

Another Verification Consideration: Impact of Fire Emissions

Peter Colarco

Atmospheric Chemistry and Dynamics Branch (GMAO-lite)

Arlindo da Silva, Ravi Govindaraju

Global Modeling and Assimilation Office

NASA GSFC

Capabilities and Motivation

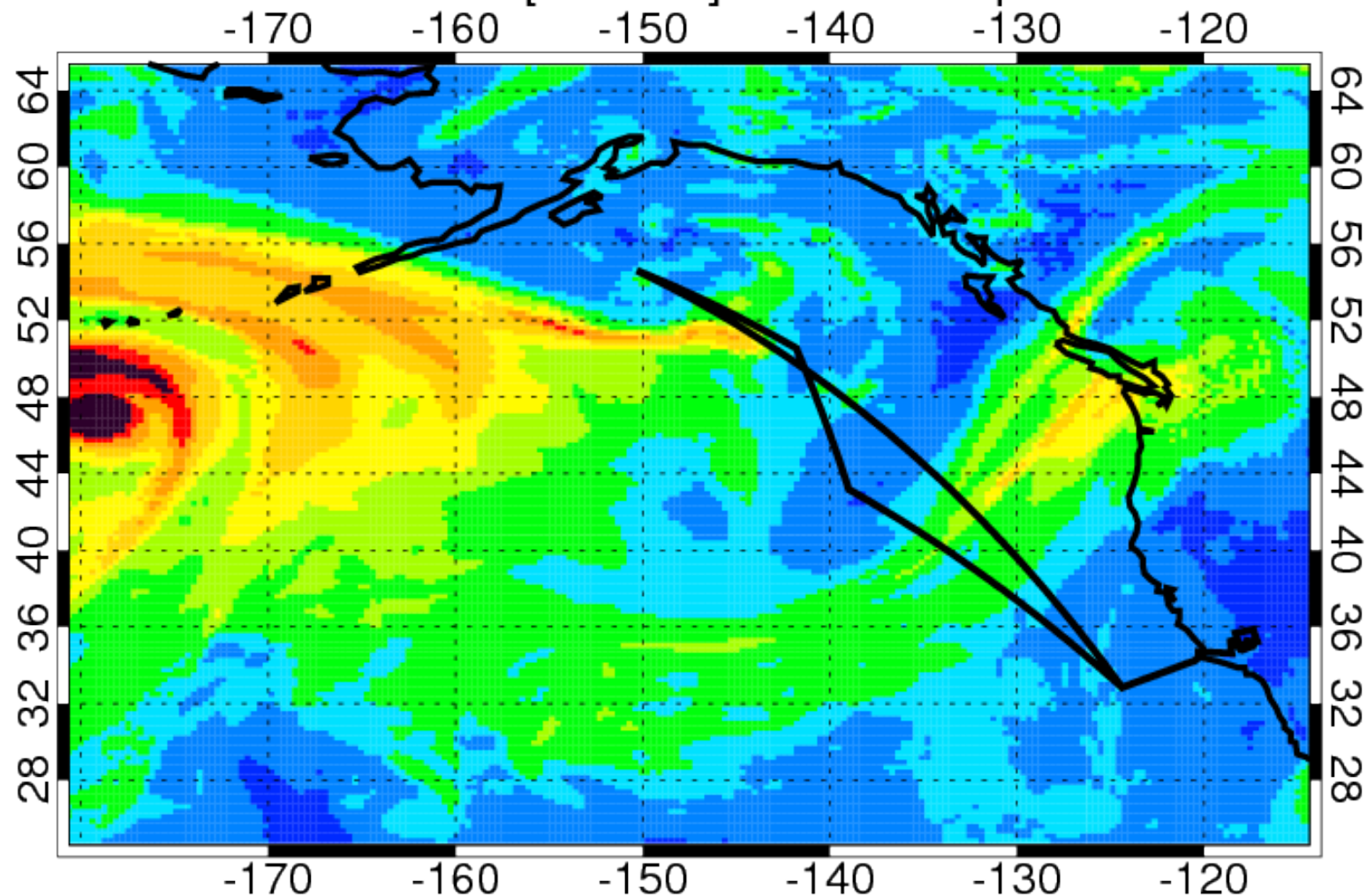
NASA GEOS-5 model

- Finite volume or cubes sphere dynamical core
- GFS data assimilation system (meteorological)
- Online GOCART aerosol module
- Same model is being used for chemistry-climate studies and aerosol forecasting

Customer

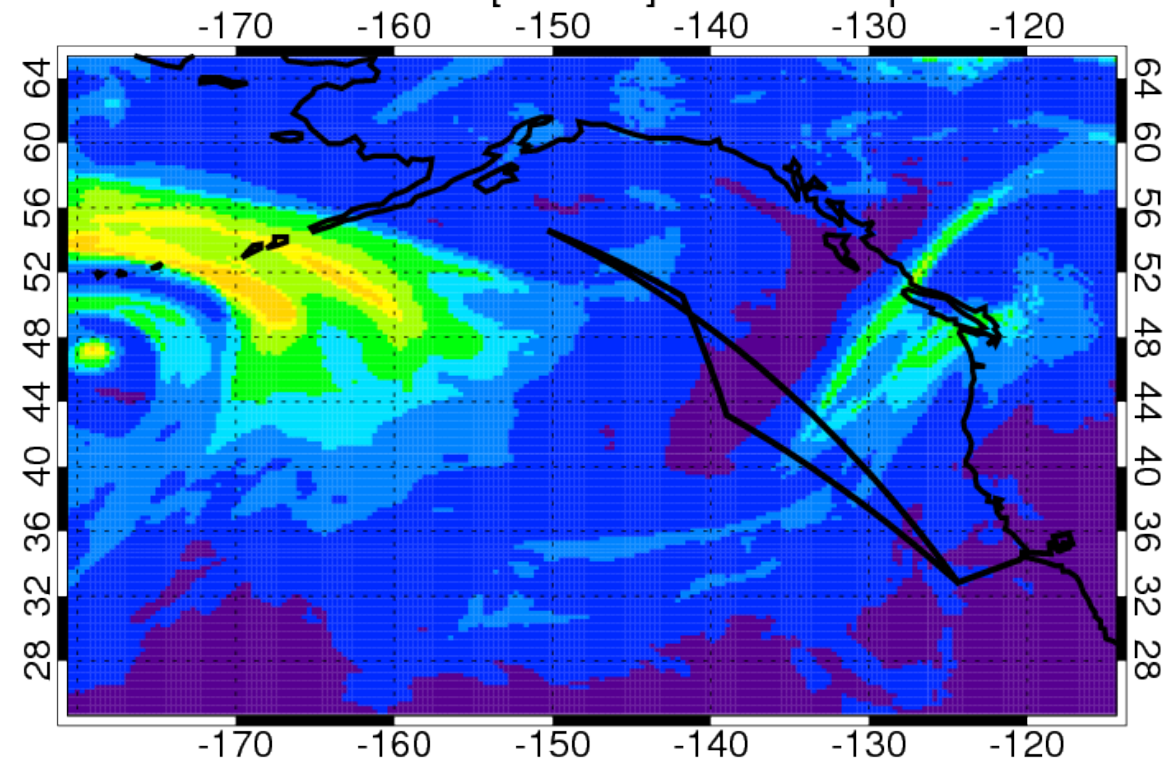
- Climate community
- Seasonal forecasts
- Field mission support
- Satellite missions - product retrievals, OSSEs, mission concept

GEOS-5 Total AOT [550 nm] valid 0z08apr2010



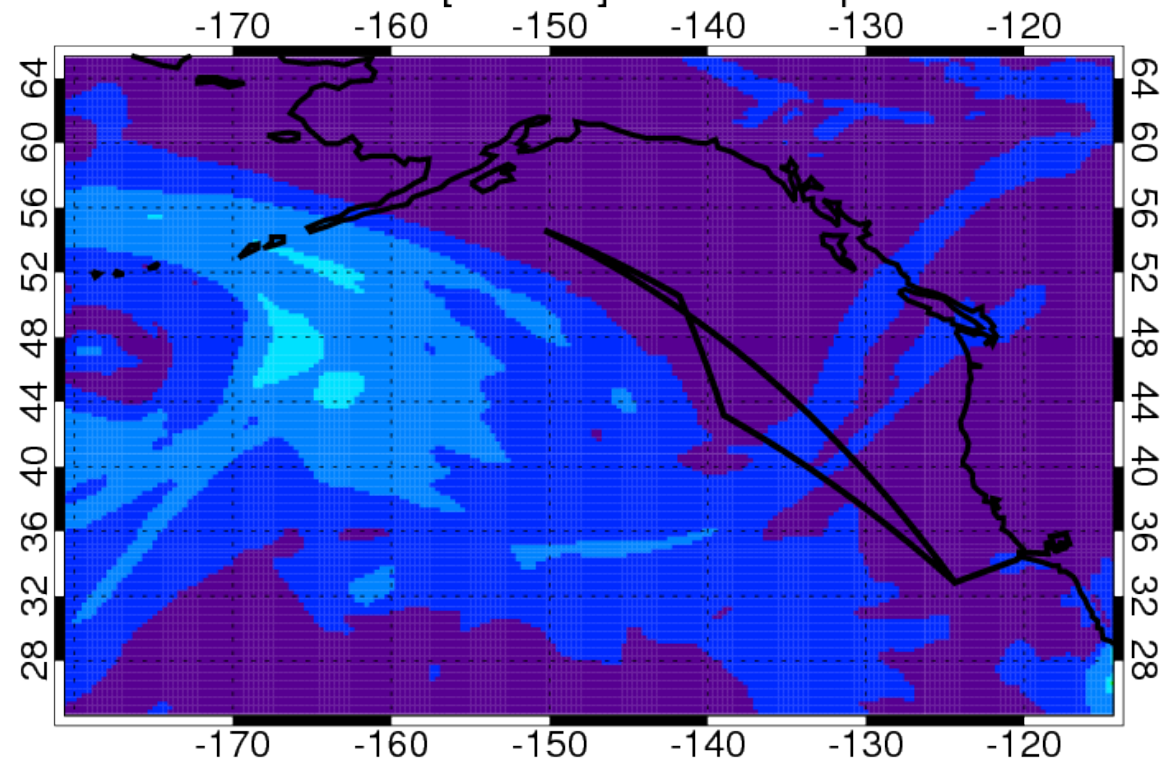
0.00 0.05 0.10 0.15 0.20 0.30 0.40 0.50 0.70 1.00 1.50

GEOS-5 Sulfate AOT [550 nm] valid 0z08apr2010



0.00 0.05 0.10 0.15 0.20 0.30 0.40 0.50 0.70 1.00 1.50

GEOS-5 Dust AOT [550 nm] valid 0z08apr2010



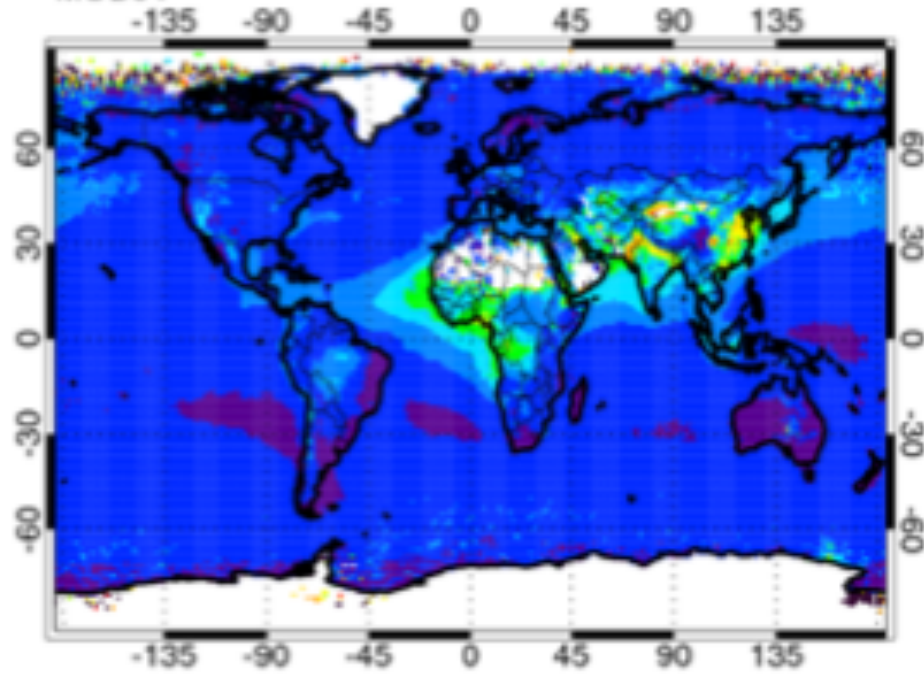
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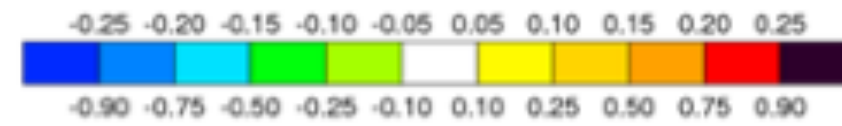
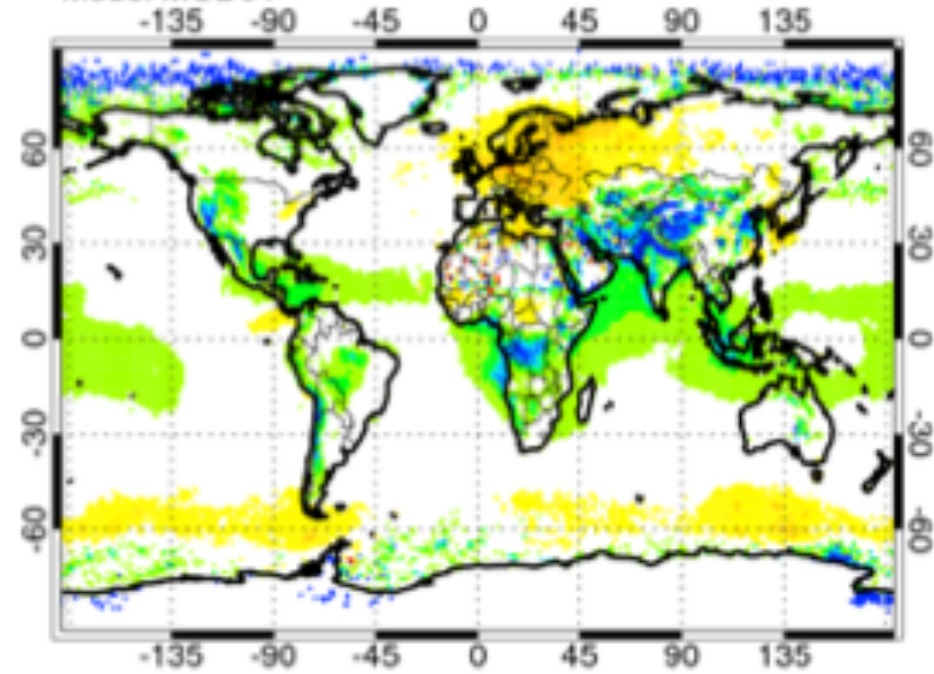
Verification

Global

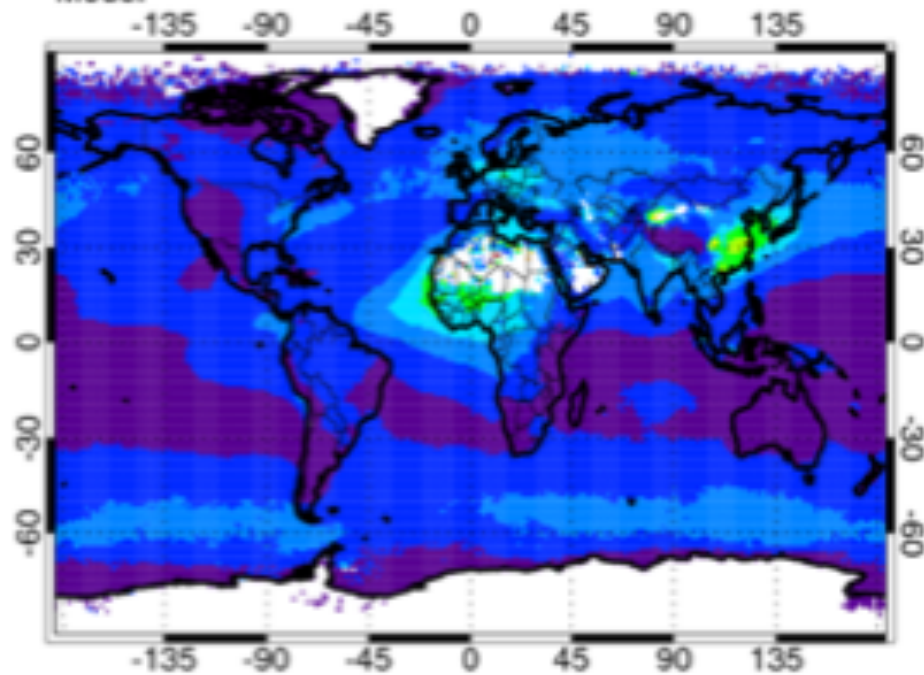
MOD04



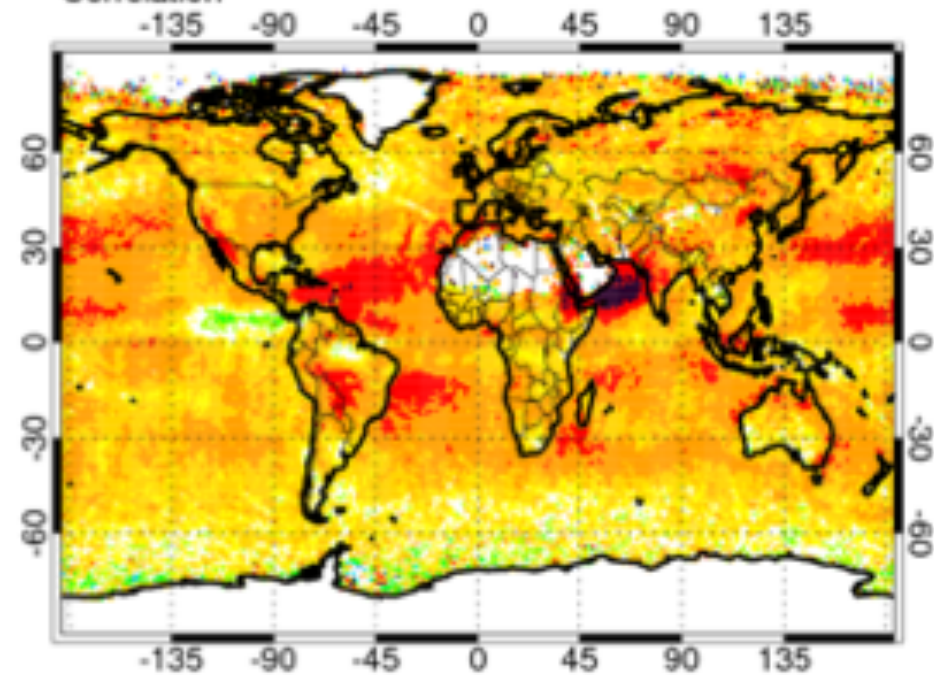
Model-MOD04



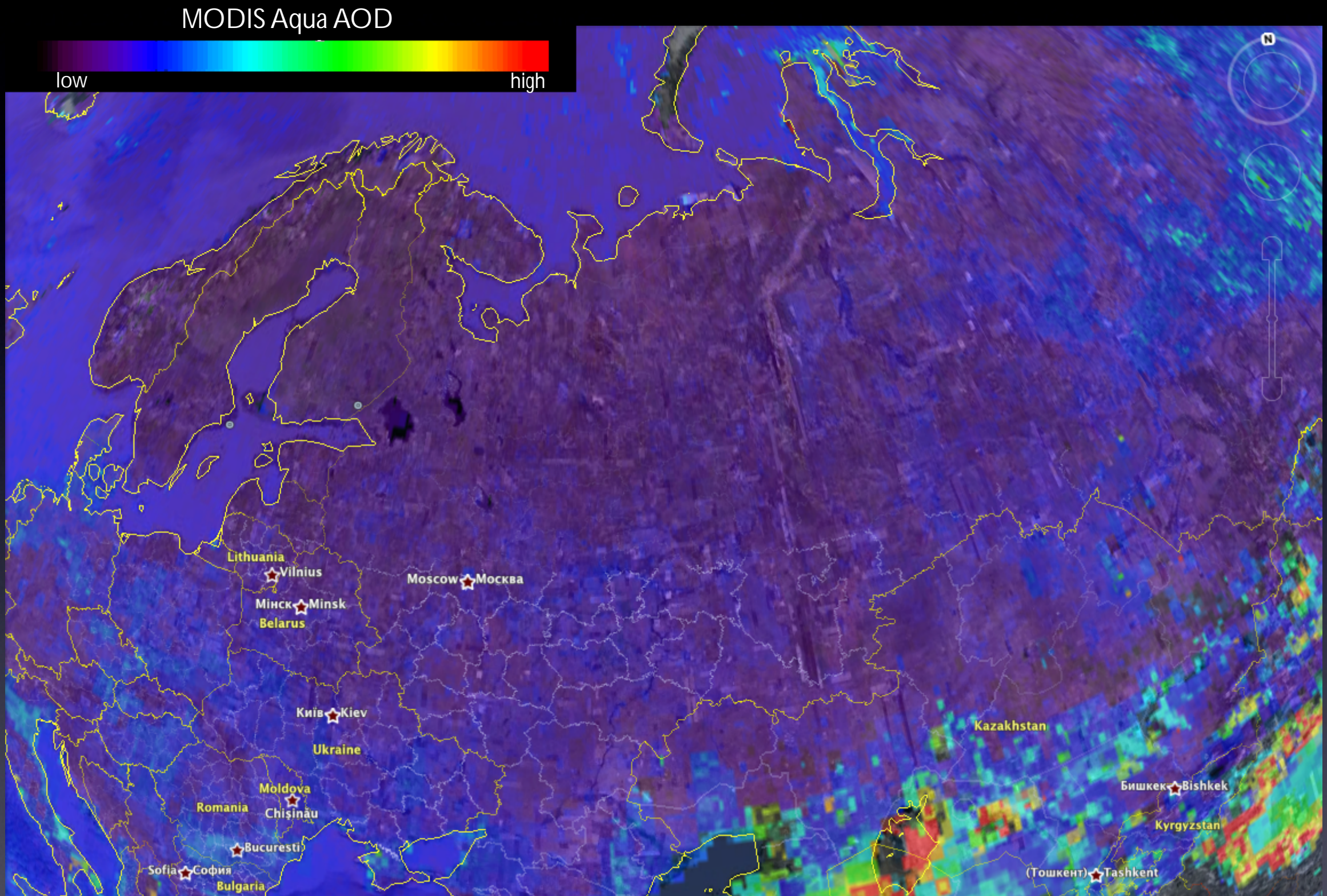
Model



Correlation



MODIS Aqua AOD Climatology July 2003 - 2009

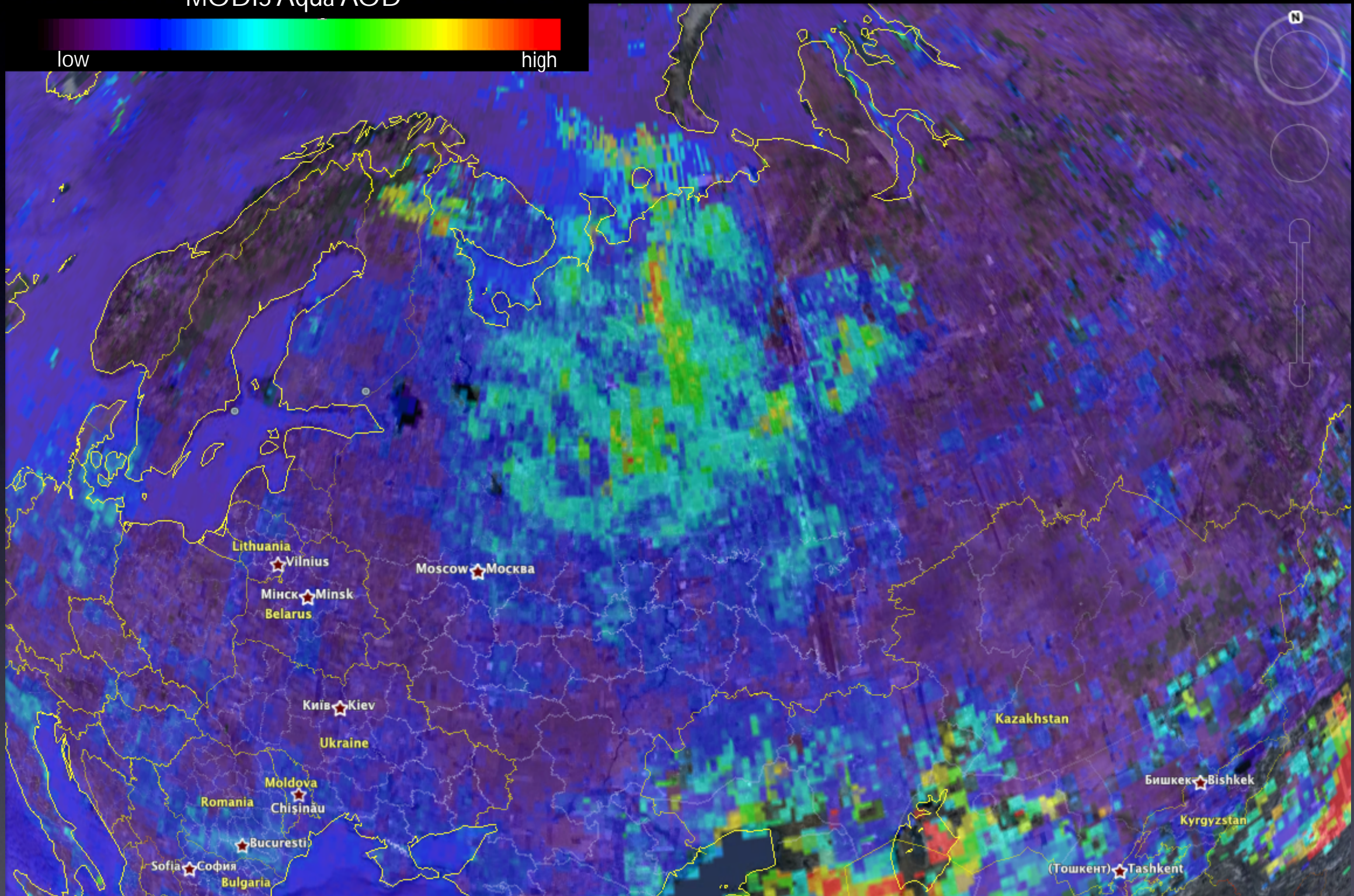


MODIS Aqua AOD July 2010

MODIS Aqua AOD

low

high

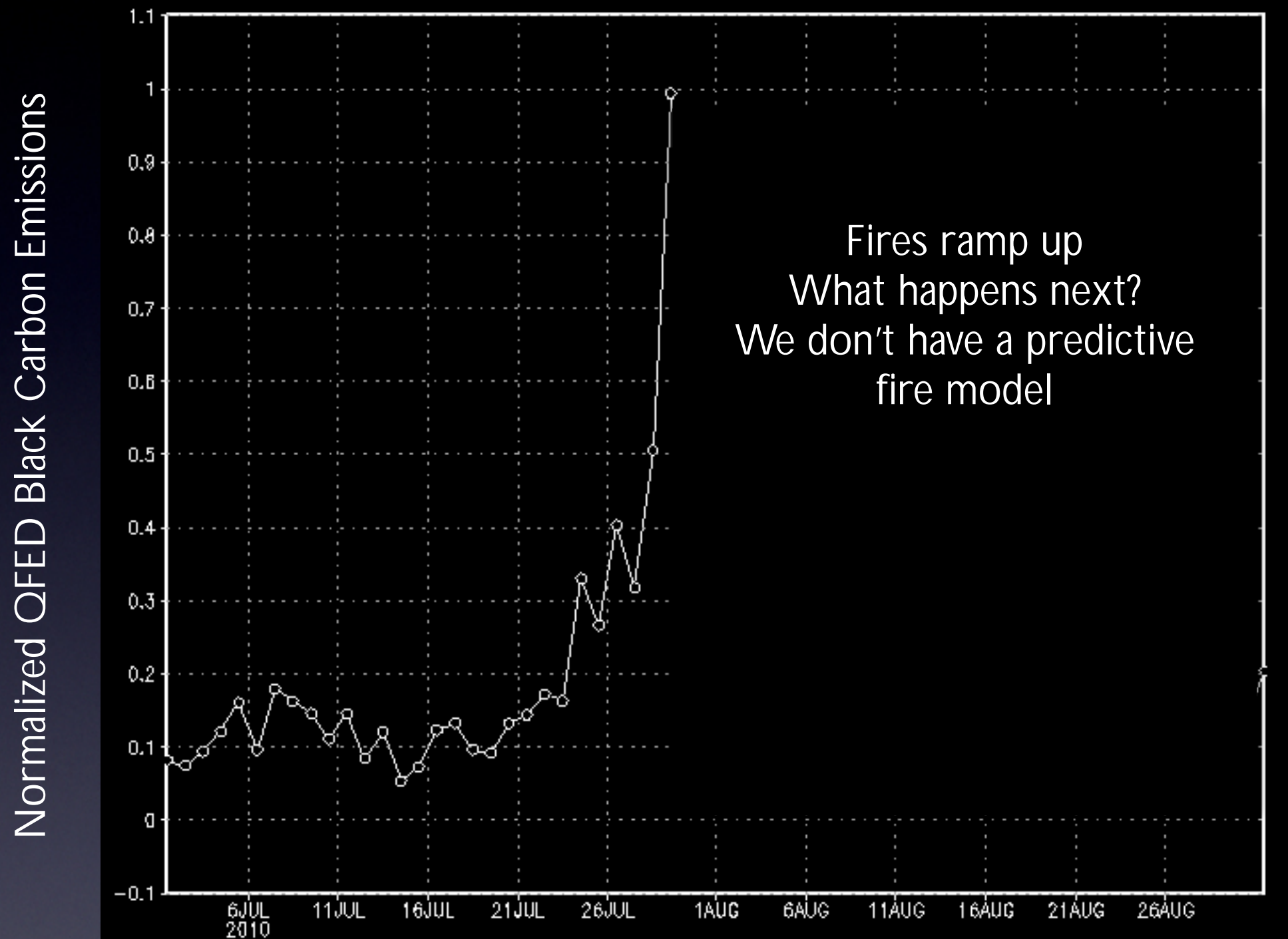


MODIS July 30 2010



The high-altitude particles in OMI data could have been smoke from fires in Western Russia. The fires are outlined in red in this photo-like satellite image from July 30, 2010. Clouds indicate that air was rising and conditions were right for a firestorm to form. (NASA image by Jesse Allen using [MODIS](#) data.)

Fire Emission Product for Forecast System



Black carbon fire emissions from so-called QFED product: based on MODIS fire detections and calibrated to GFEDv2 emission inventory

Fire Emission Product for Forecast System



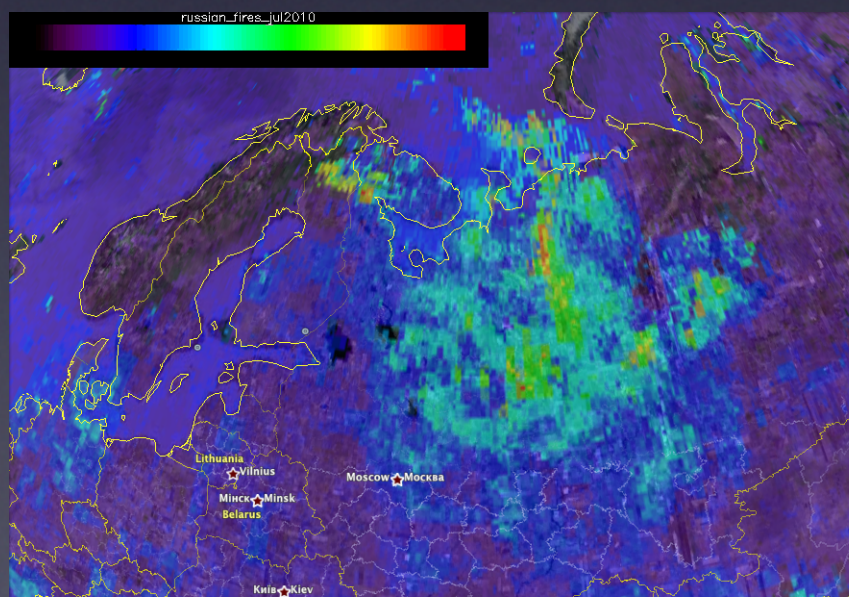
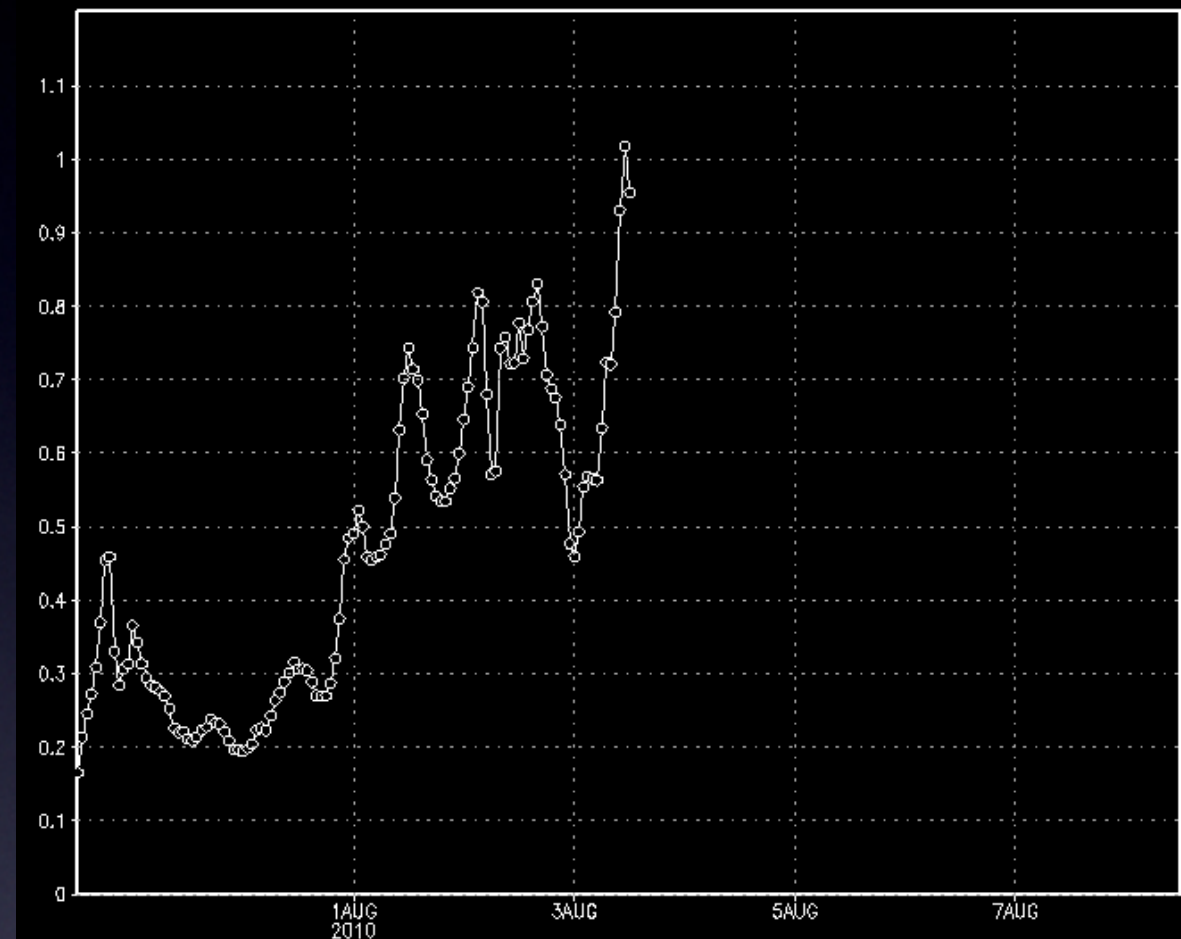
Black carbon fire emissions from so-called QFED product: based on MODIS fire detections and calibrated to GFEDv2 emission inventory

Forecast Smoke AOD in Moscow

Emissions



AOT

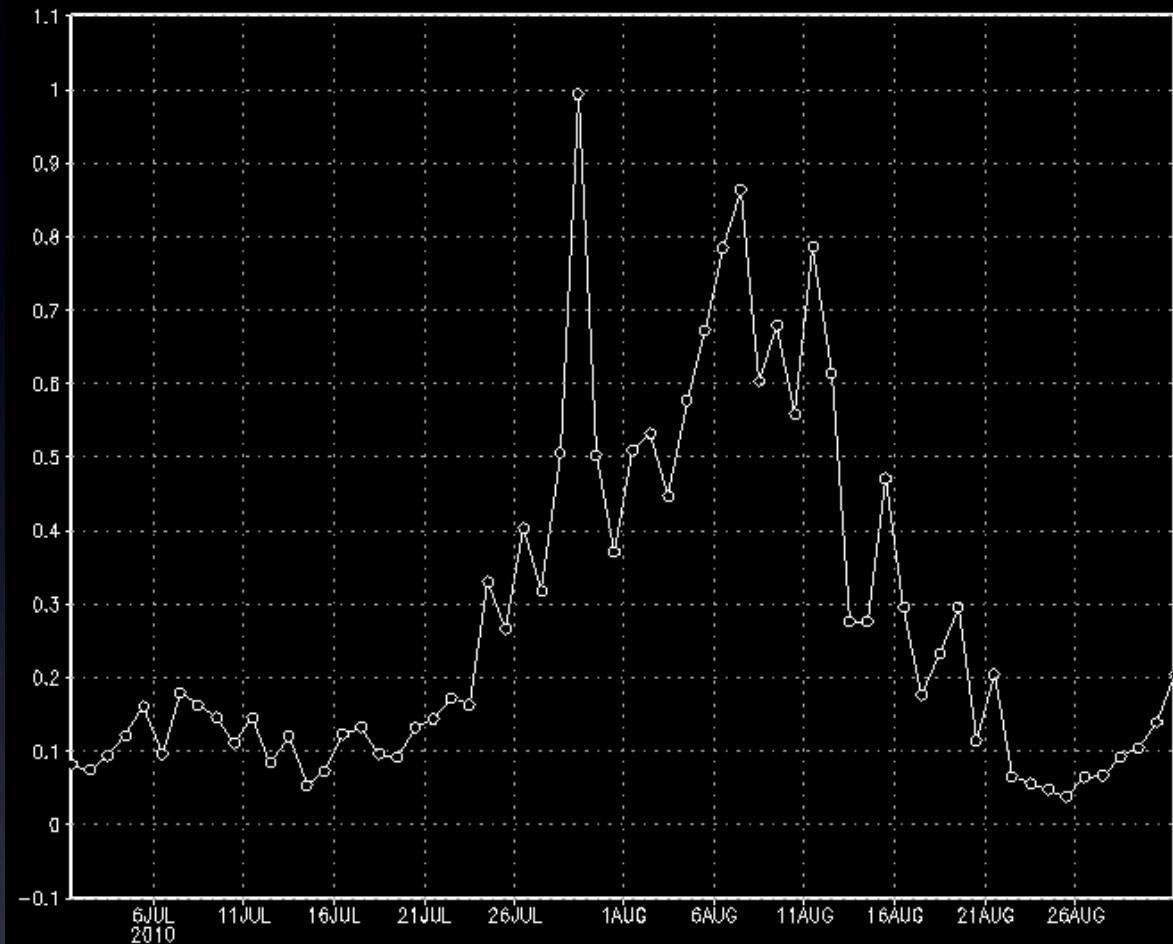


Emissions are used to drive online GOCART model inside the near-realtime GEOS-5 model runs

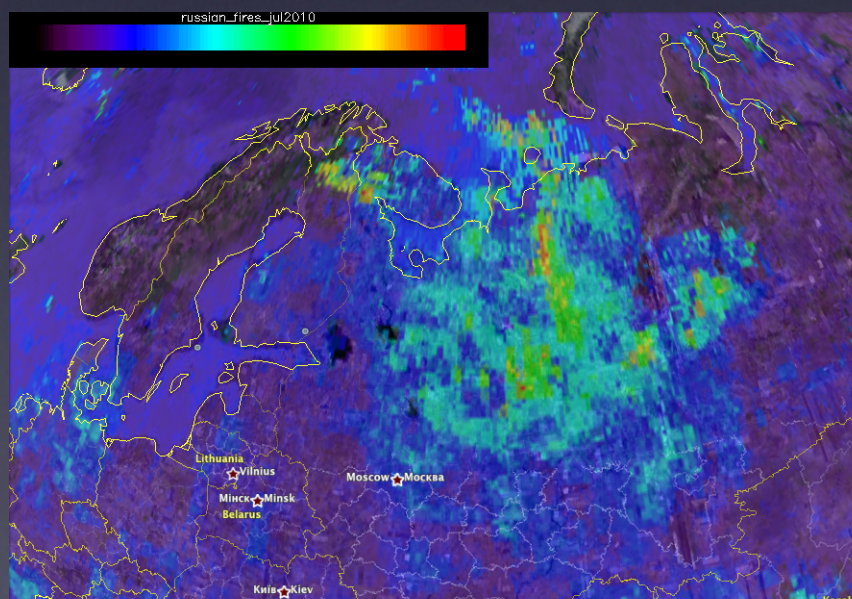
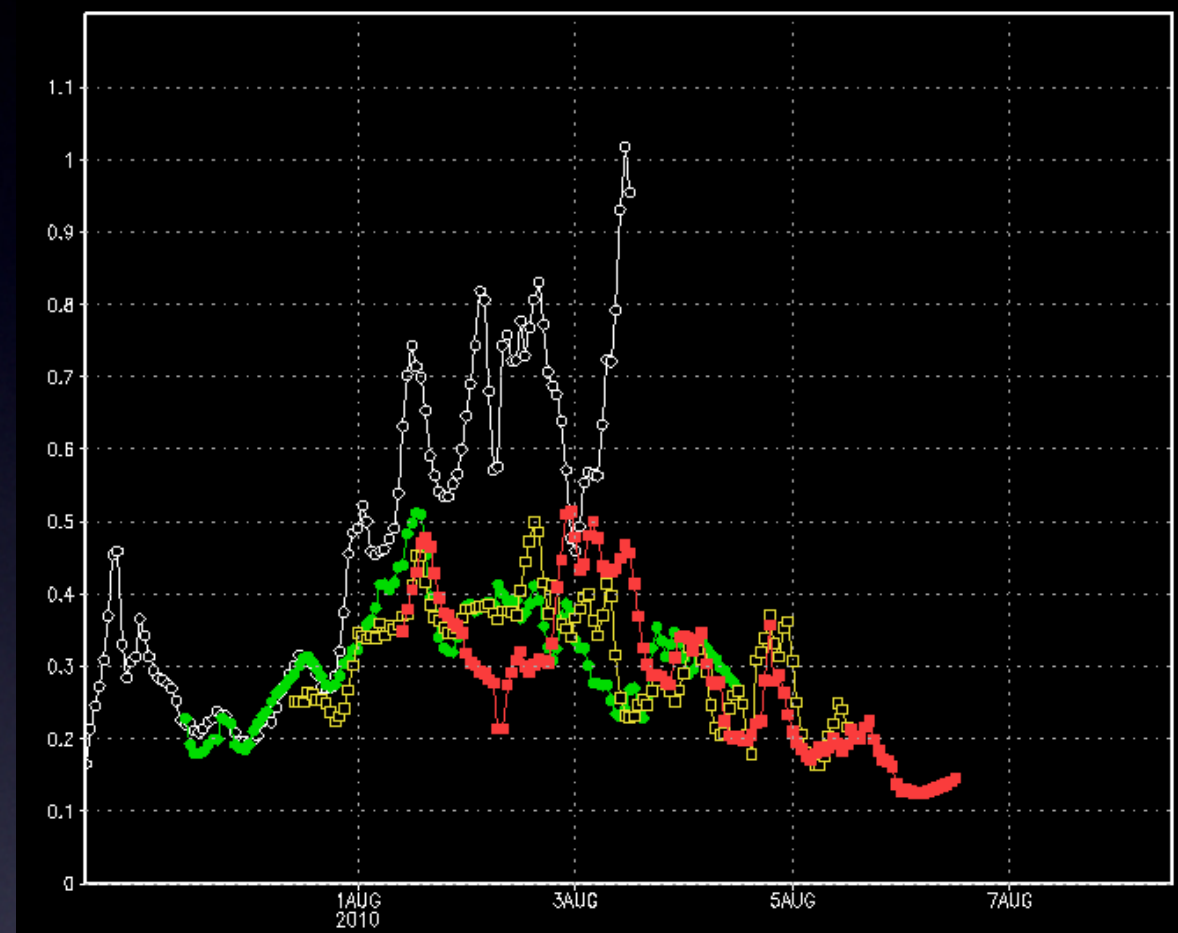
Forecast Smoke AOD in Moscow

Impact of new emissions information

Emissions



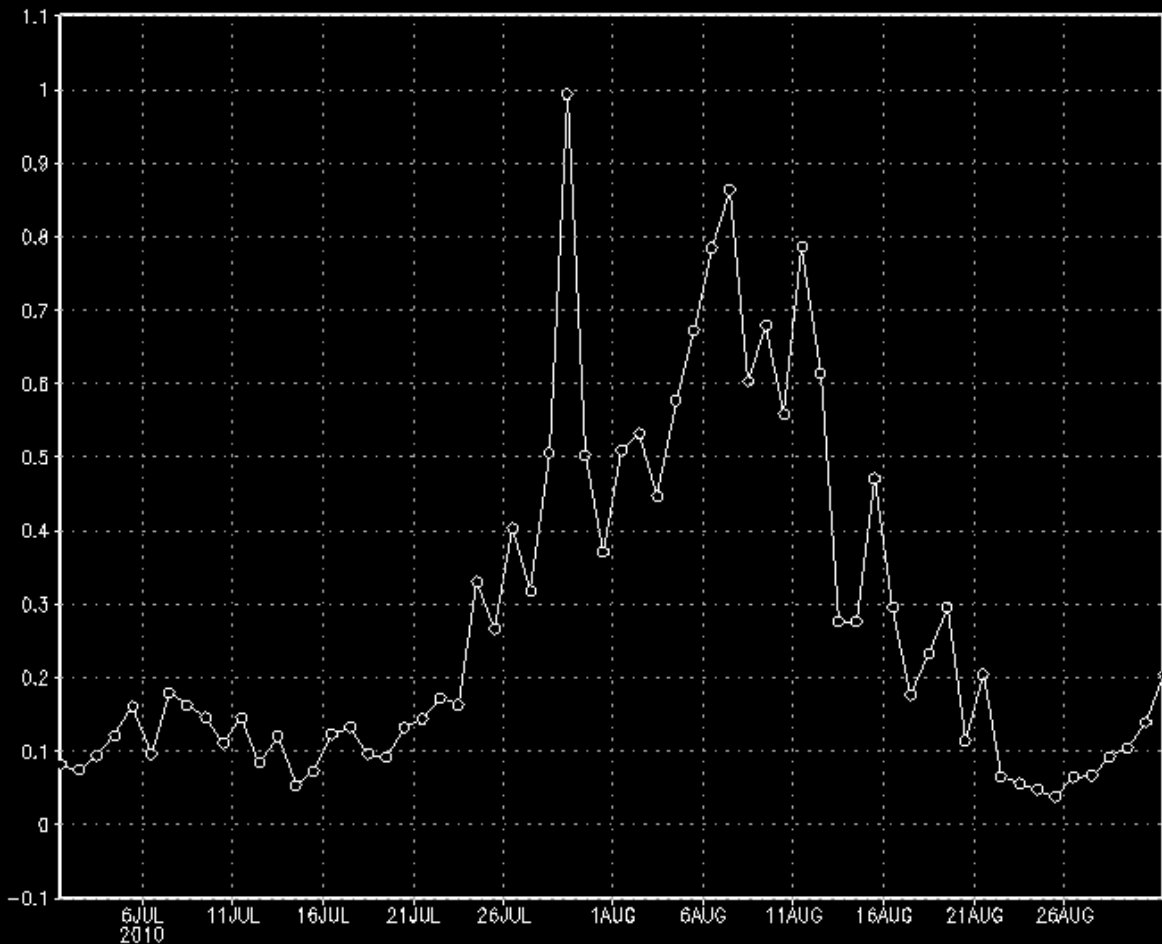
AOT



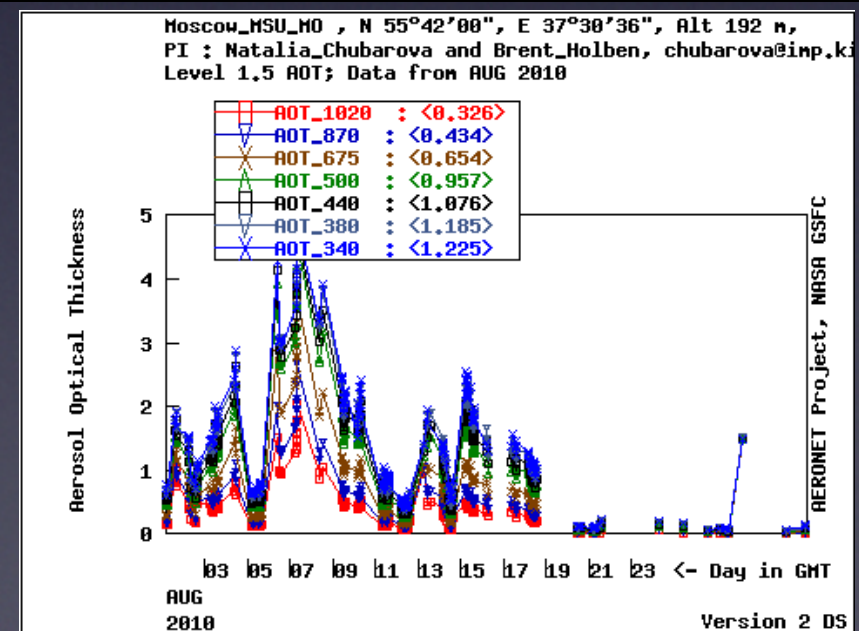
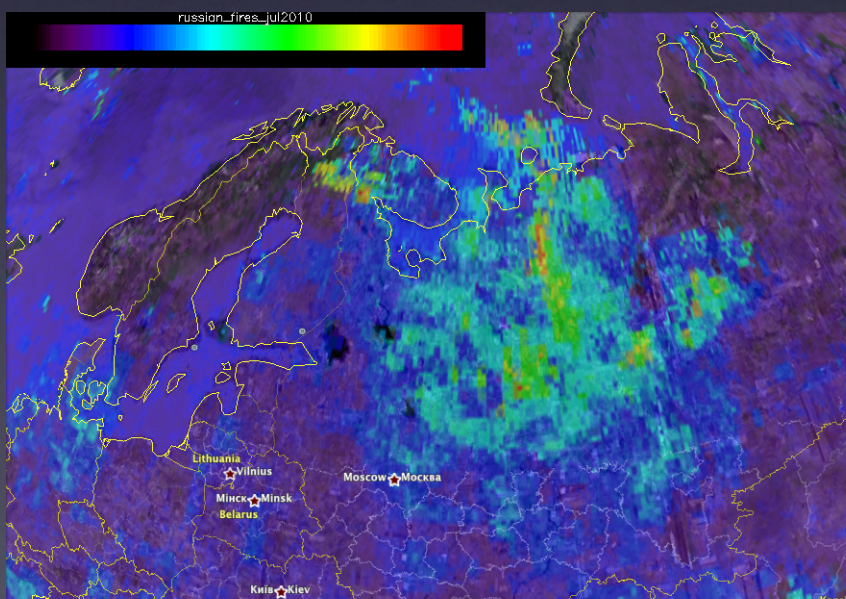
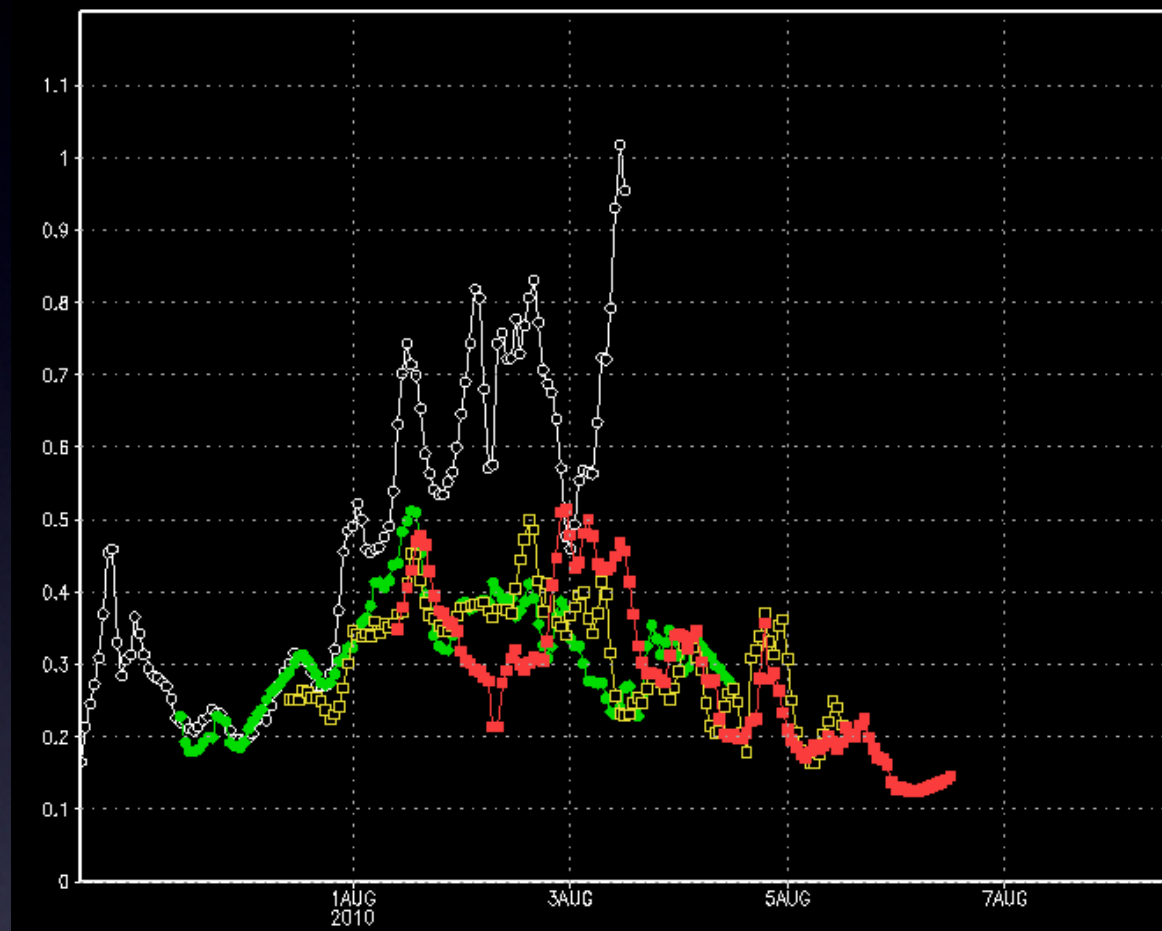
Forecast Smoke AOD in Moscow

Impact of new emissions information

Emissions

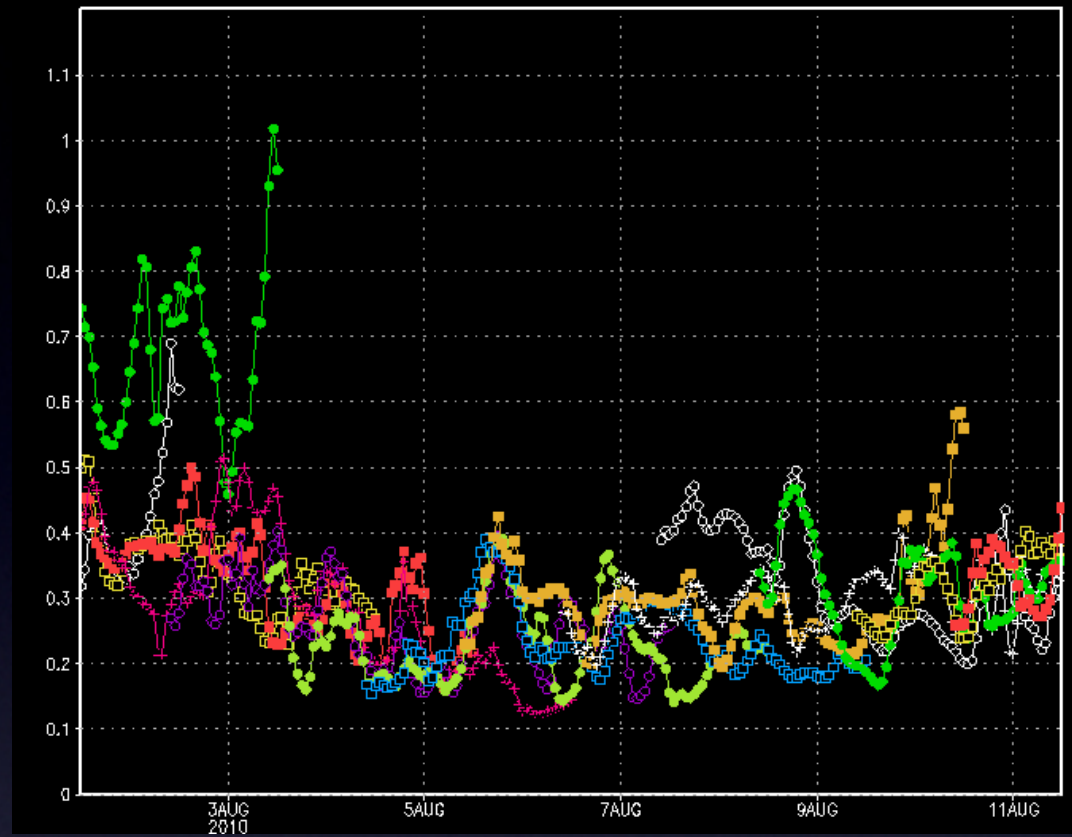


AOT

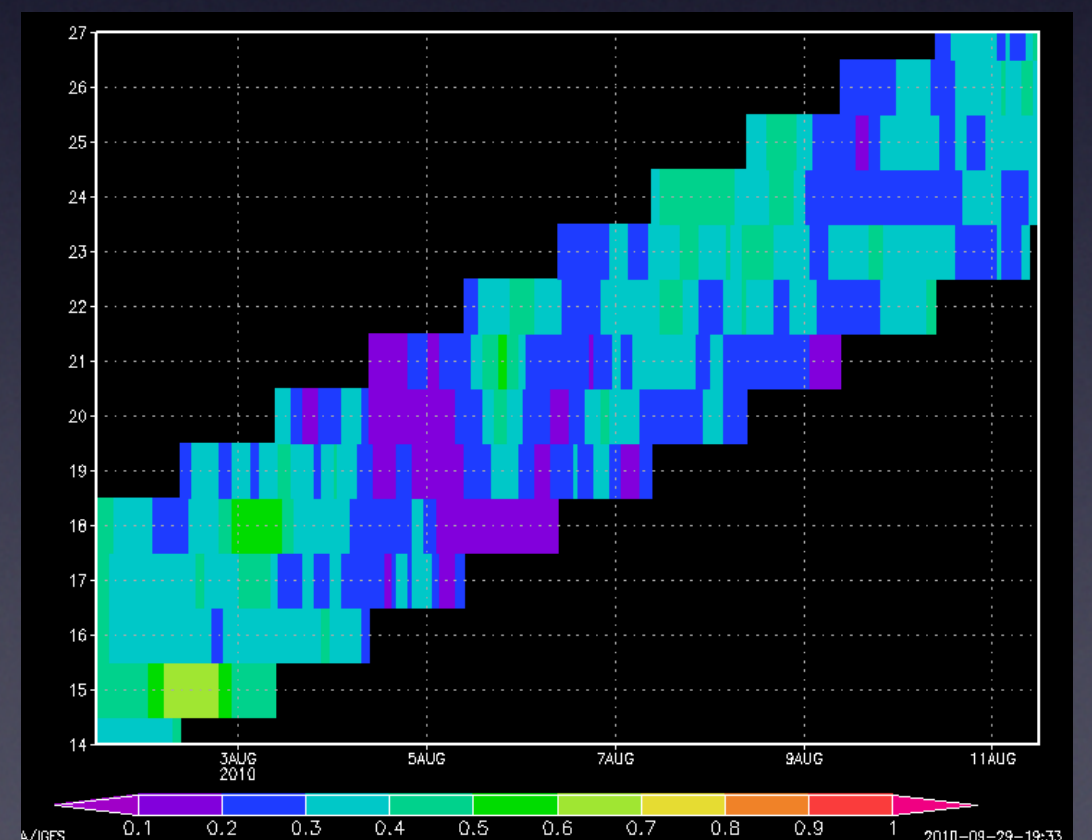
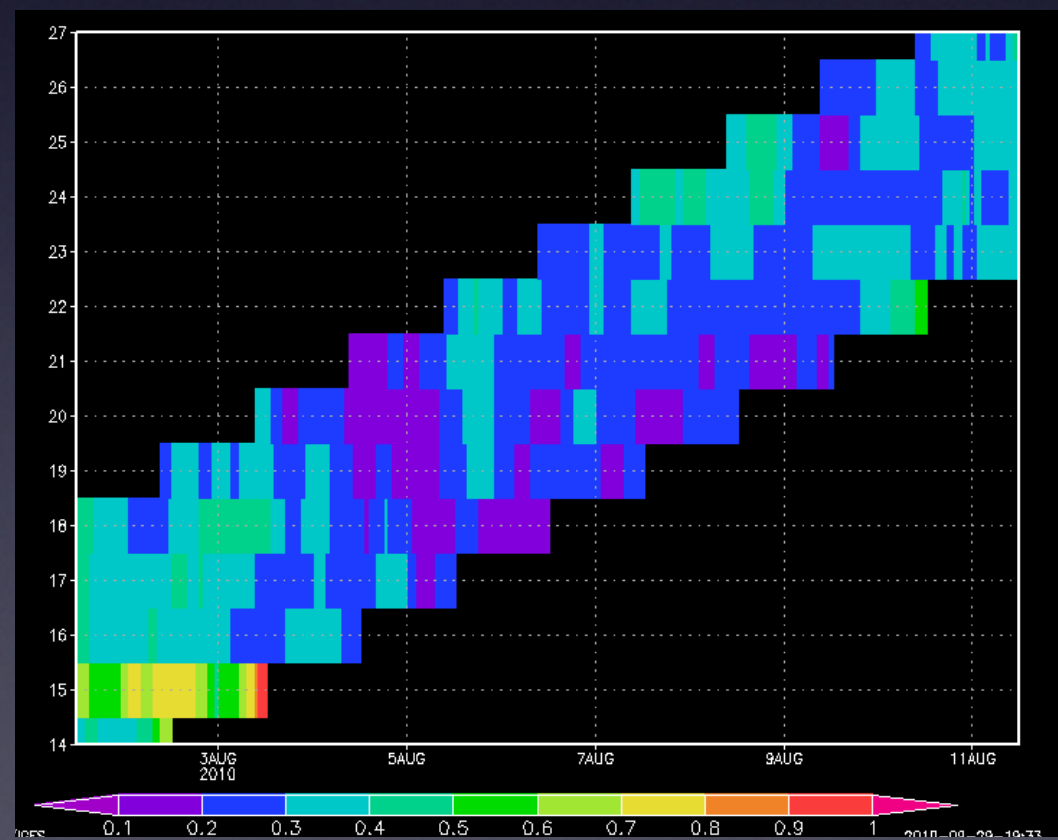
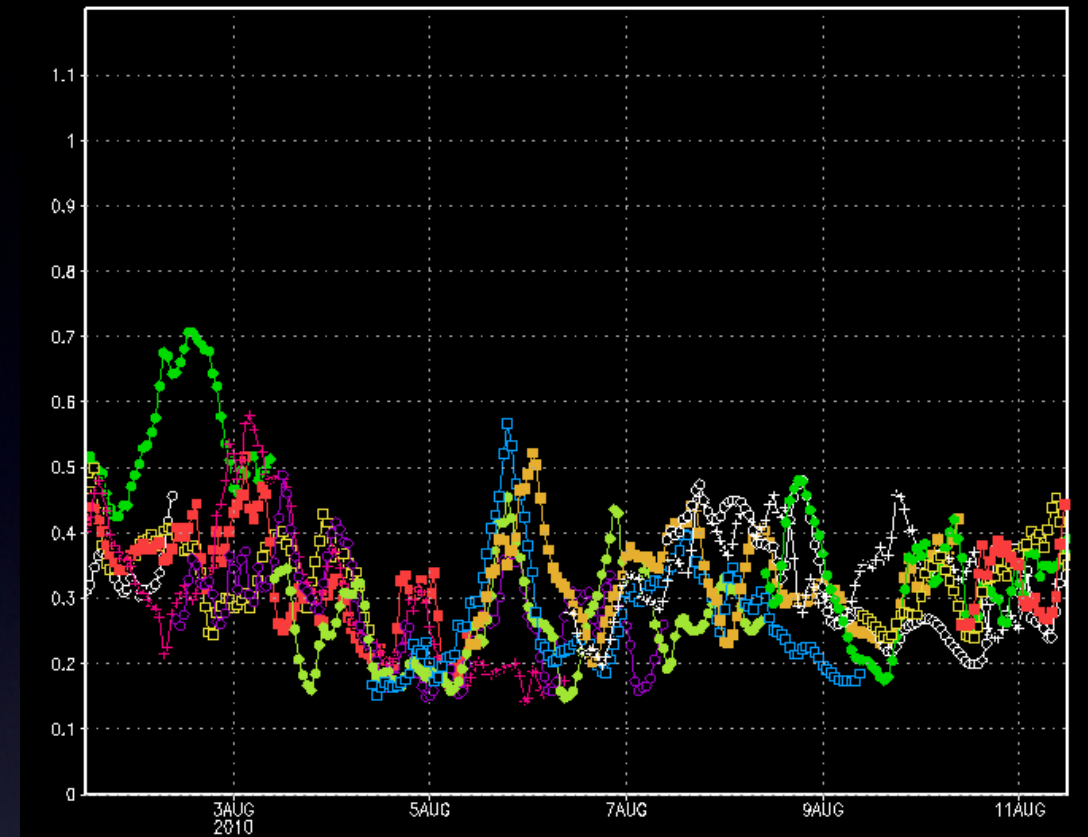


Original Forecast Set

AOT



Hindcast



Conclusion

Fires present a different beast than many other species we are simulating

Our model does not presently have aerosol assimilation; does that automatically fix this problem?

If not, how do you deal with this sliding emissions? A better strategy than fire **persistence**? Fire modeling?