

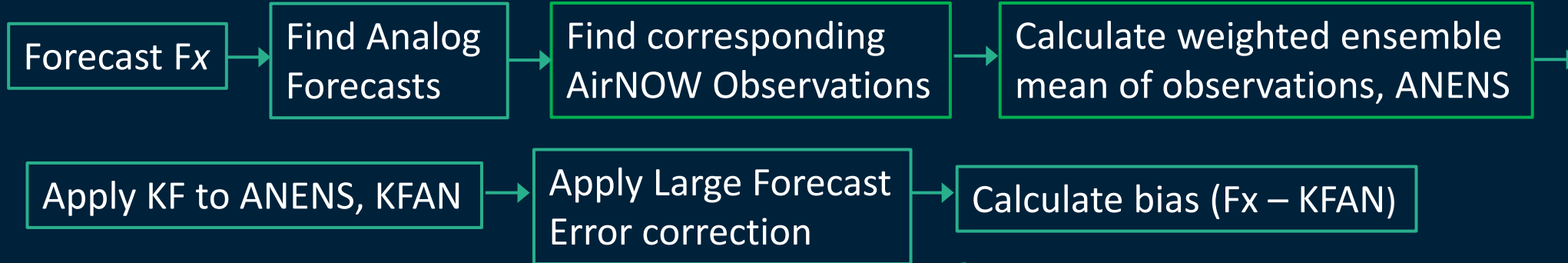
Potential New Directions for CMAQ Post-Processing: Probabilistic AQ Forecasts

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NOAA/Earth System Research Laboratory/Physical Sciences Division

Current KFAN Post-Processing System:

At each AirNOW observation site x

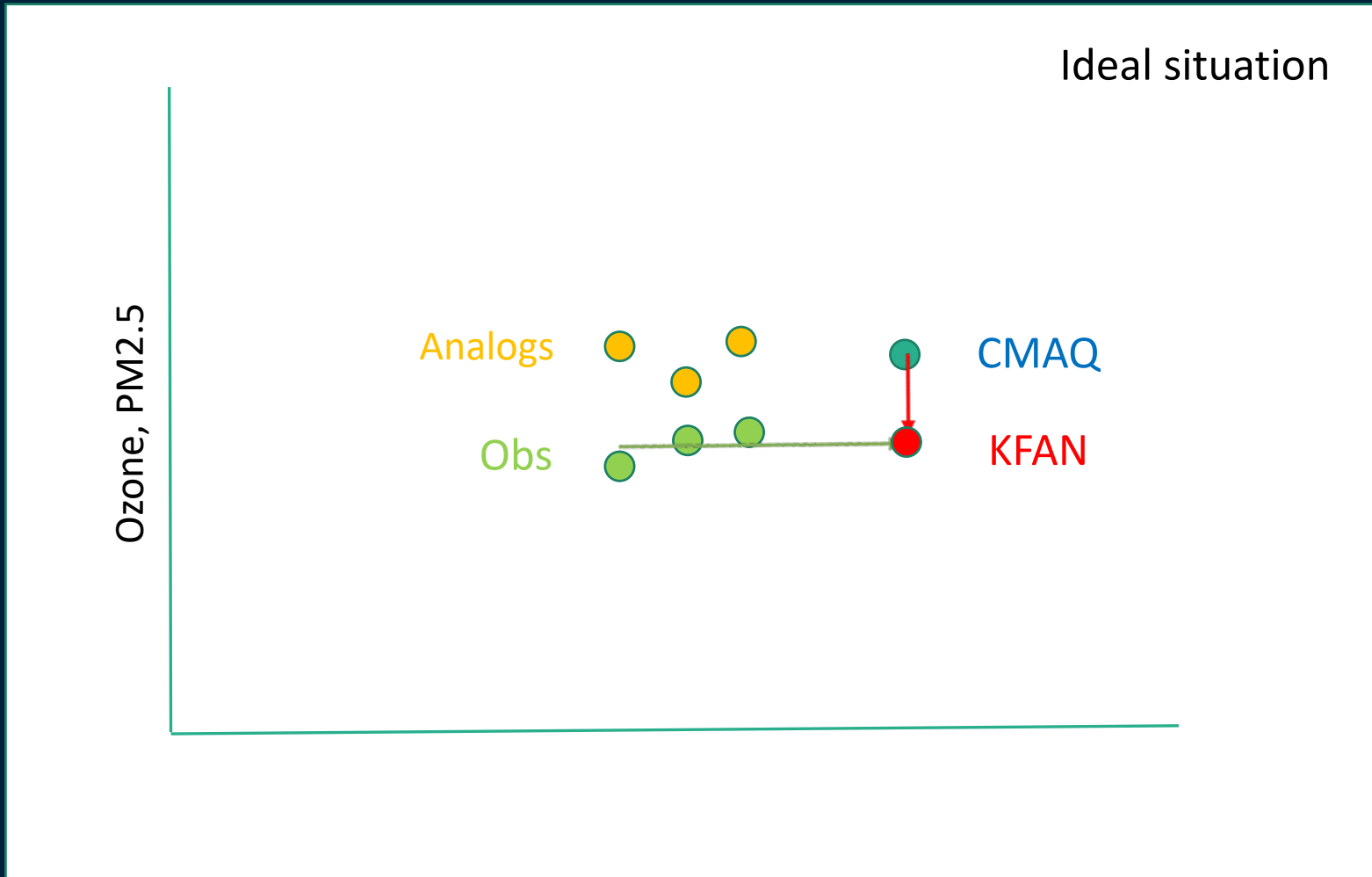


Over entire CMAQ grid



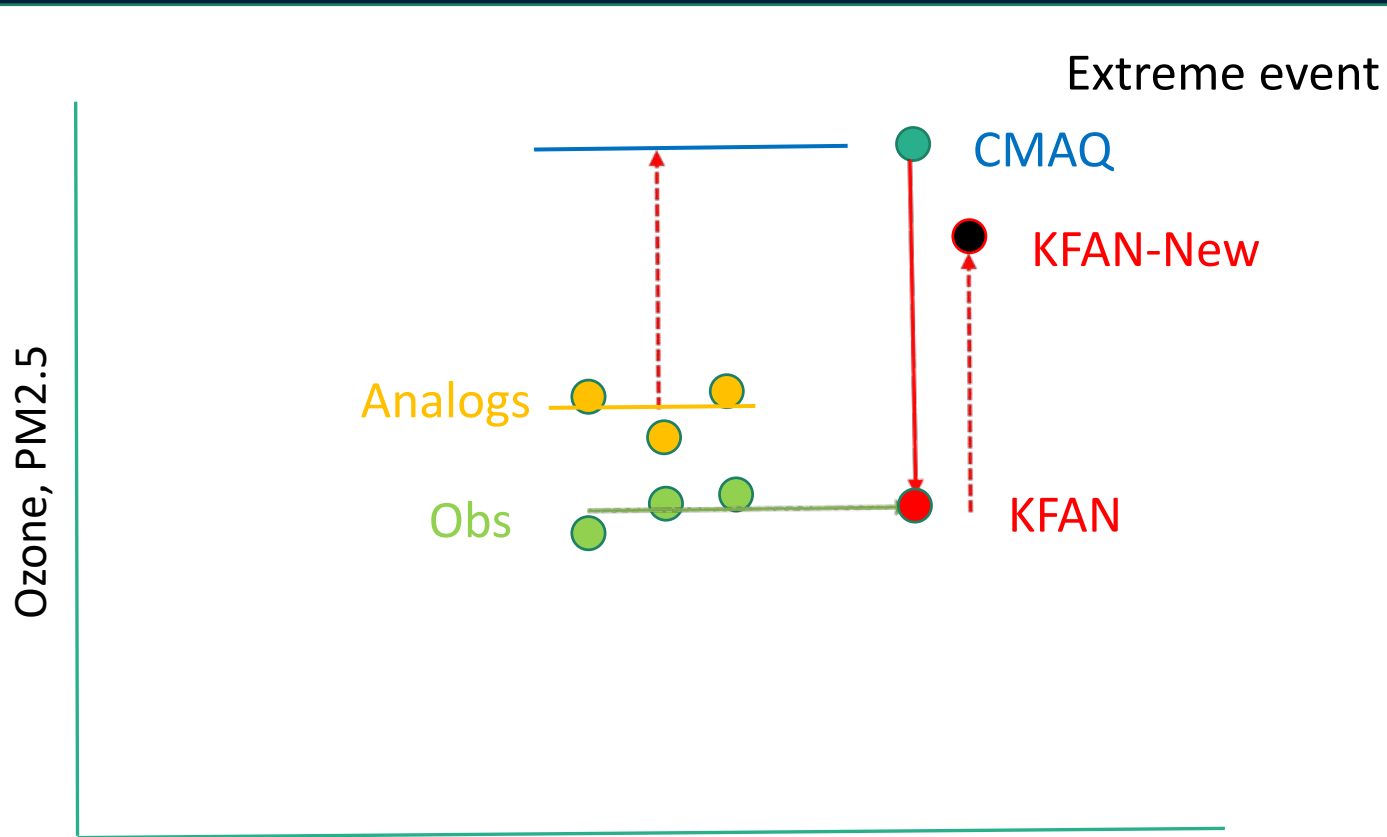
Operational later this autumn for PM2.5 and ozone

Large Forecast Error Correction



Algorithm works because it can find good analogs

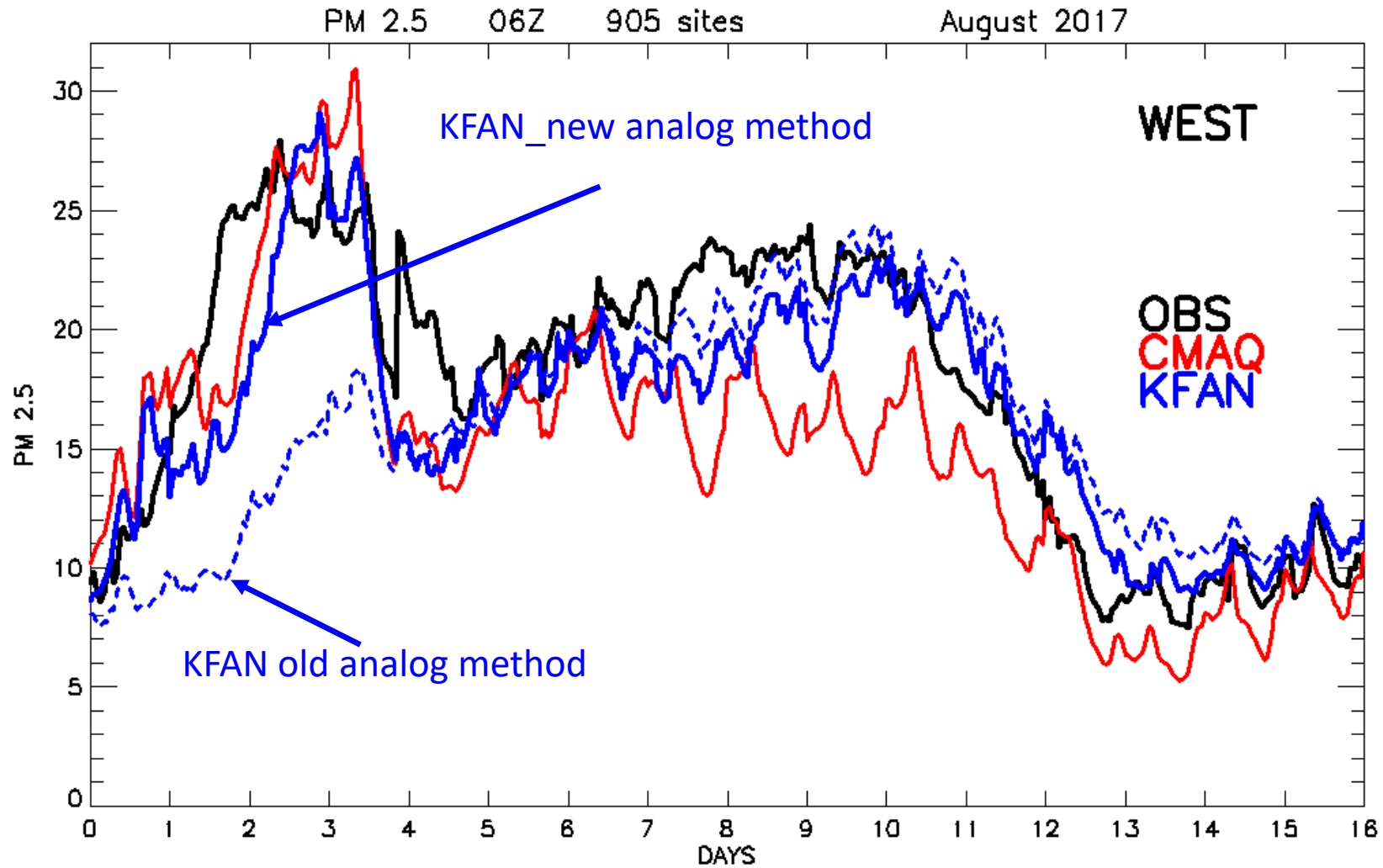
Large Forecast Error Correction



Problem occurs because we are always working with short training data sets

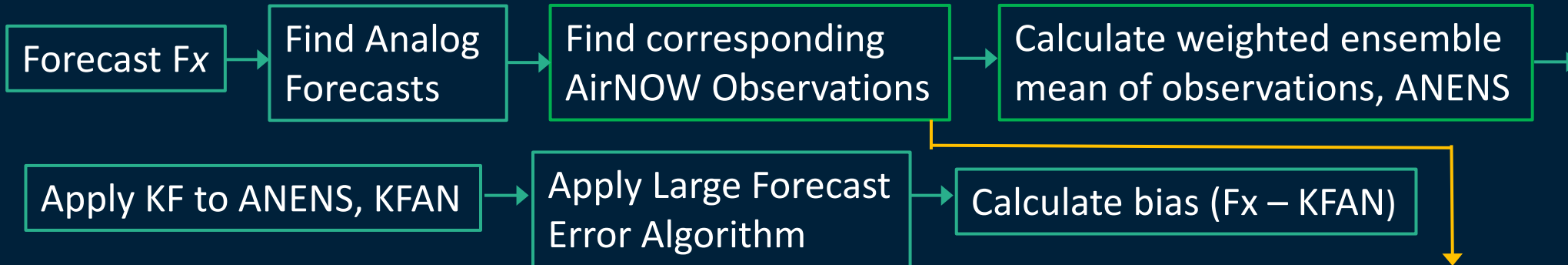
Reason why the correction works is because CMAQ has some skill at predicting these extreme (forest fire) events

Large Forecast Error Correction

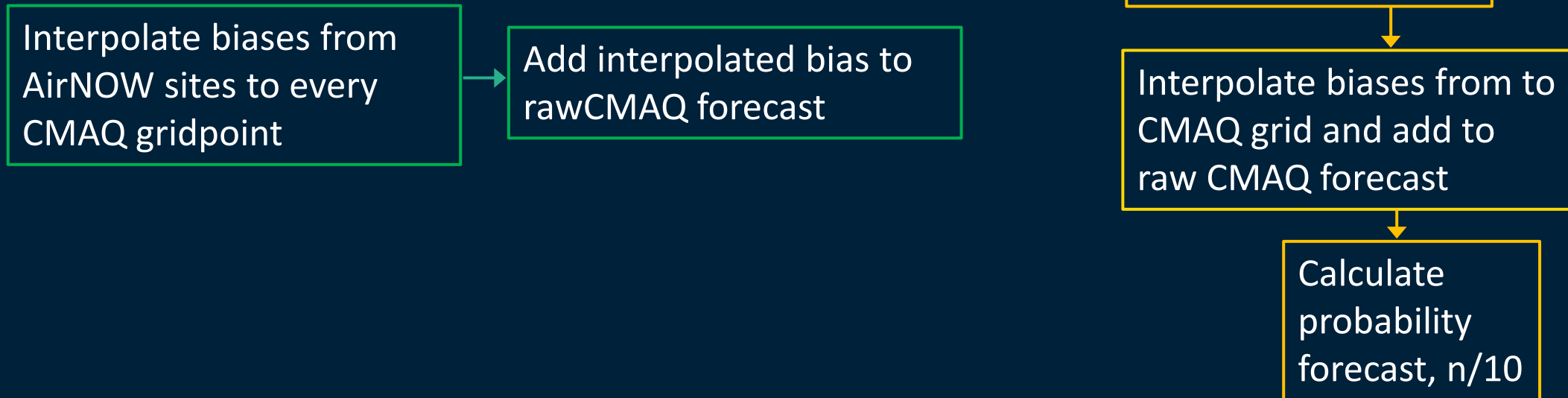


Modifications for Probabilistic Forecasts:

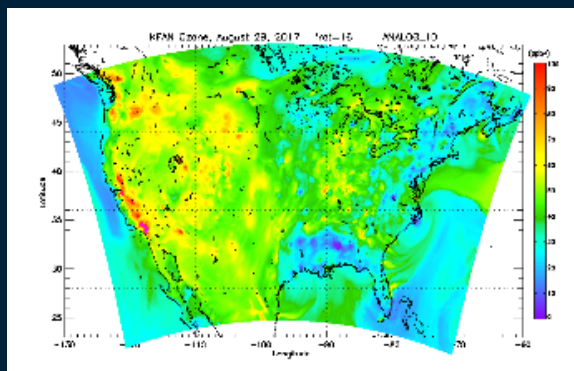
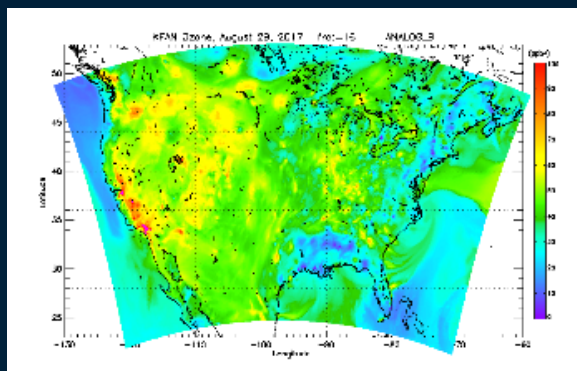
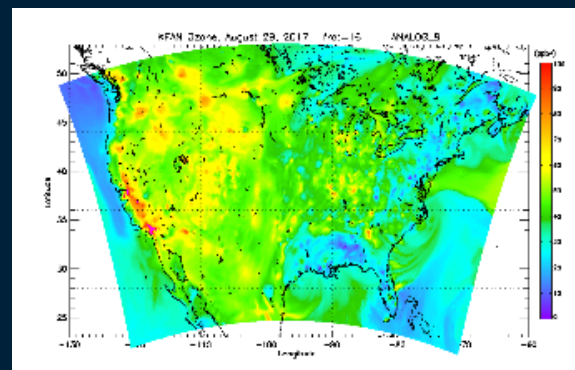
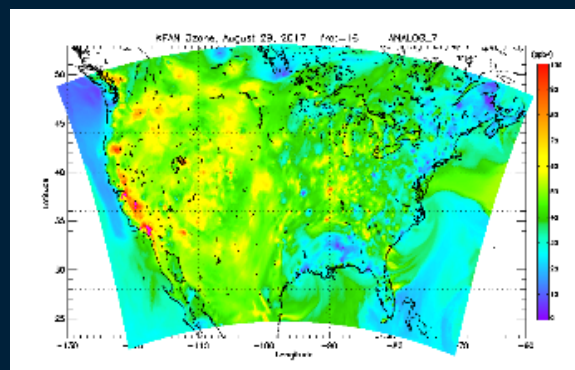
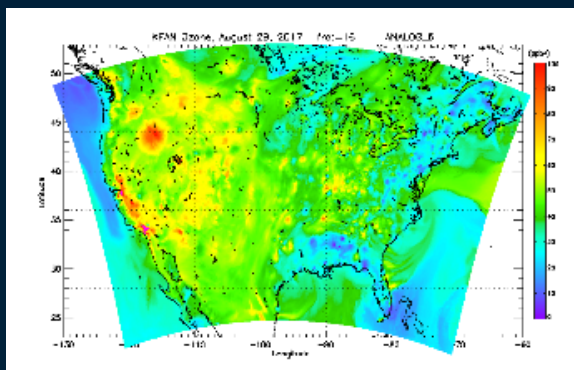
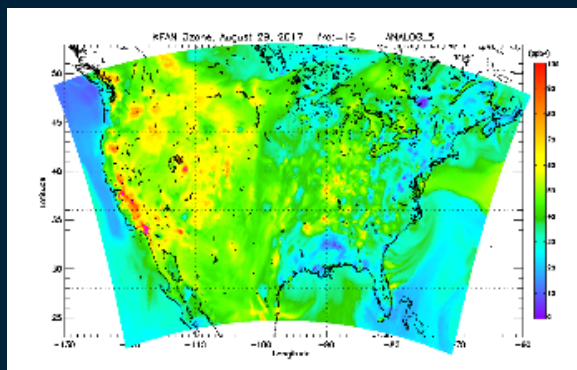
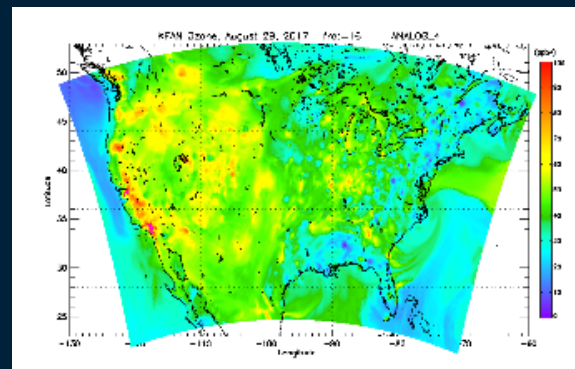
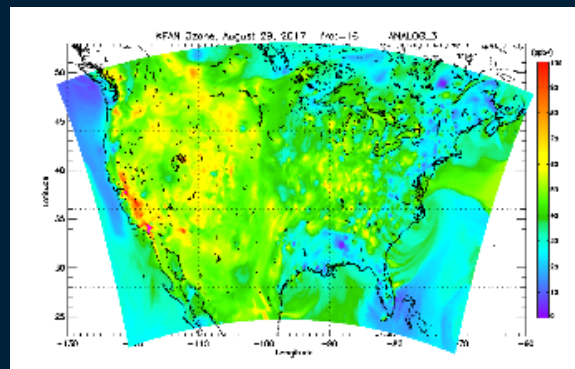
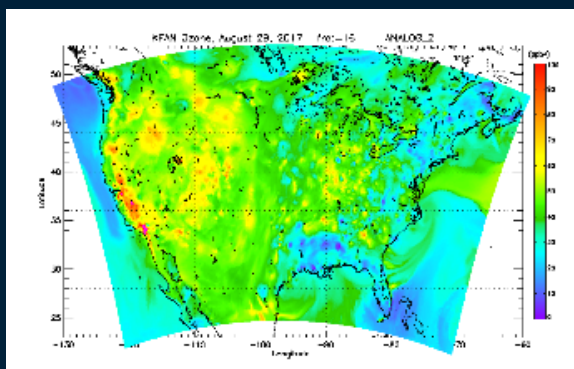
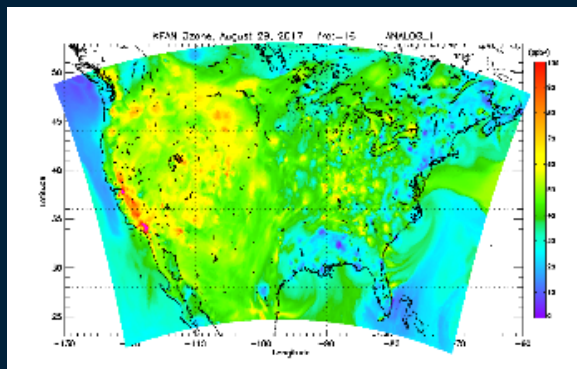
At each AirNOW observation site x



Over entire CMAQ grid

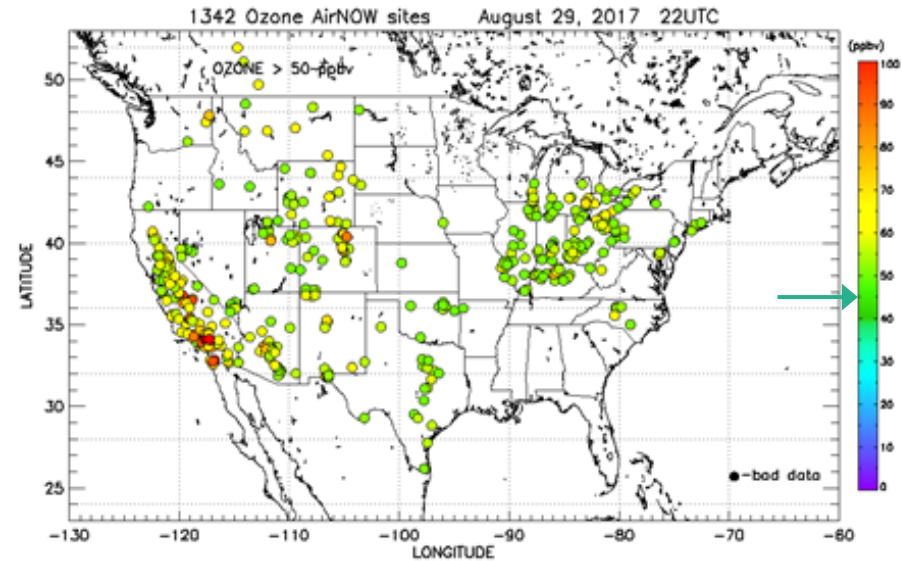
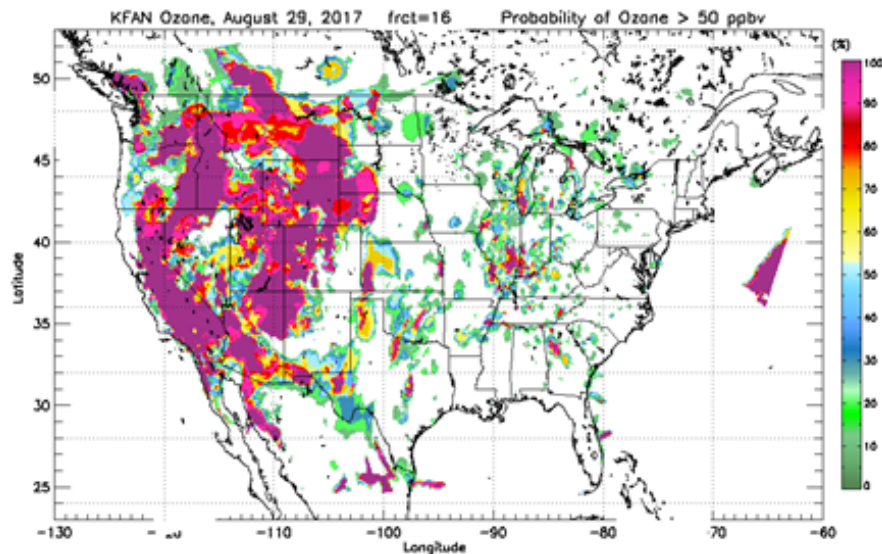


10 Member Ensemble, Ozone

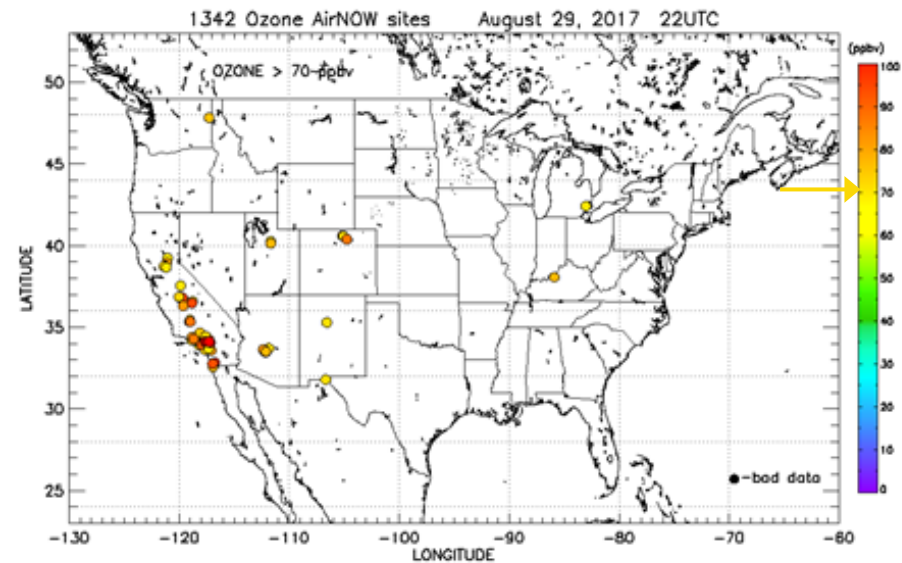
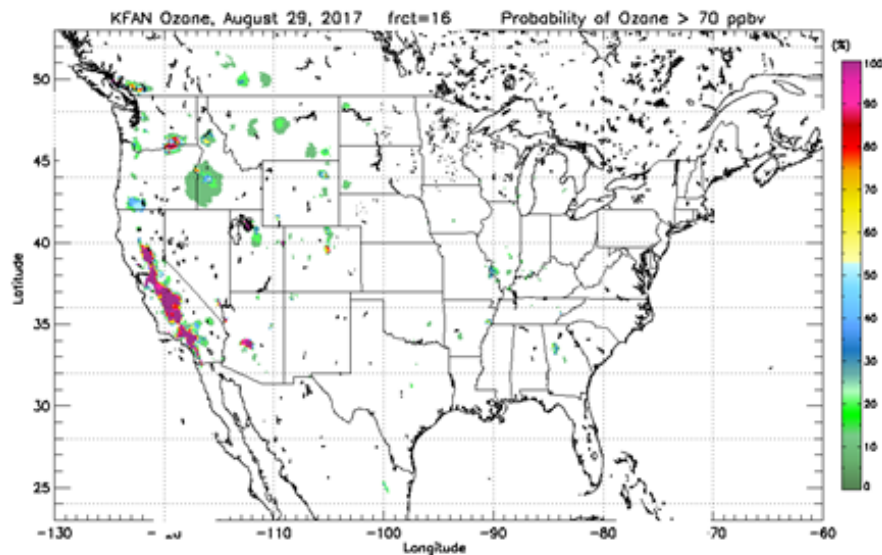


Ozone Exceedance Probability Maps

$O_3 > 50$ ppbv

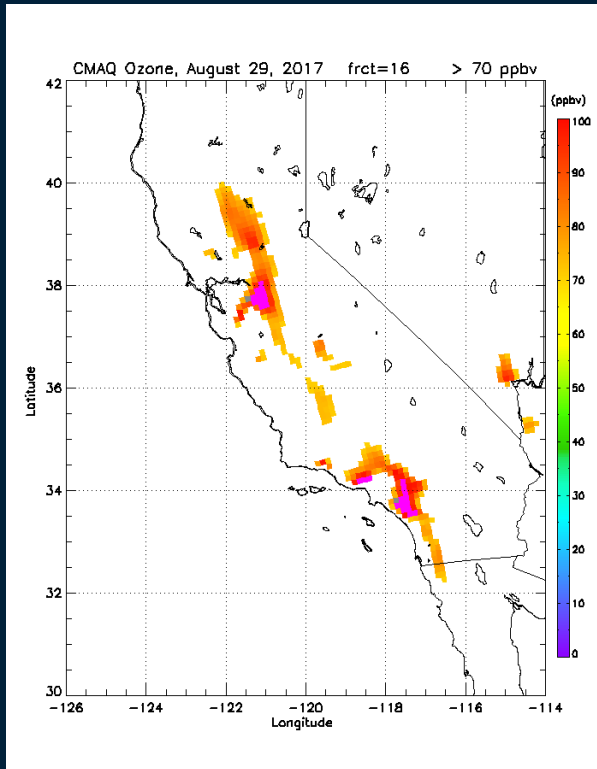


$O_3 > 70$ ppbv

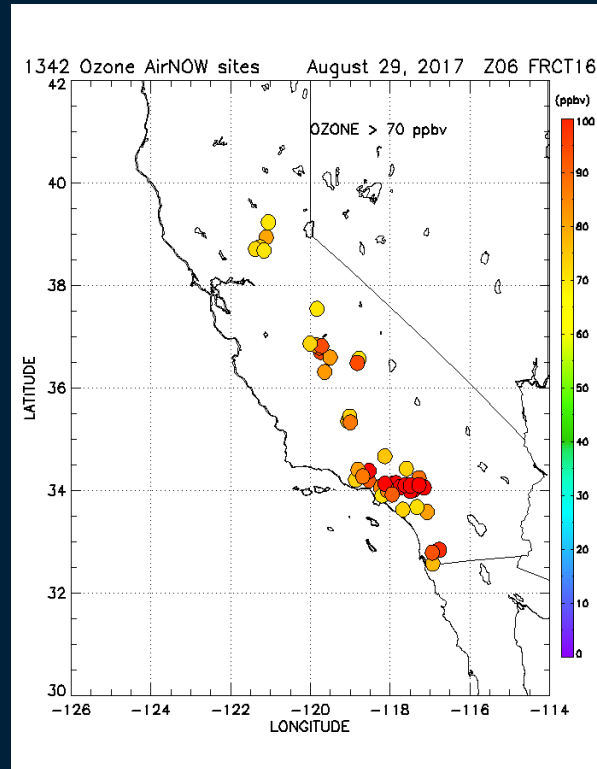


Regional Probability Ozone Exceedance Map

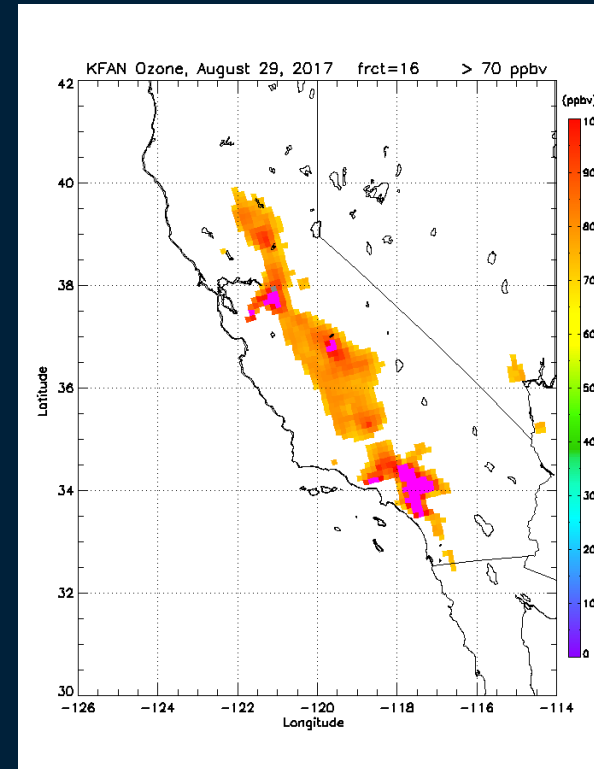
$O_3 > 70$ ppbv



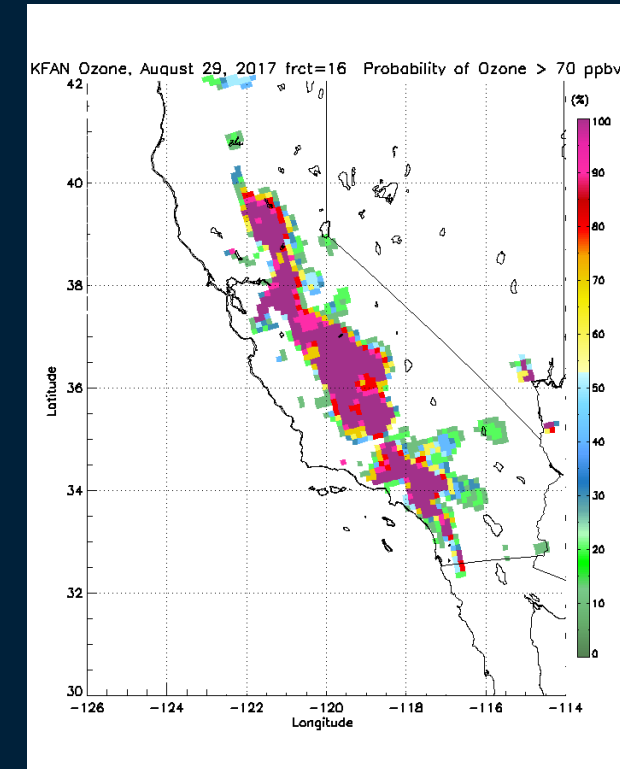
CMAQ



OBSERVATION



ANENS

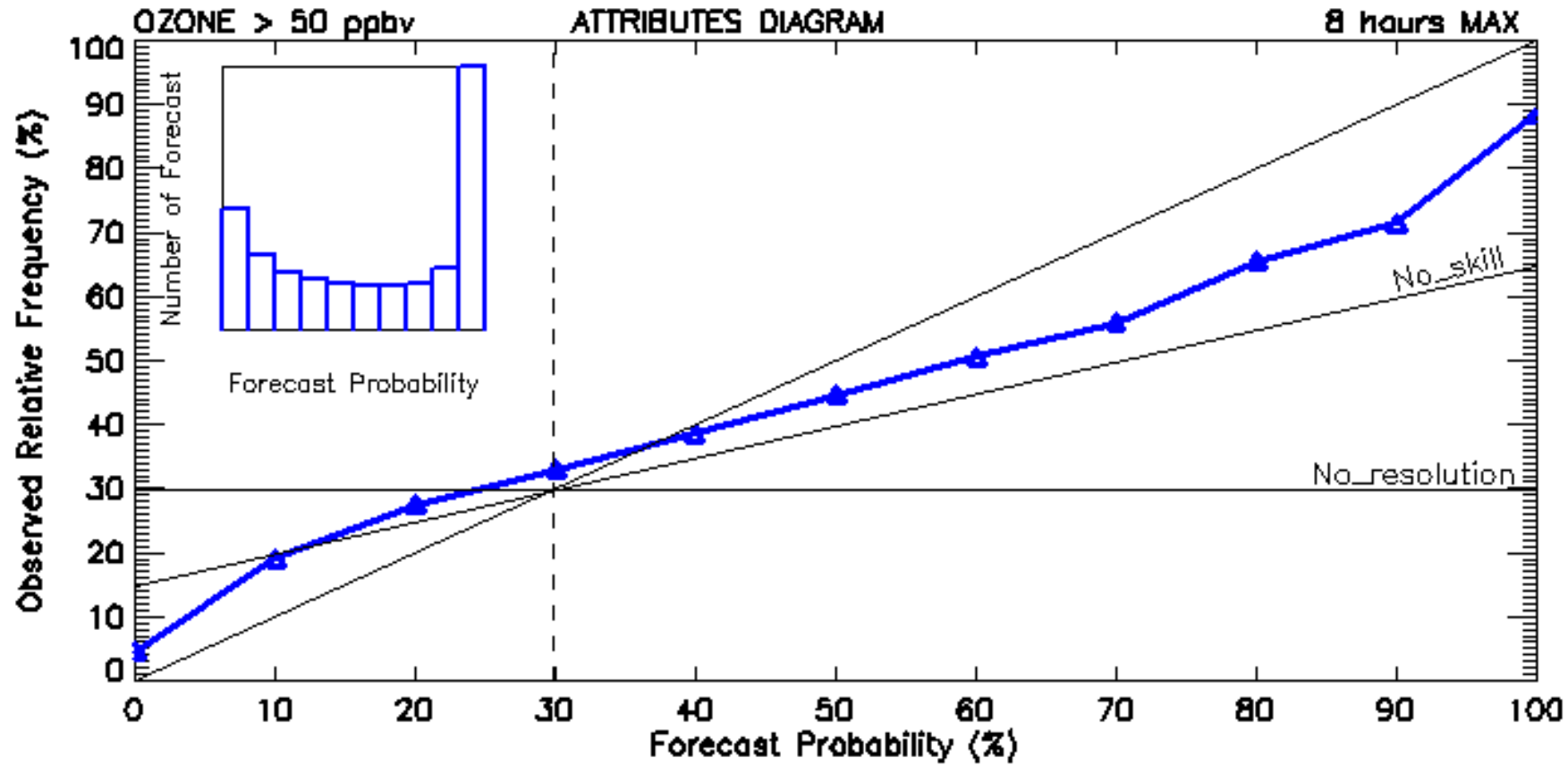


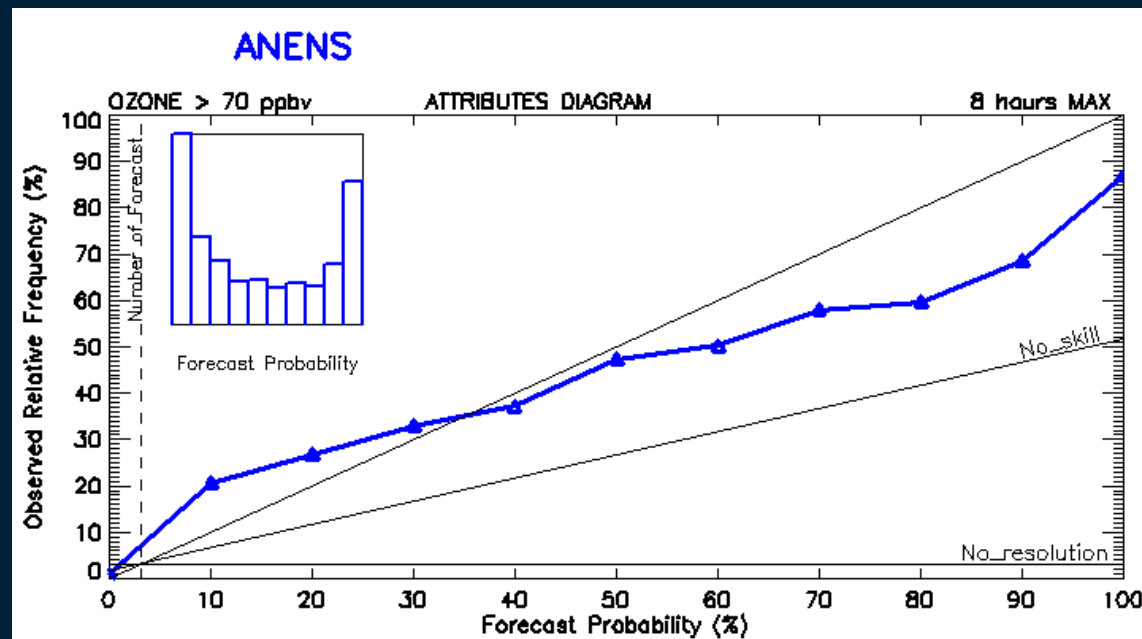
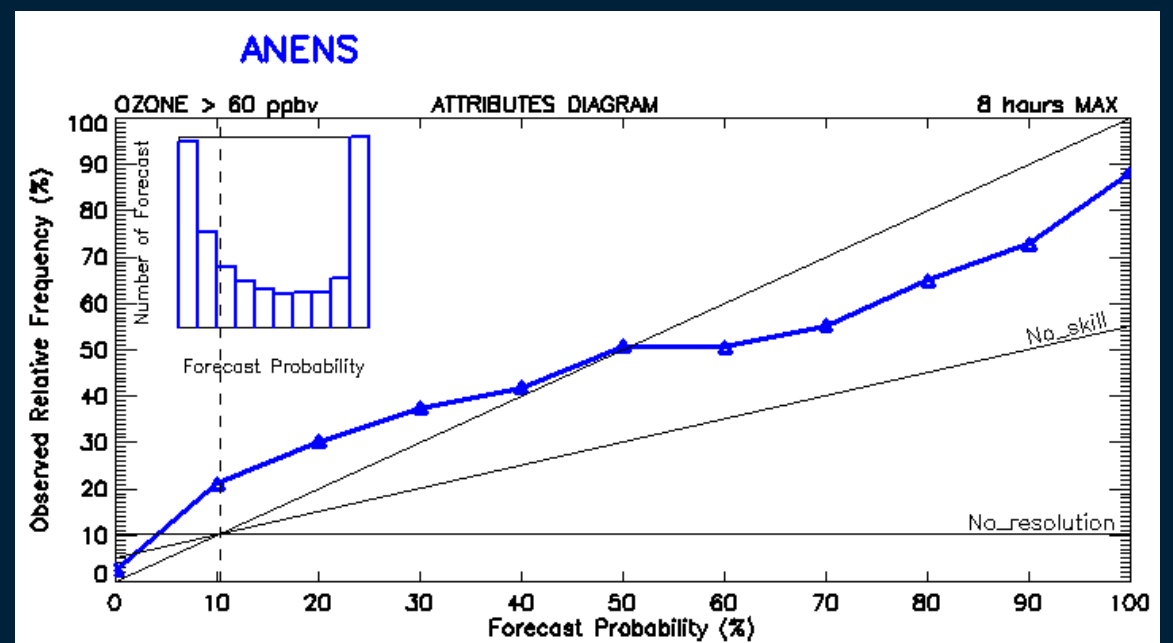
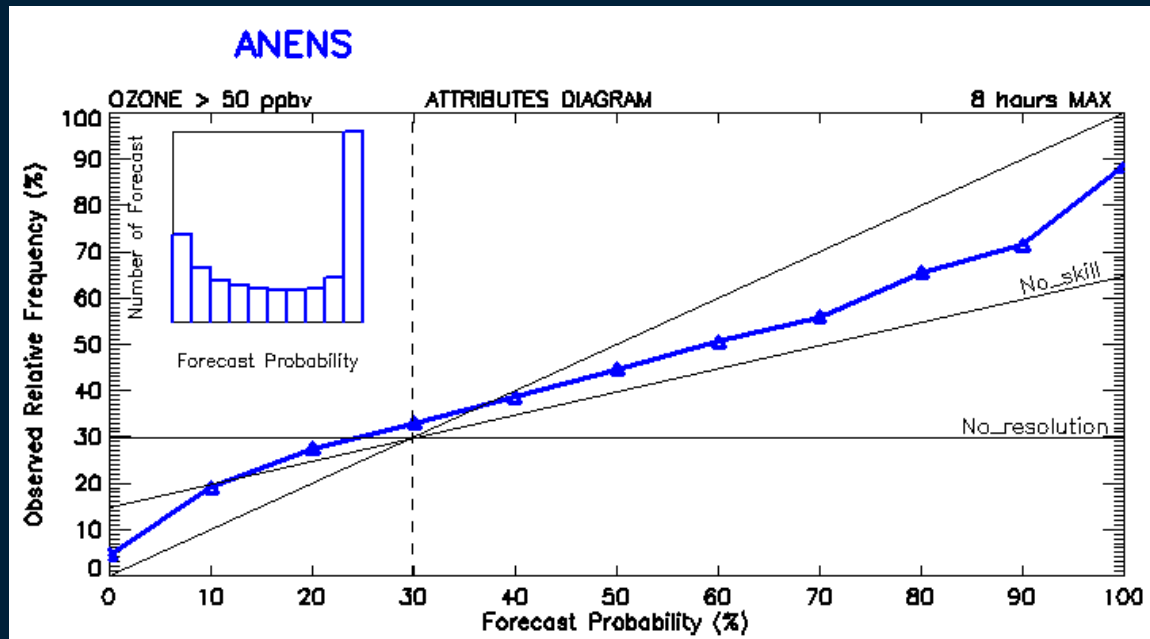
ANENS_probabilistic

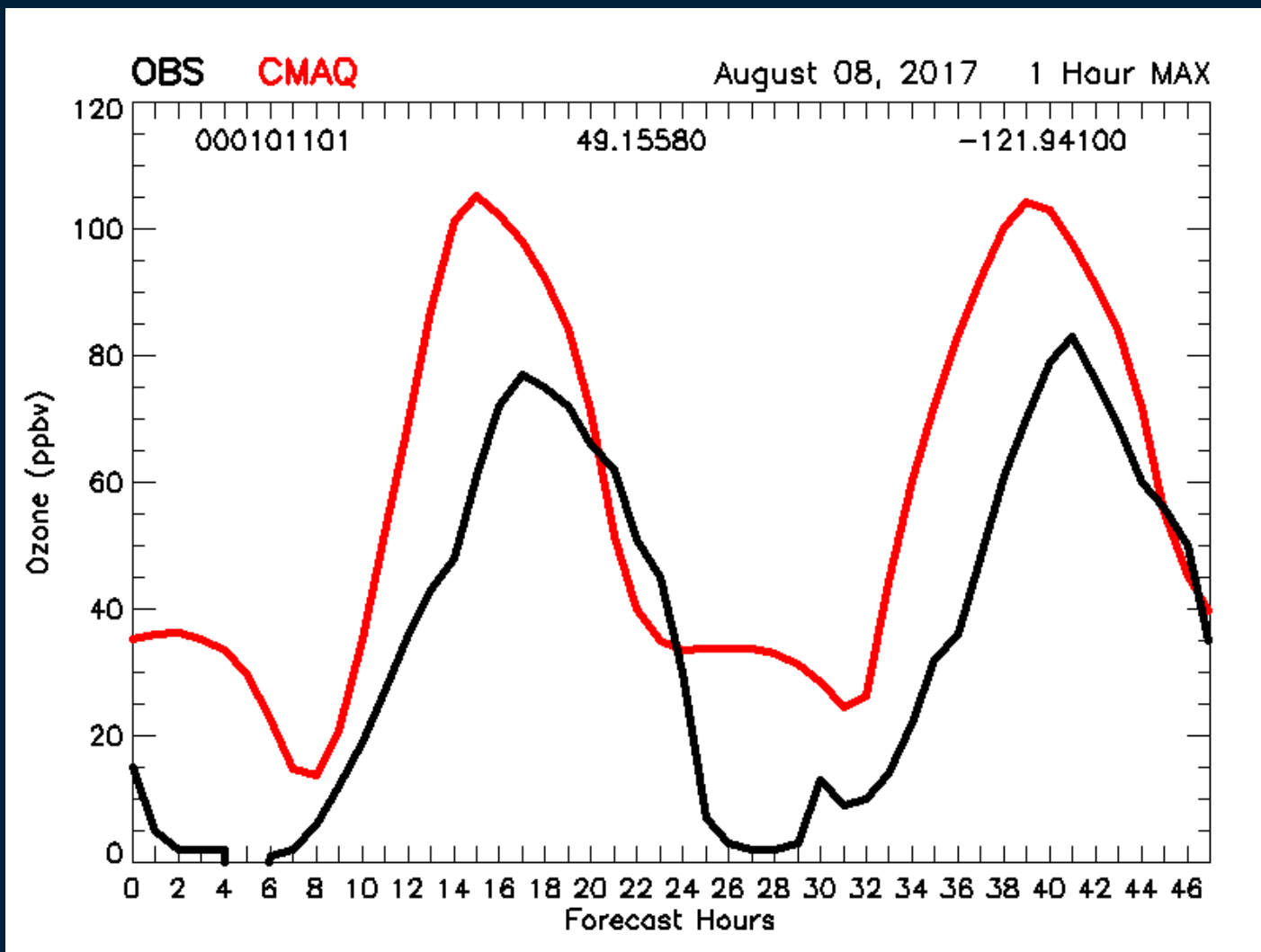
Reliability Diagrams

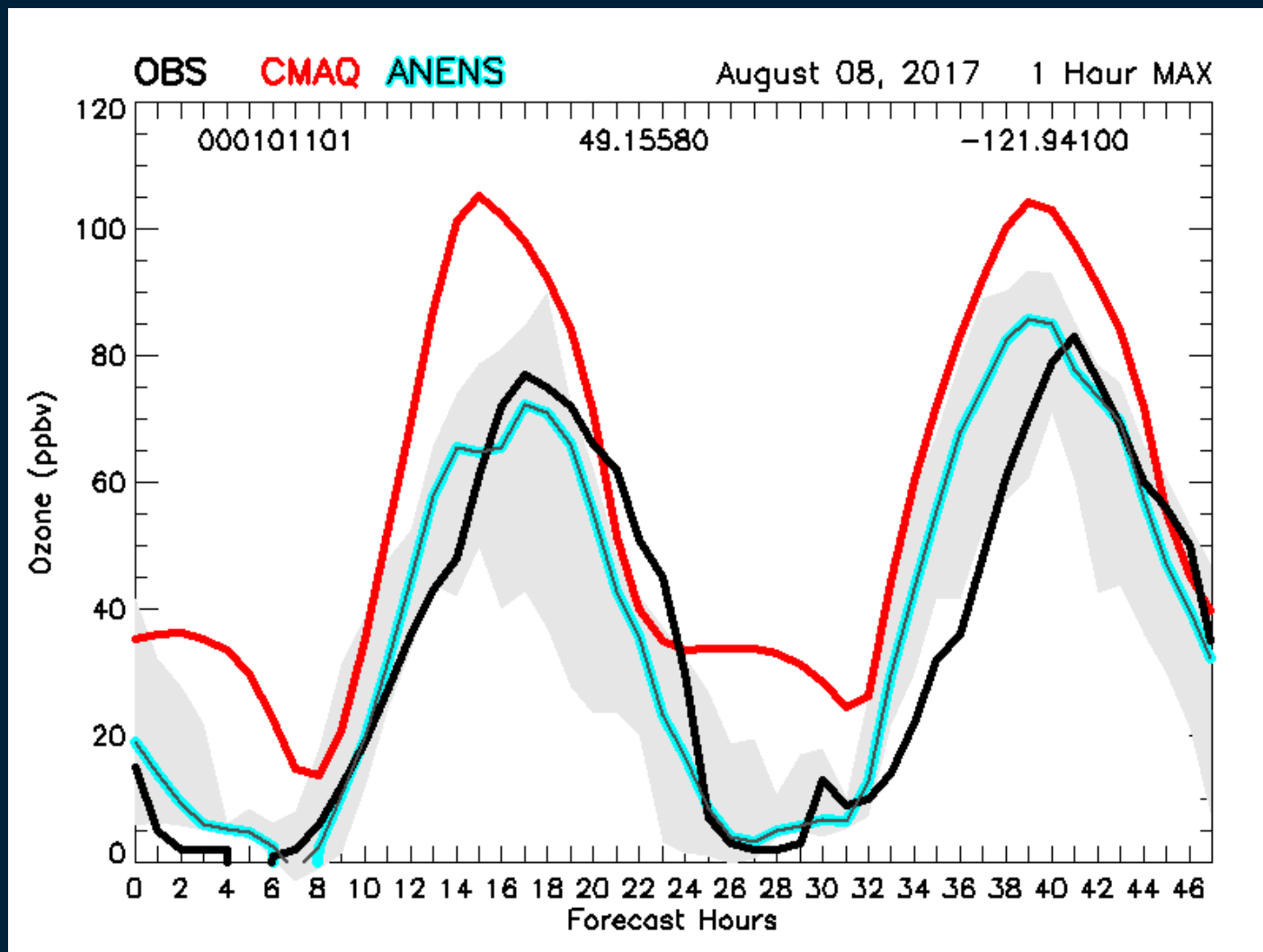
ANENS

July-August 2017

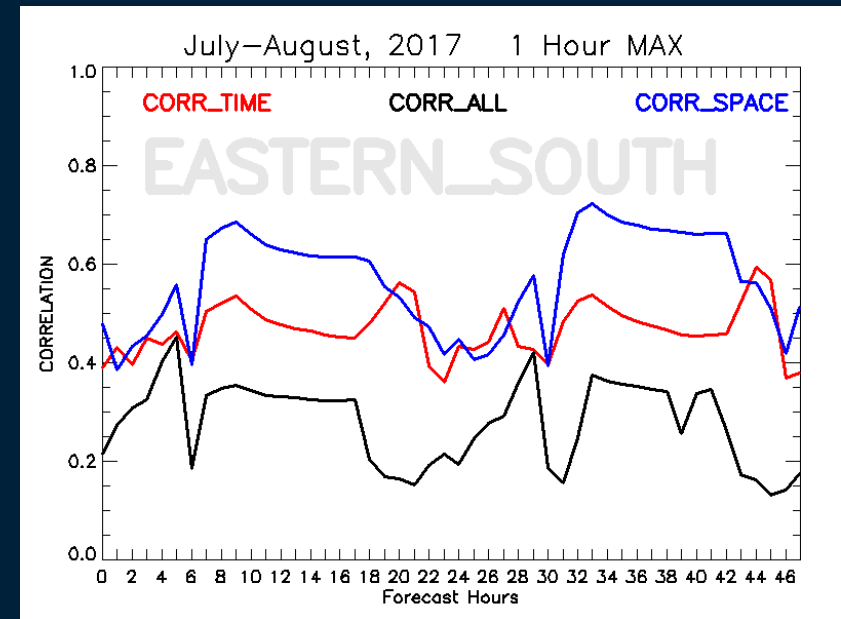
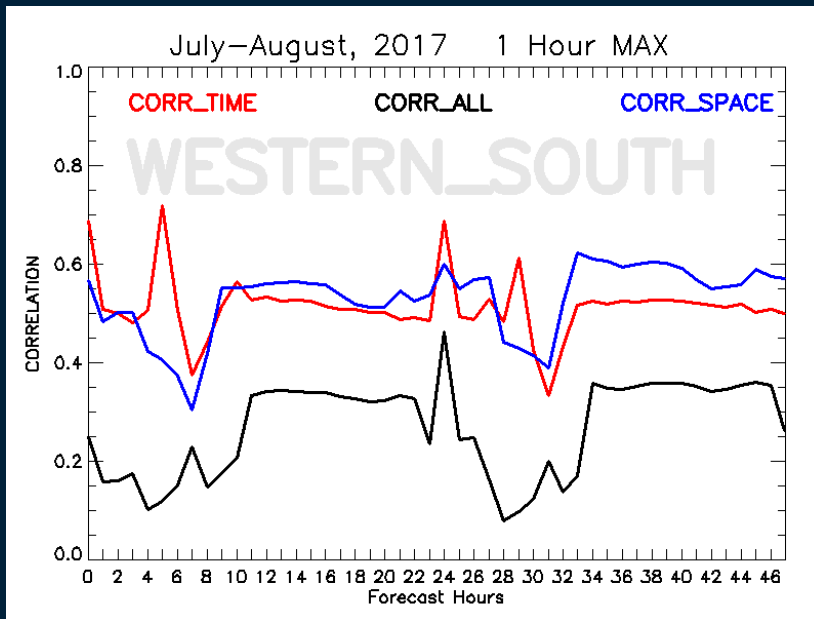
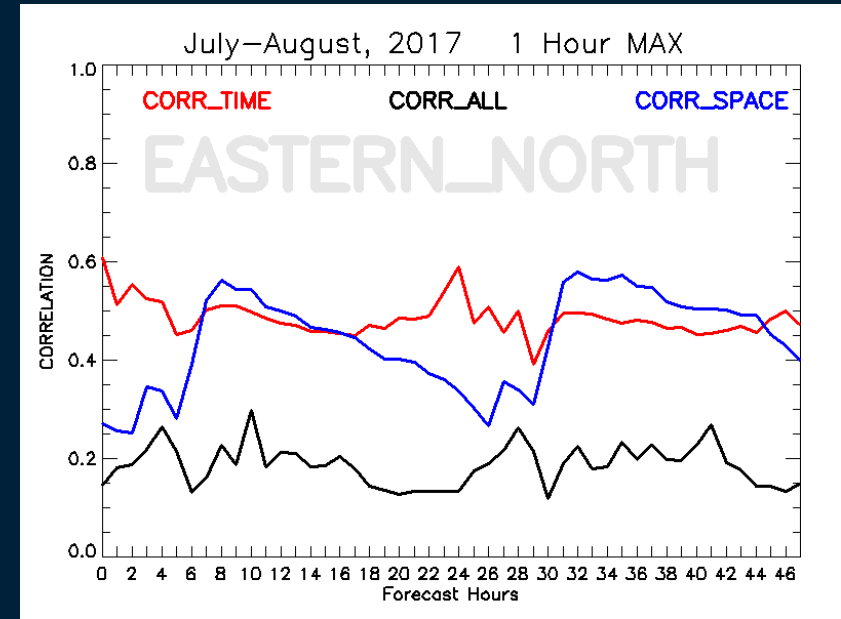
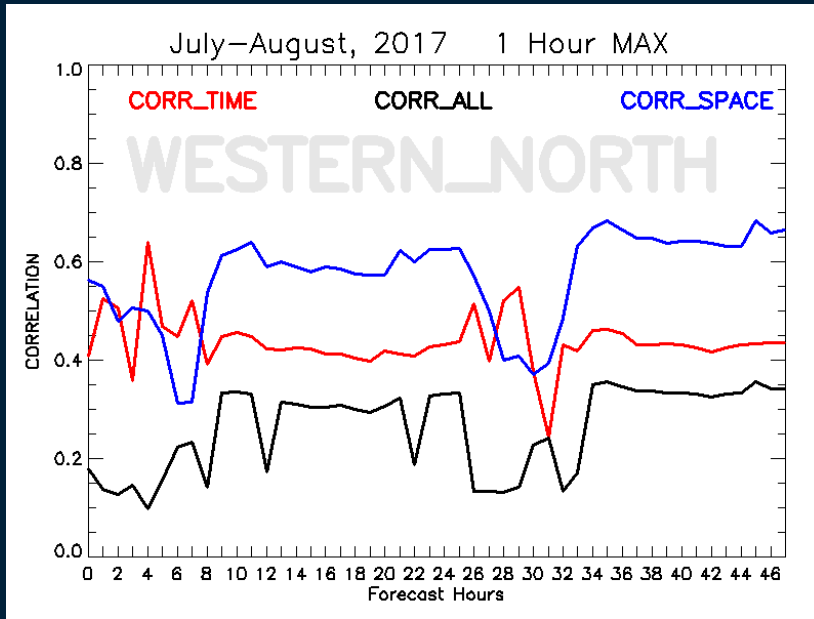




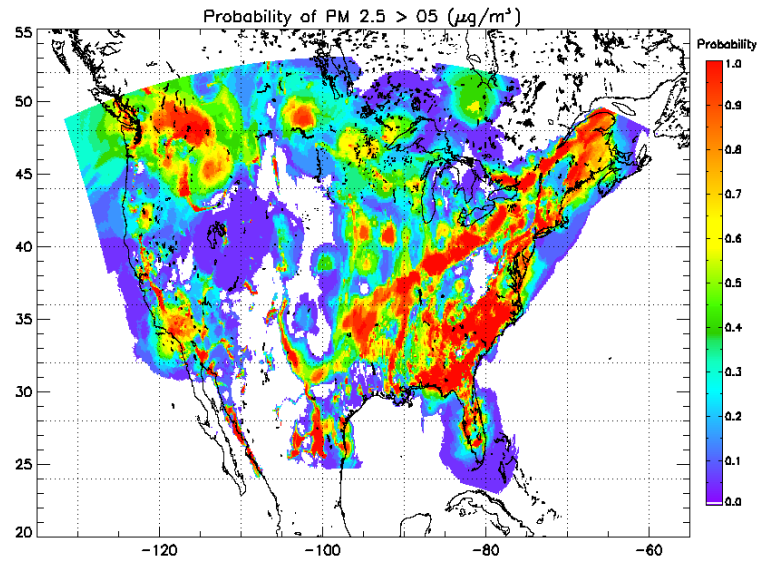




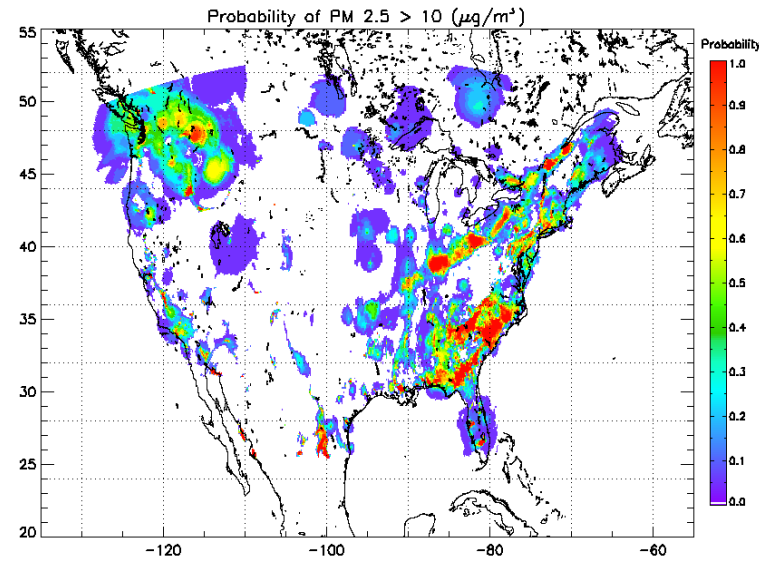
Spread-Skill Correlations



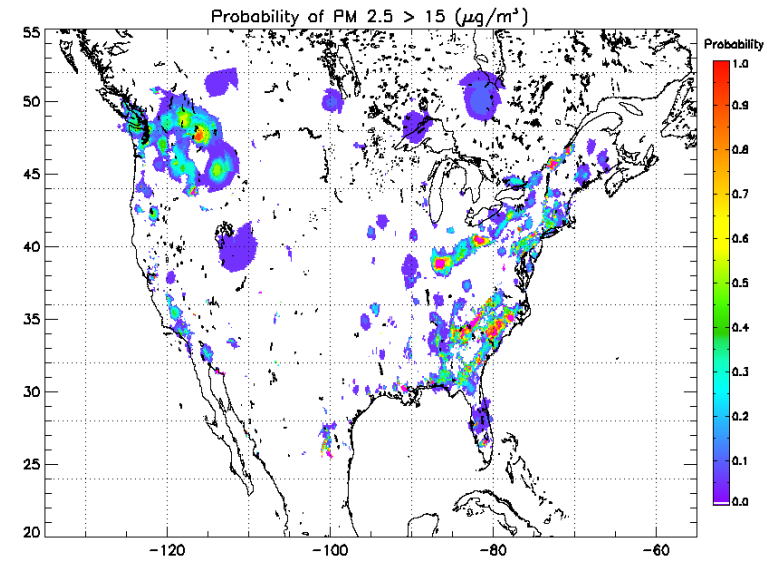
20141201



20141201

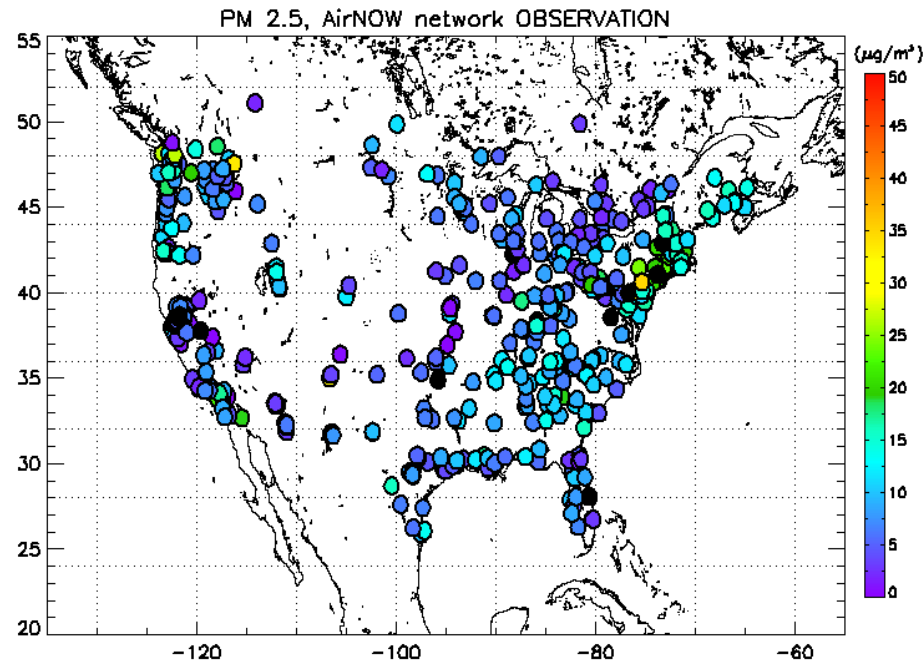


20141201



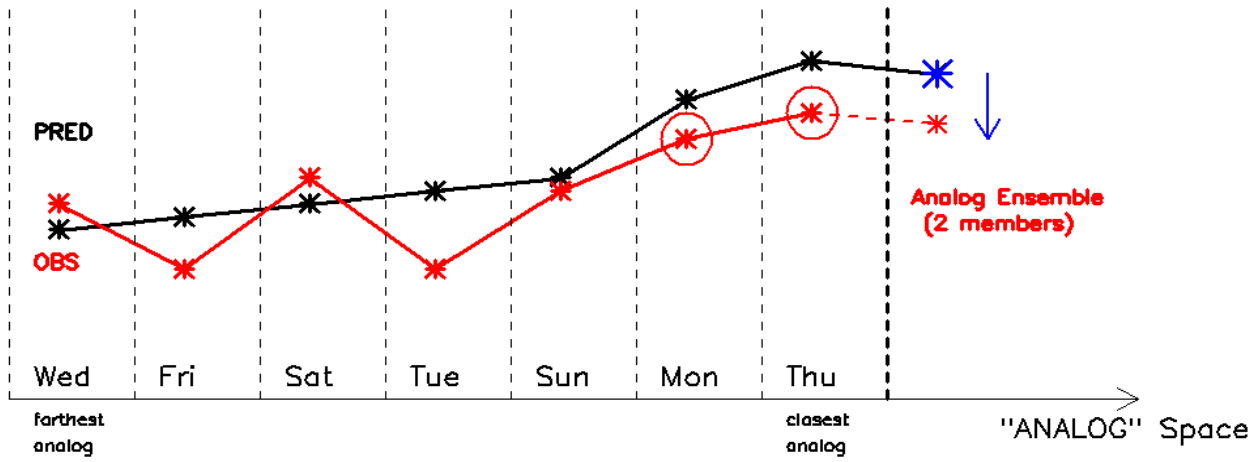
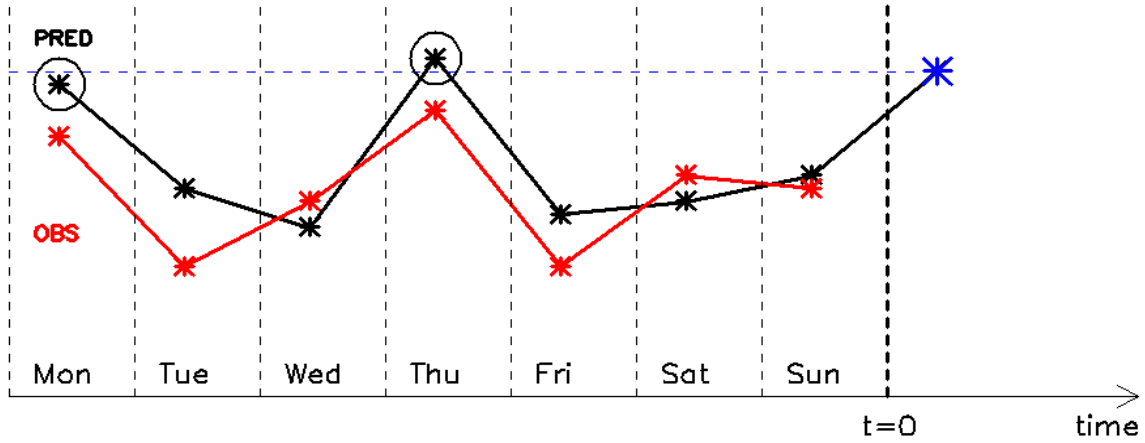
PM2.5
Exceedance
Probability
Maps

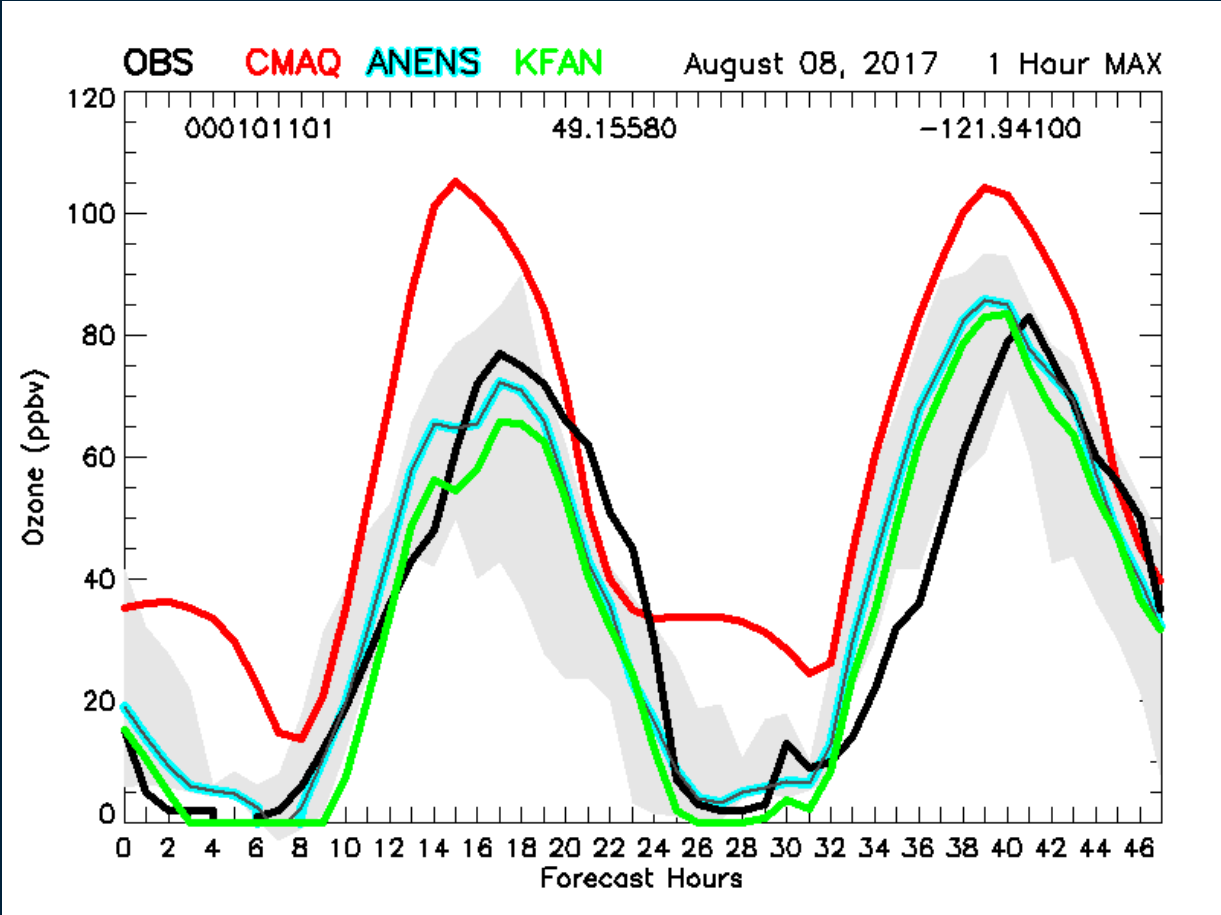
20141201



Summary

- New Large Forecast Error Correction scheme adds skill to all ranges of PM2.5 and ozone forecasts, but most importantly for high concentration events
- Probabilistic forecasts for ozone (and PM2.5) can be made from the existing analog ensemble
- These forecasts have skill as shown by reliability diagrams
- The spread of the ensemble members is moderately correlated with forecast skill, allowing for time-series of point or regional forecasts of forecast uncertainty
- *Would these forecasts be useful?*





Spread-Skill Relationship

