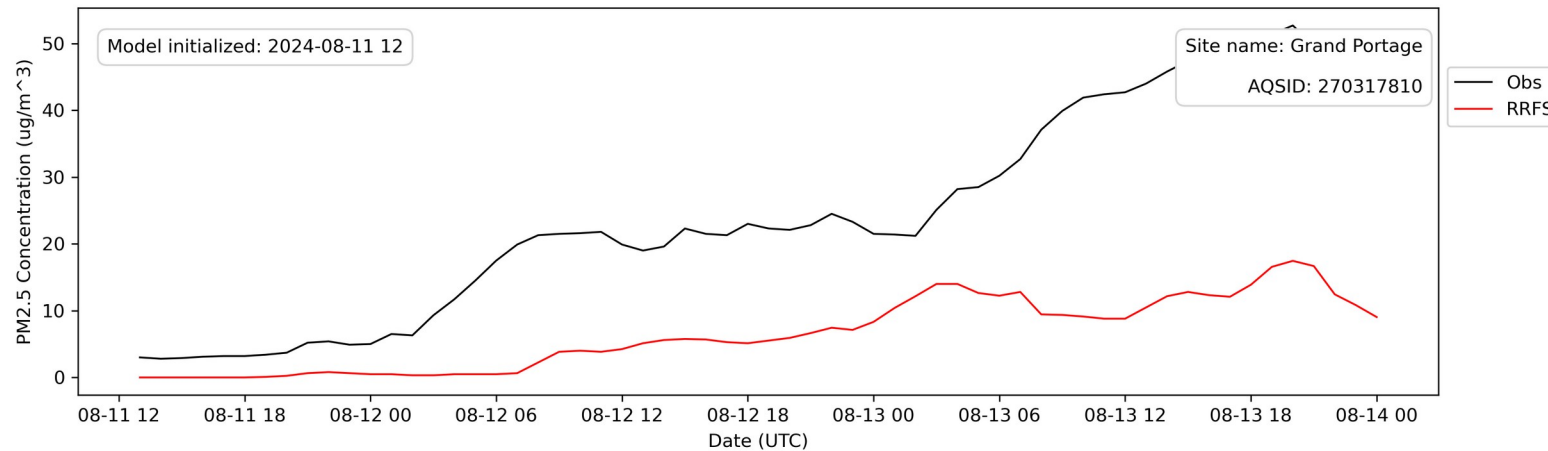
Initialized: 2024-08-11 12 UTC

Valid Time: 2024-08-11 13 to 2024-08-11 14 UTC

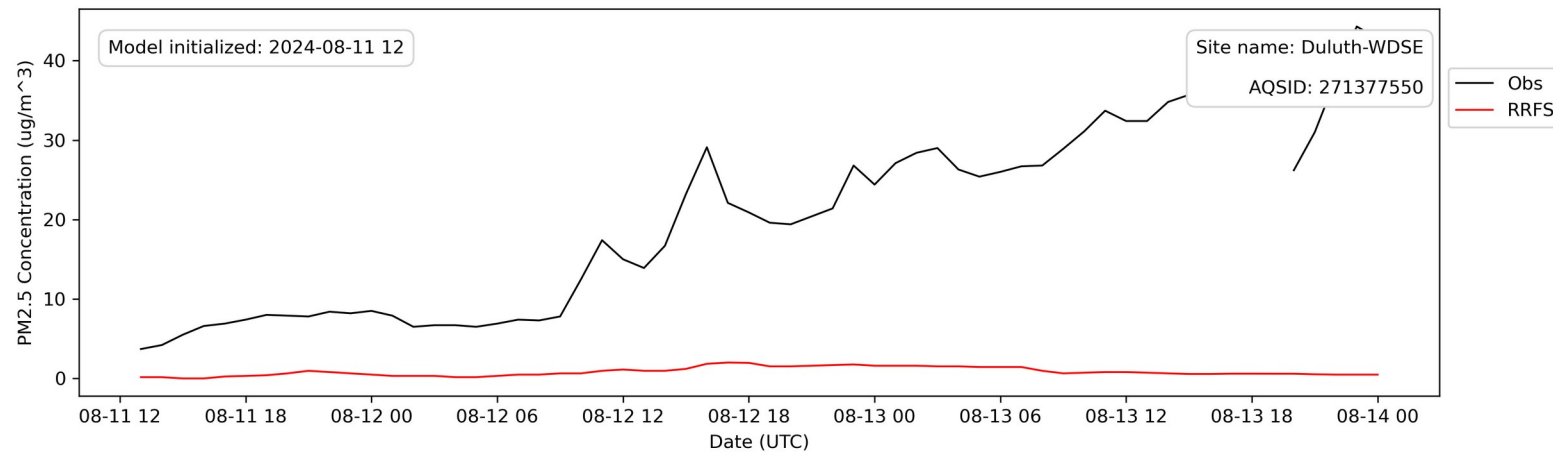


RRFS Smoke Forecast Initialized 08/11 12Z

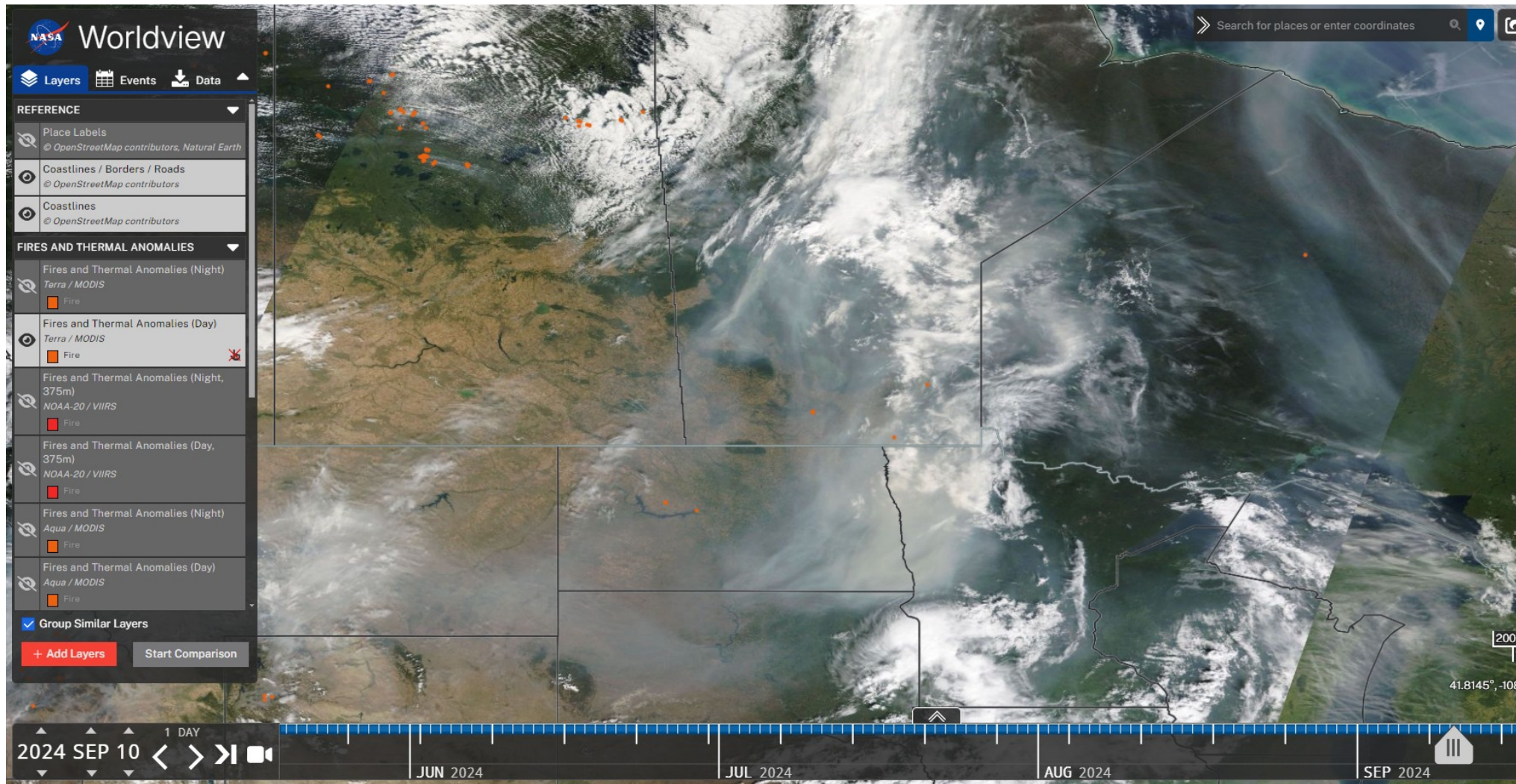
Hourly PM2.5 observations and RRFS smoke forecast



Hourly PM2.5 observations and RRFS smoke forecast



Sep 11 Wildfire Smoke Event Impacts Northwest MN

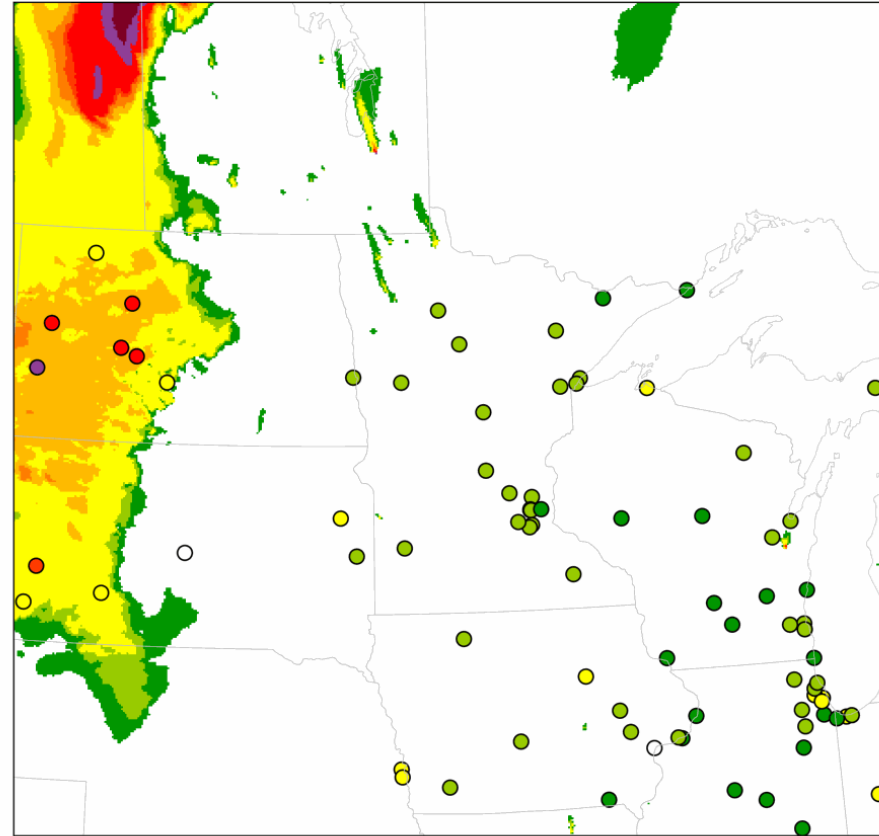


RRFS Smoke Forecast Initialized 09/10 12Z

Experimental RRFS_A: Near-surface smoke, 1 hour average

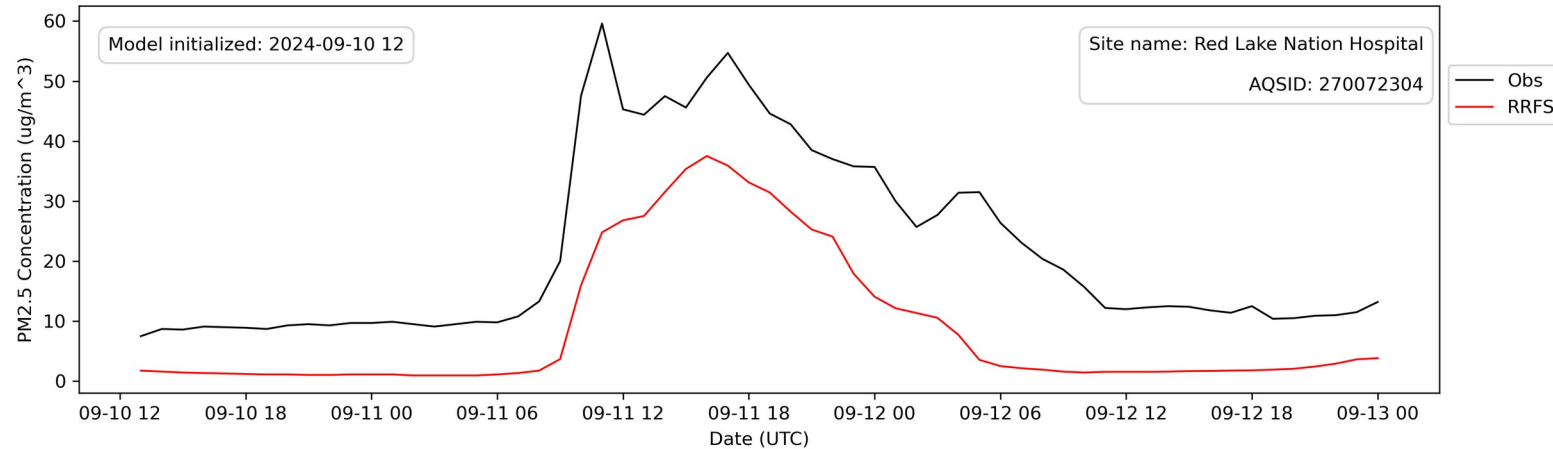
Initialized: 2024-09-10 12 UTC

Valid Time: 2024-09-10 13 to 2024-09-10 14 UTC

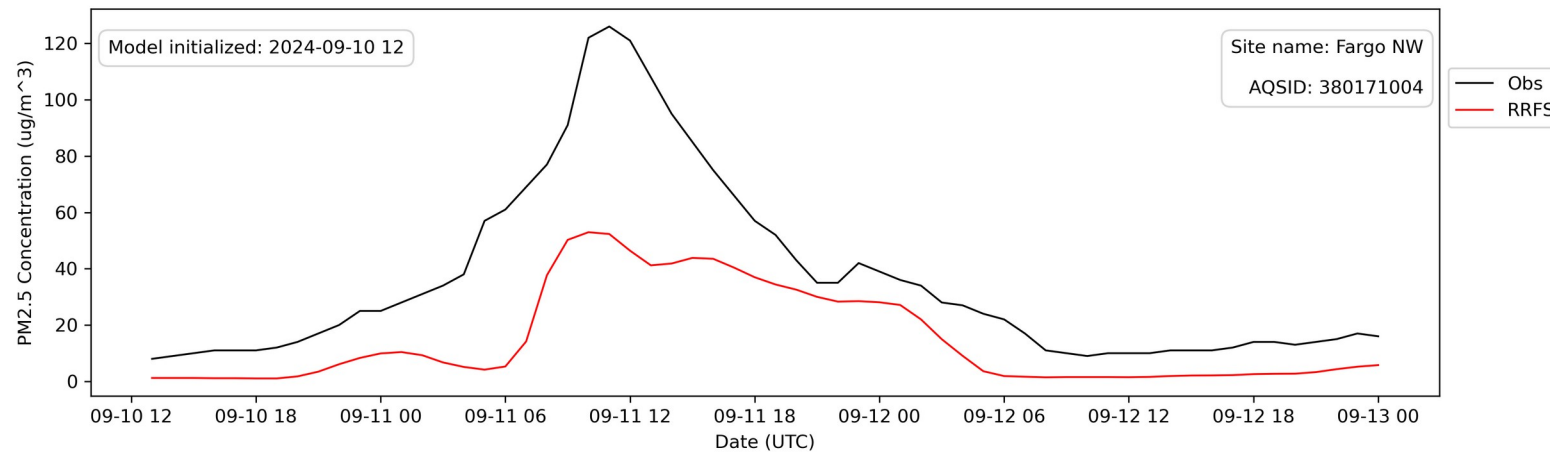


RRFS Smoke Forecast Initialized 09/10 12Z

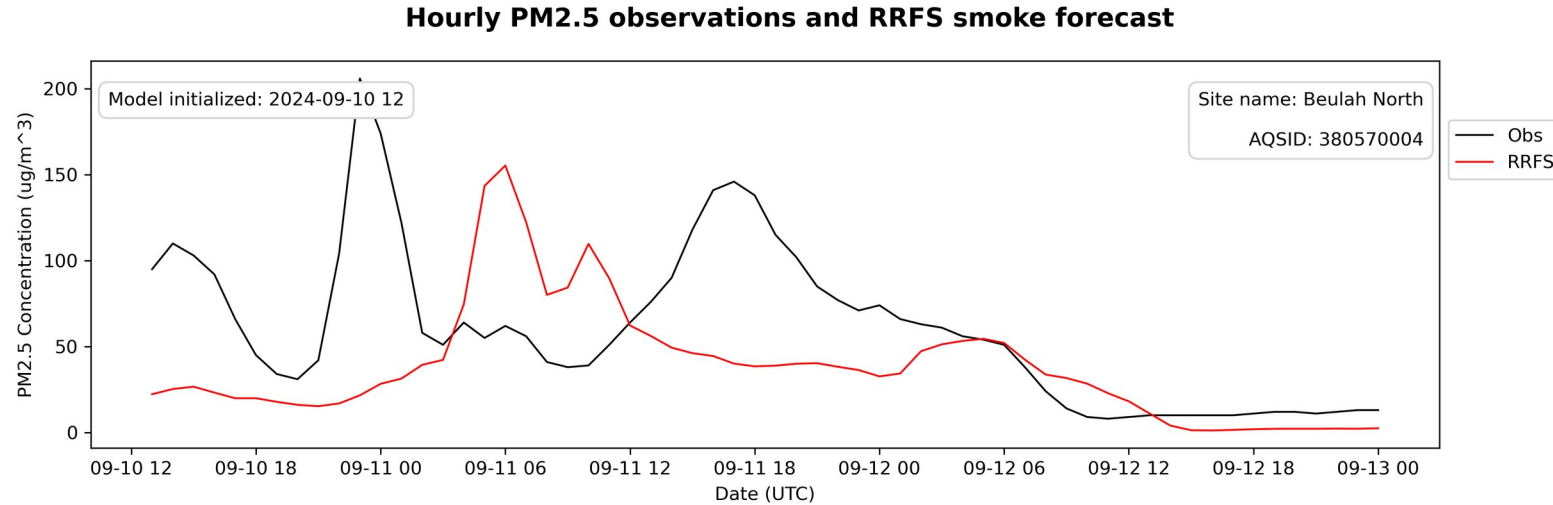
Hourly PM2.5 observations and RRFS smoke forecast



Hourly PM2.5 observations and RRFS smoke forecast



RRFS Smoke Forecast Initialized 09/10 12Z



- Surface PM_{2.5} was significantly underpredicted for May 11-12 smoke event
- Model performance improved for events later in the summer
- Significant improvement in wildfire smoke predictions across northern U.S. compared to HRRR-Smoke in 2023

- Estimate smoke fraction of measured PM_{2.5} to compare to RRFS smoke predictions
- Calculate error statistics using model-observation pairs during wildfire smoke event time periods
- Compare performance to other models, including HRRR-Smoke, AQM, and Firework

Thank you!

David Brown

David.L.Brown@state.mn.us

651-757-2227