Multi-scale WRF Modeling to Support Western Air Quality Applications

prepared for:
Ad-hoc Met. Group

prepared by:

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Alpine Geophysics, LLC

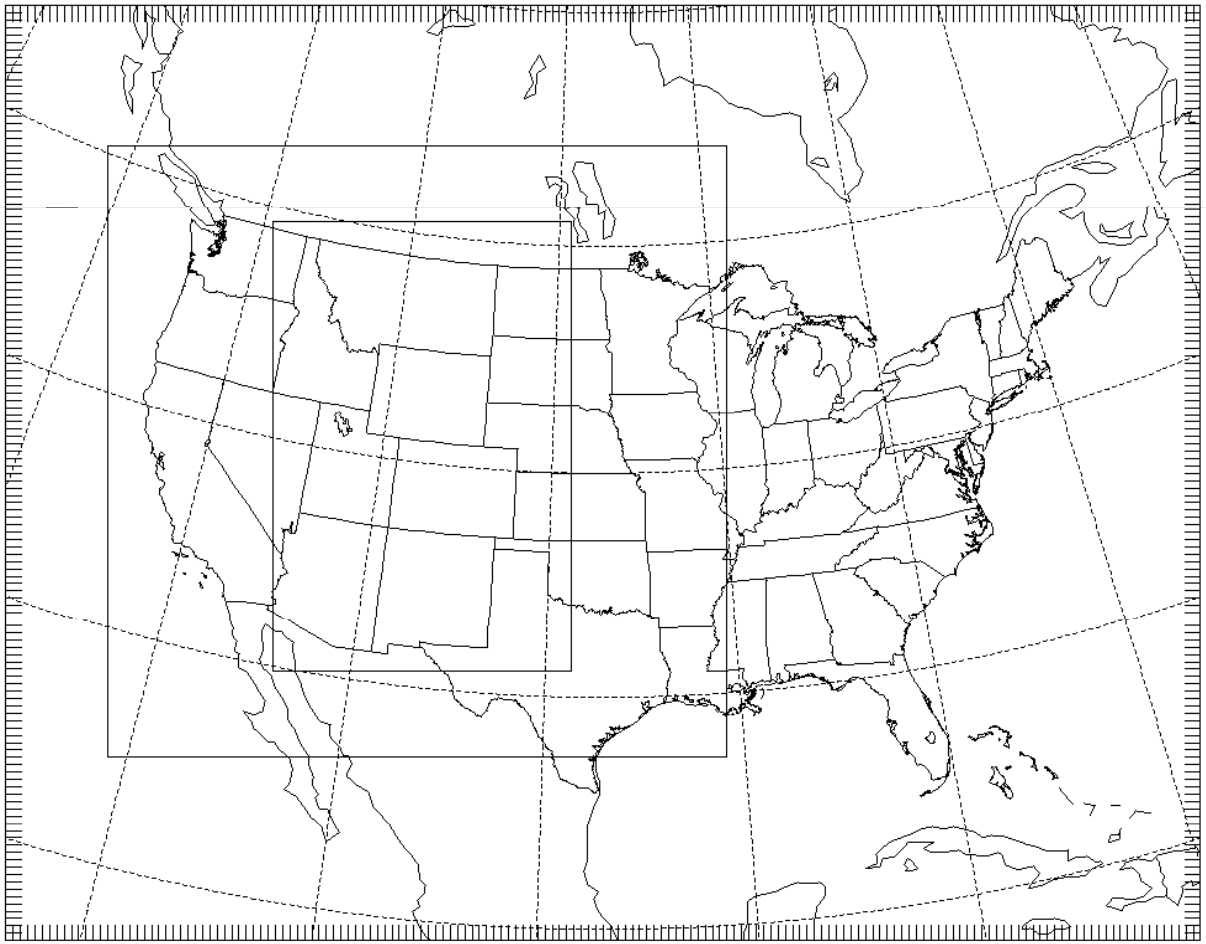
28 June 2012

Simulation Overview

- "Coordinated" 2008
  - WRAP Westjump
  - Wyoming DEQ
  - Colorado Regional Air Quality Council
- EPA ORD National 12km

Coordinated 2008

Modeling Domain



"RPO" LCP Projection

36km: CONUS(165x129)

12km: WEST (256x253)

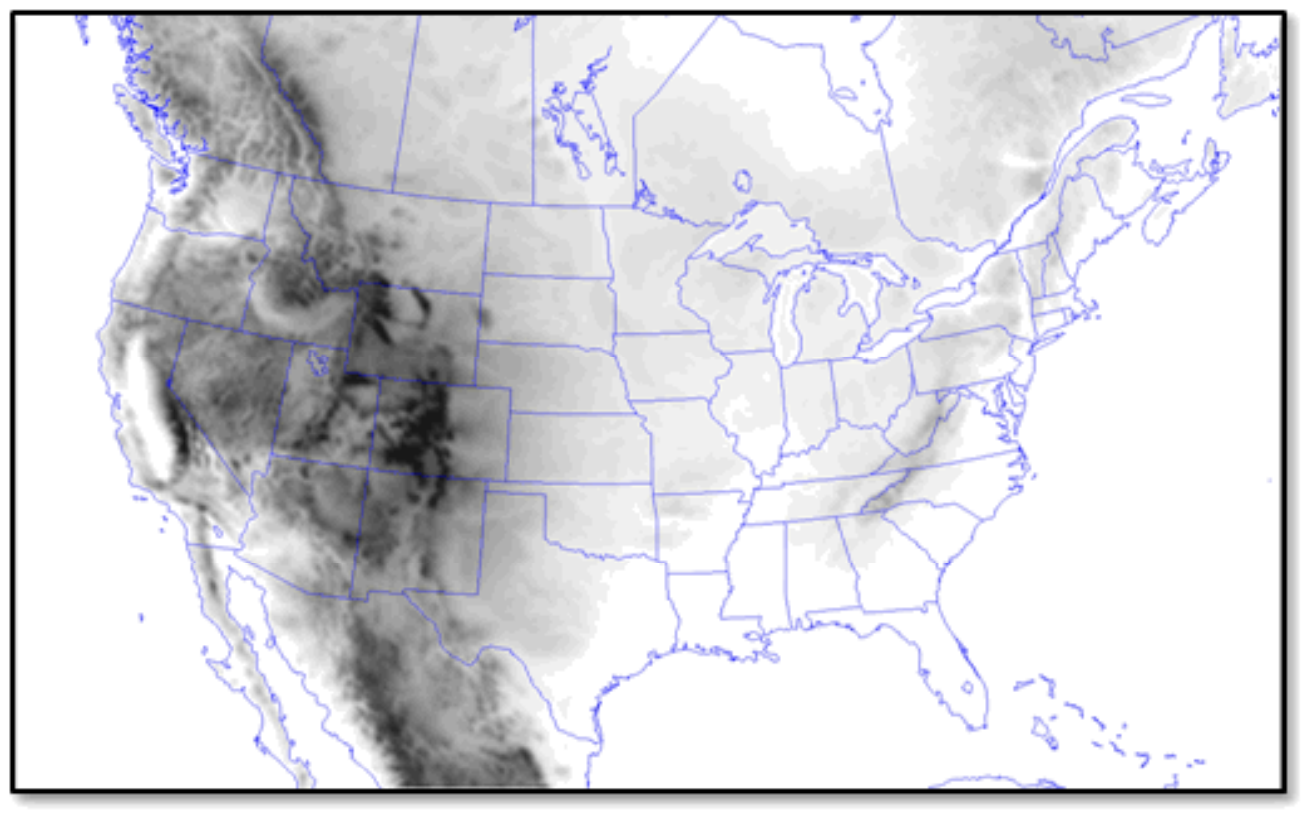
4km: Intermountain (370x556)

Coordinated 2008

- Modeling Period
  - 15 December 2008 through 2 January 2009
- Model Options
  - Microphysics: WSM-3
  - Long/Short Wave Radiation: RRTMG
  - Land Surface Model: NOAH
  - PBL Scheme: YSU
  - Cumulus Parameterization: Kain-Fritsch 36/12
  - Initialization Dataset: 12km North American Model (NAM)

EPA ORD National 12km

Modeling Domain



"RPO" LCP Projection

12km : CONUS

(472x312)

EPA ORD National 12km

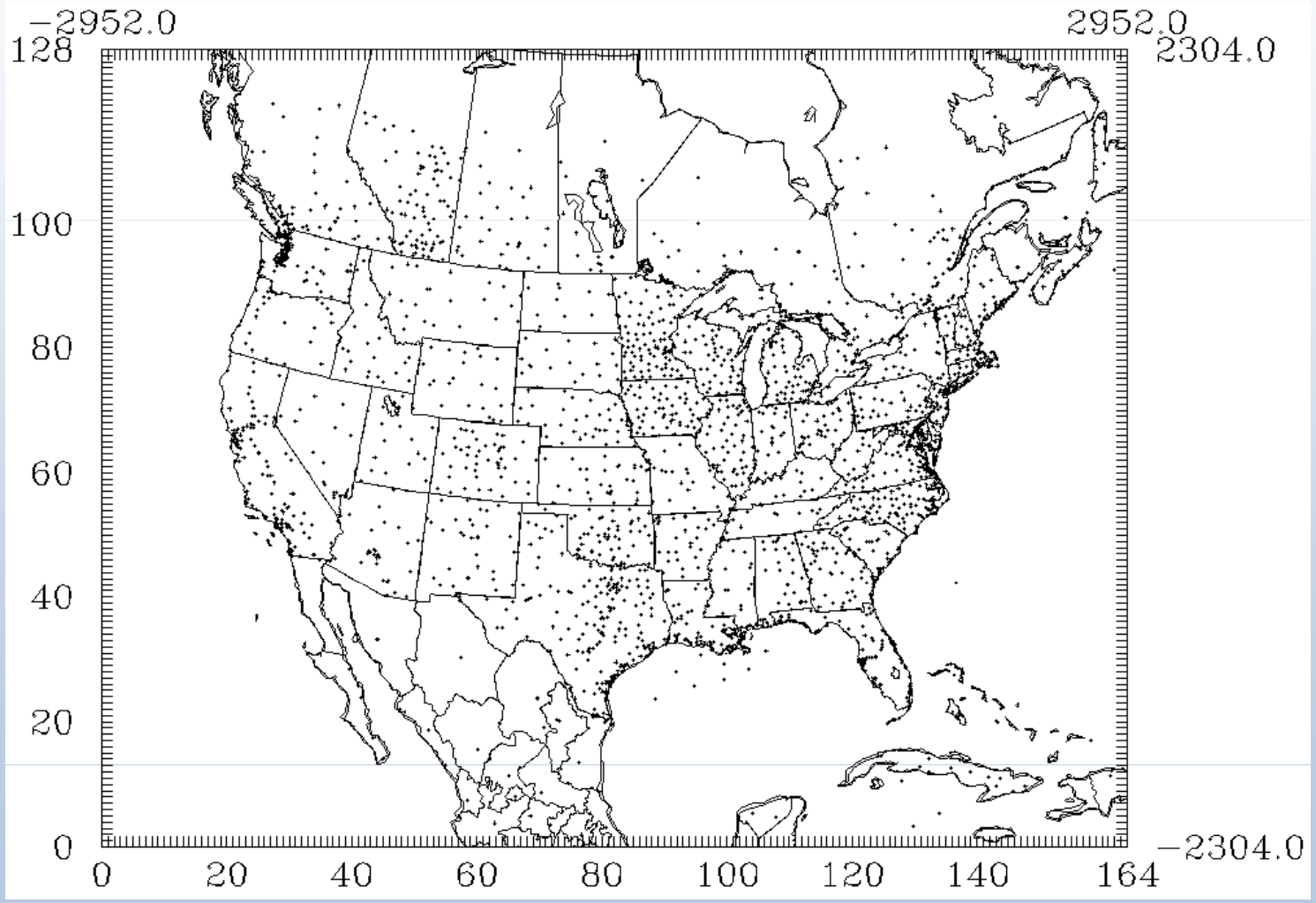
- Modeling Period
  - 22 December 2005 through 2 January 2009
- Model Options
  - Microphysics: Morrison
  - Long/Short Wave Radiation: RRTMG
  - Land Surface Model: Pleim-Xiu
  - PBL Scheme: Pleim
  - Cumulus Parameterization: Kain-Fritsch 36/12
  - Initialization Dataset: 12km North American Model (NAM) ?

Model Performance Evaluation

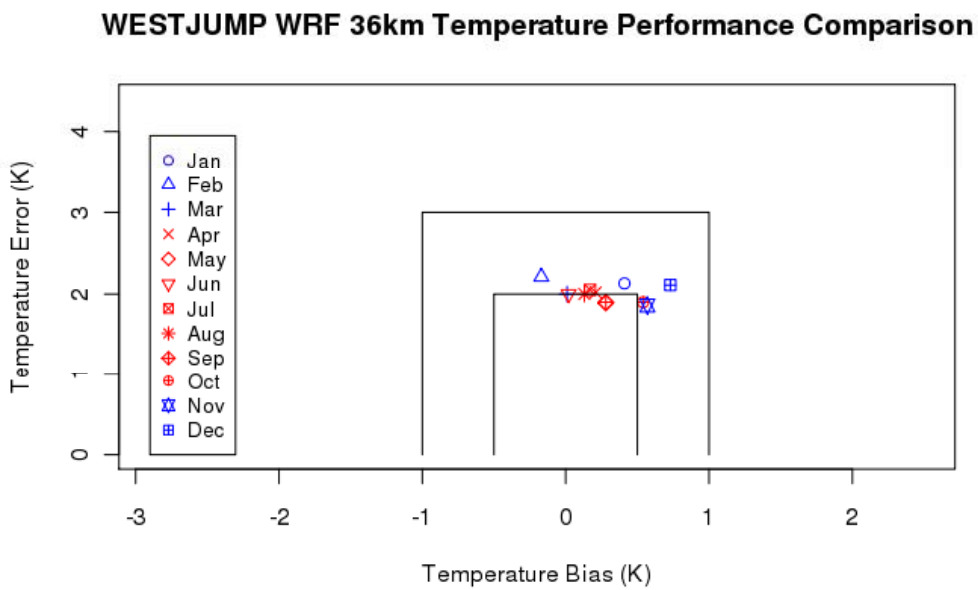
- Quantitative (METSTAT)
  - Temperature
  - Humidity
  - Wind
- Qualitative
  - Precipitation

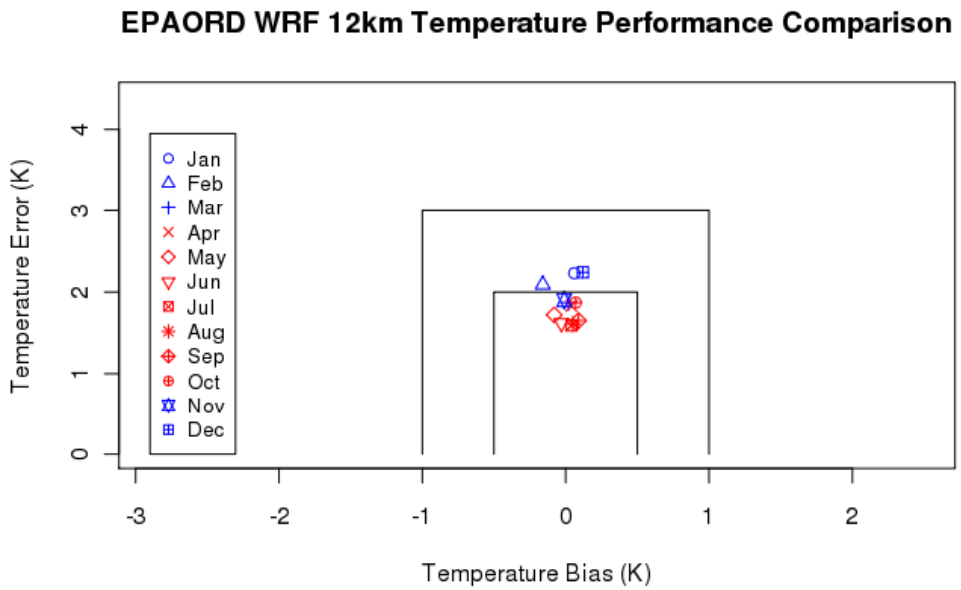
Observation Dataset

MADIS

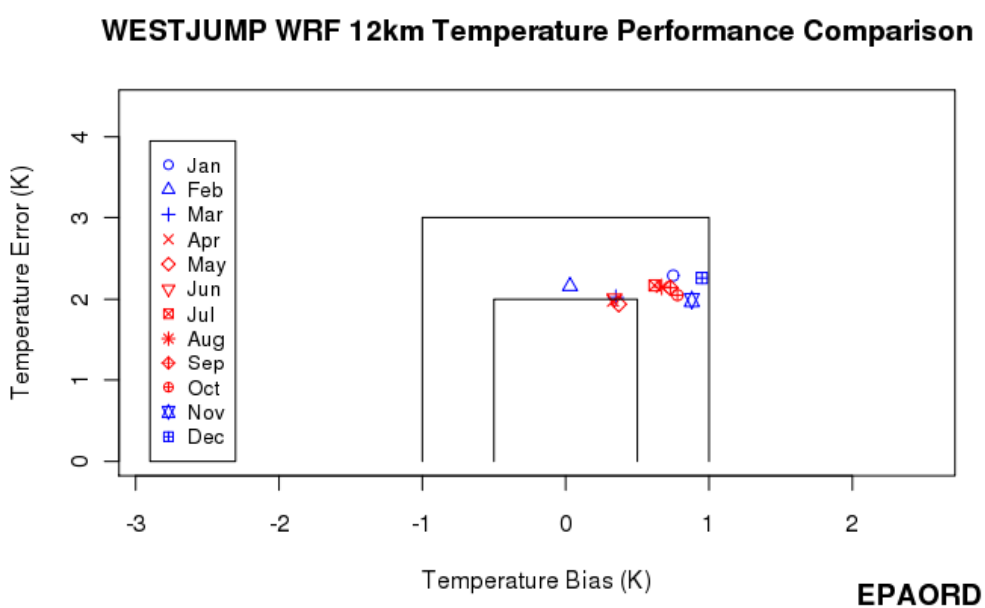


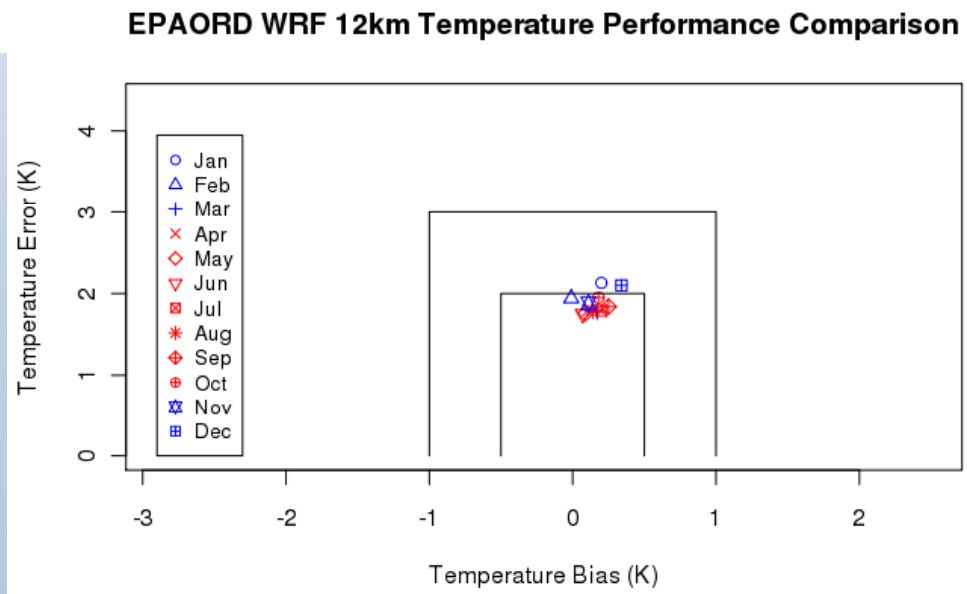
Temperature (CONUS)



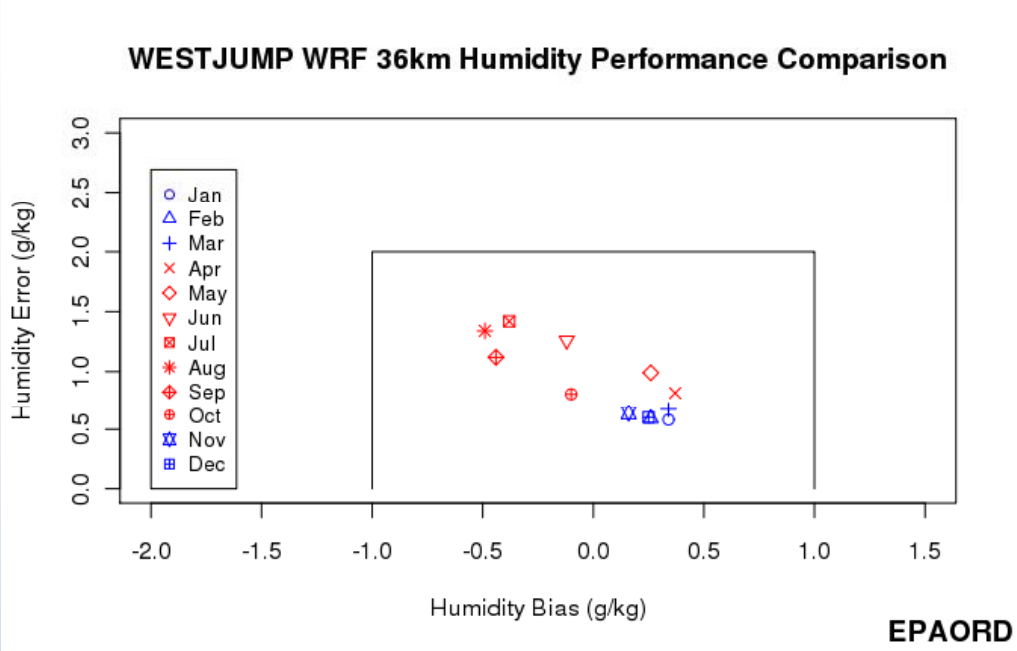


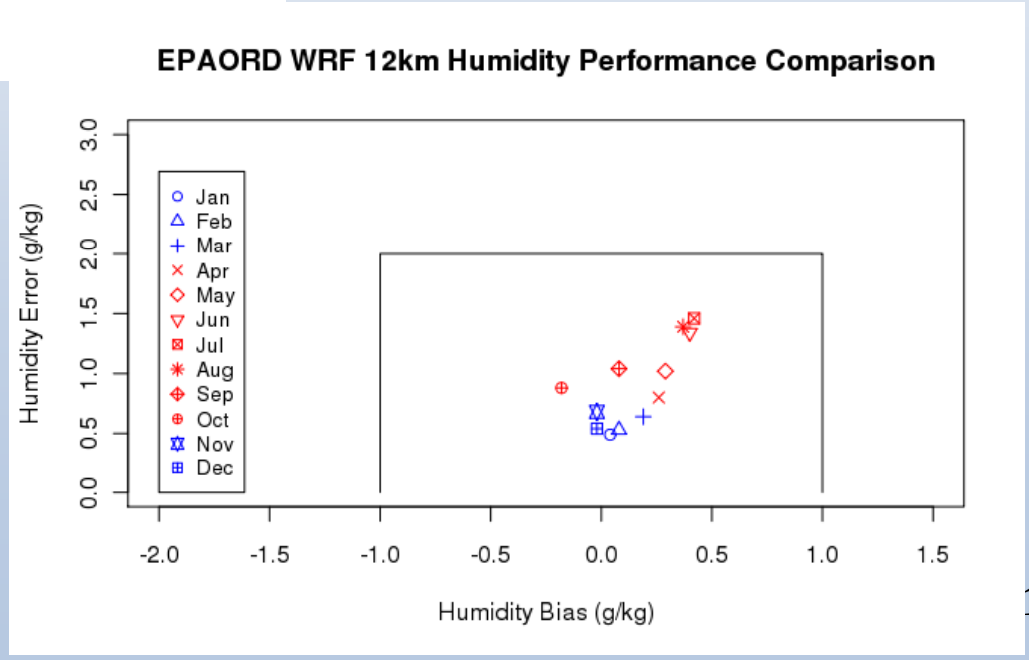
Temperature (12km WRAP)



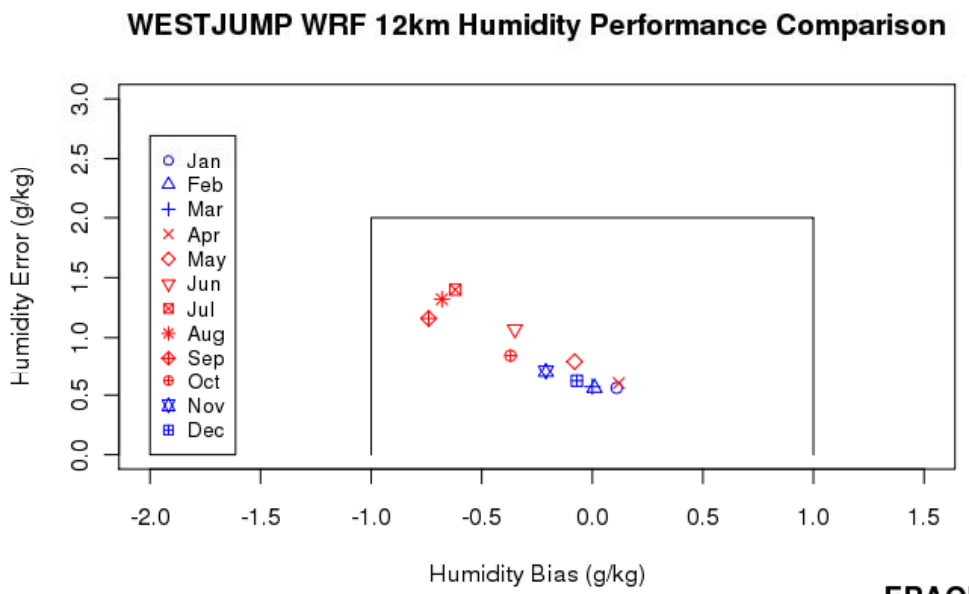


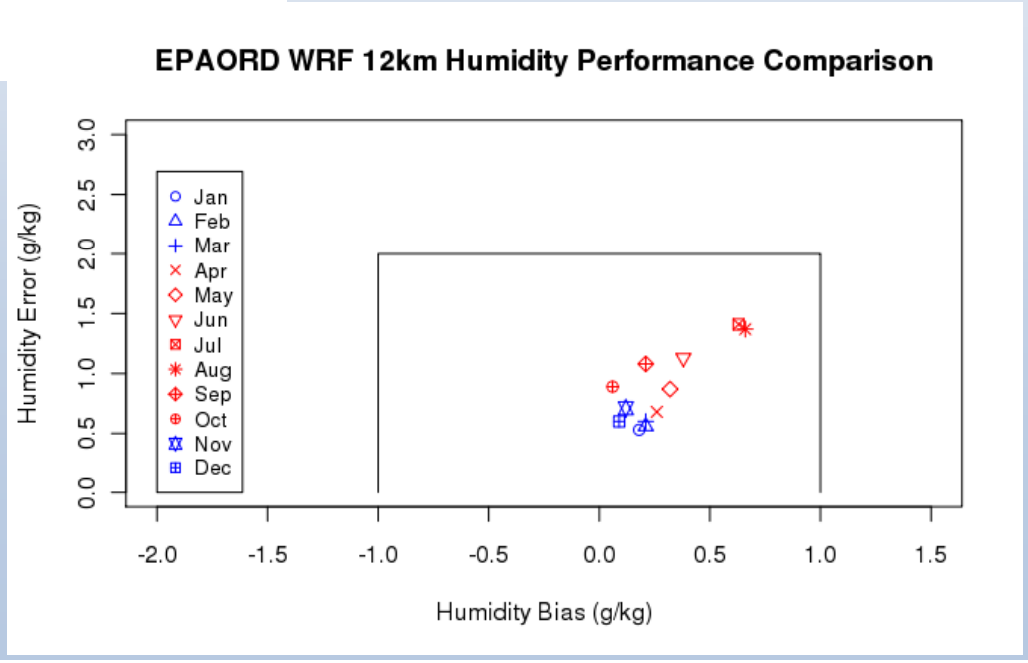
Humidity (CONUS)



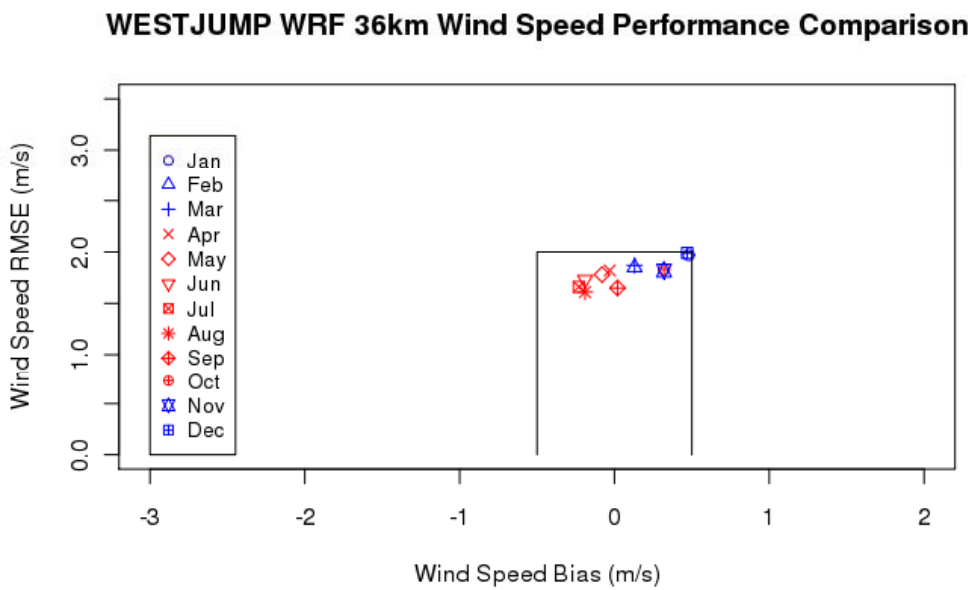


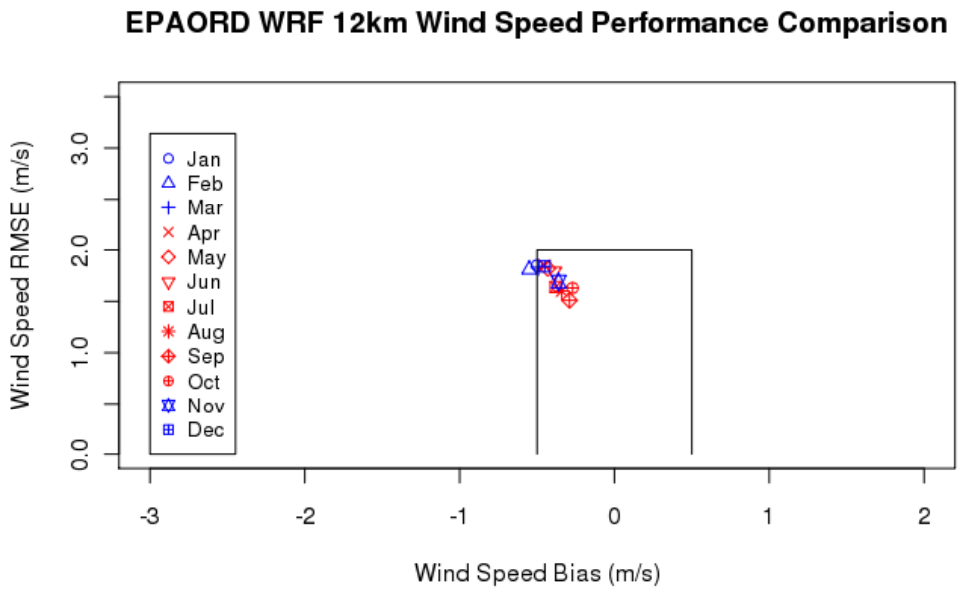
Humidity (12km WRAP)



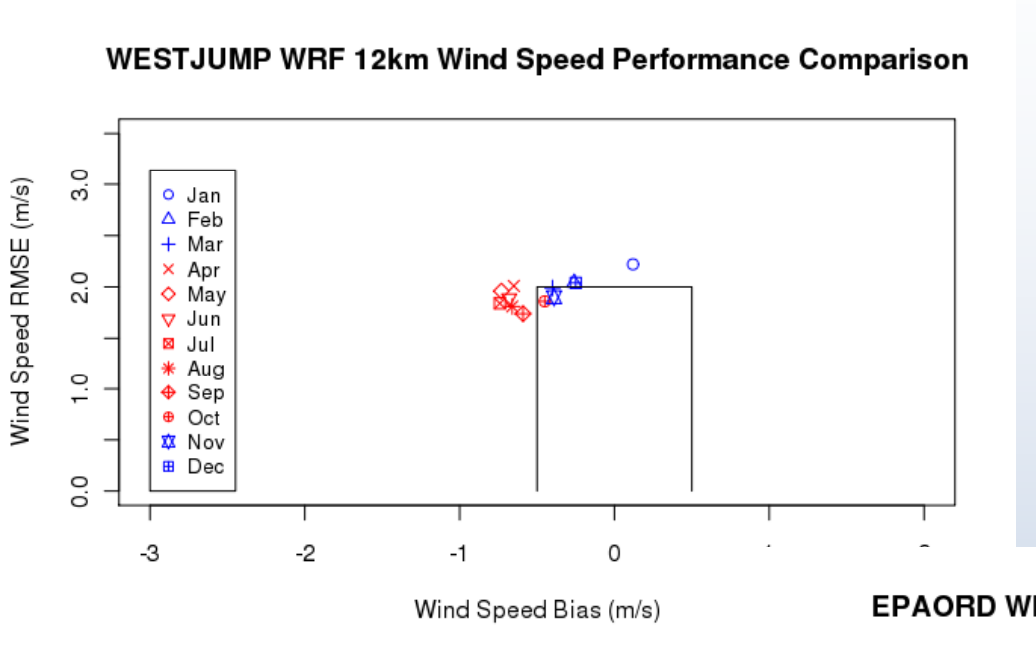


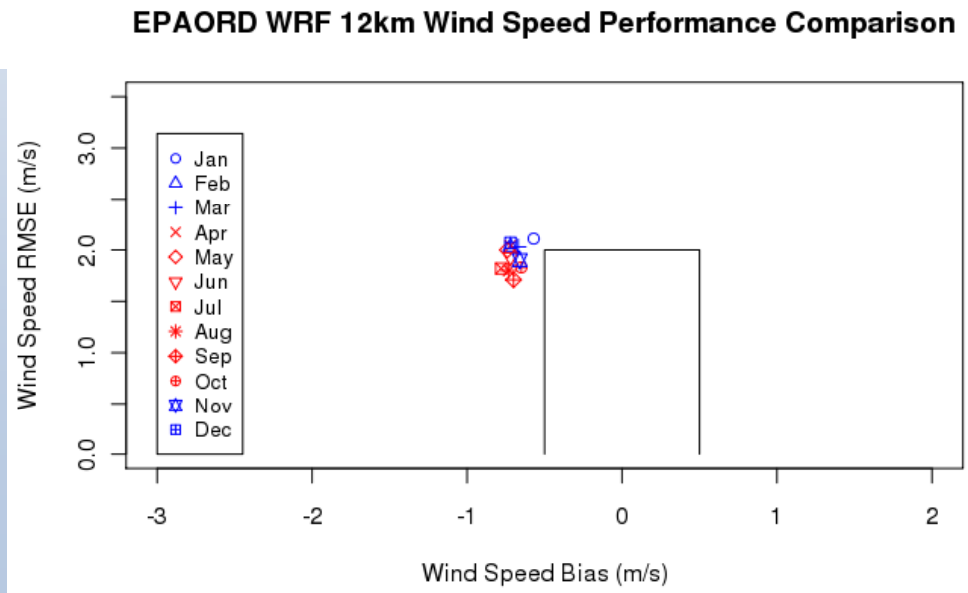
Wind Speed (CONUS)



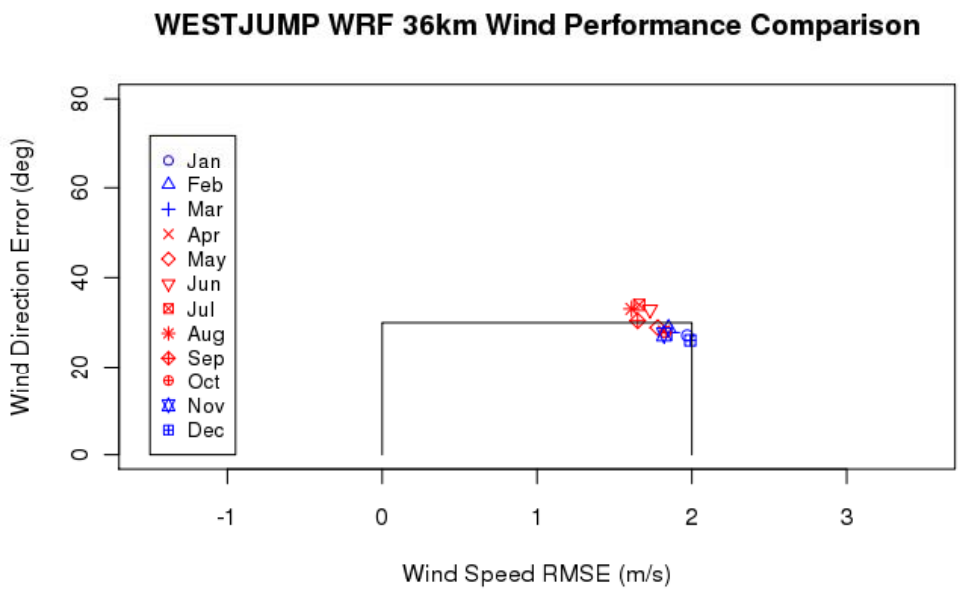


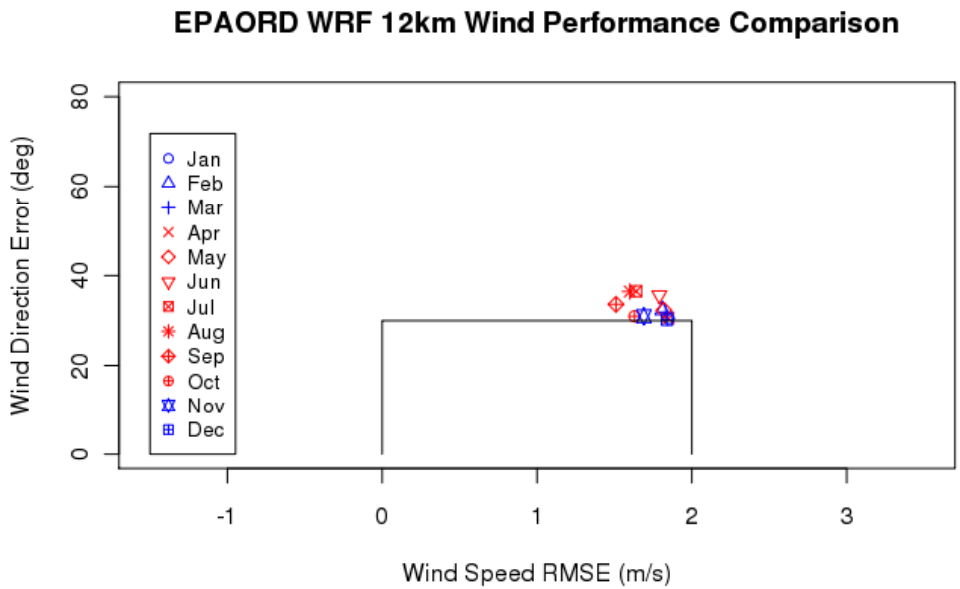
Wind Speed (12km WRAP)



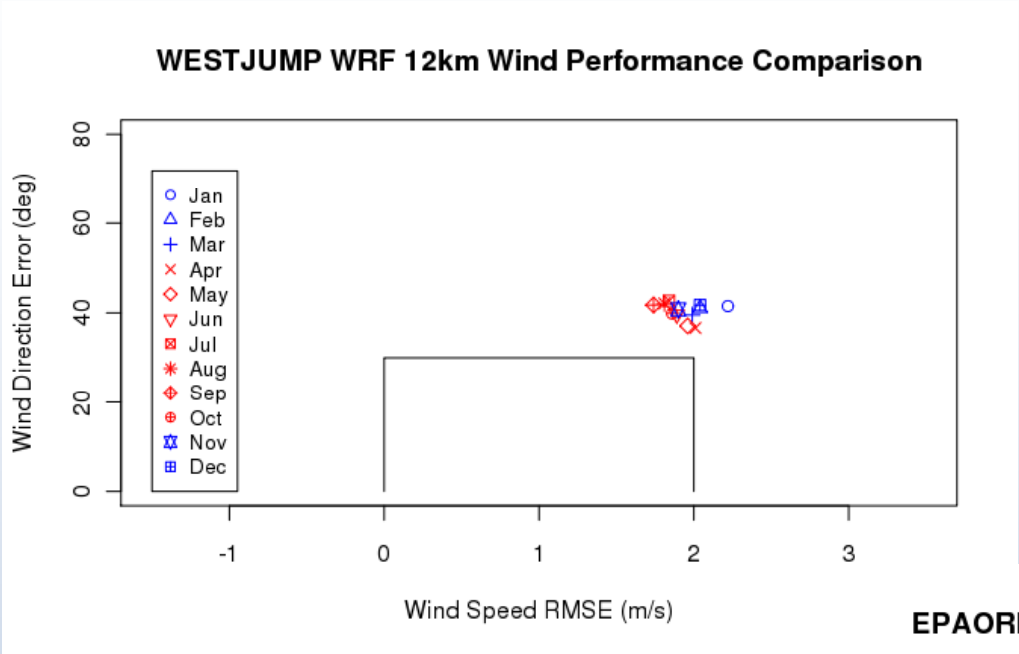


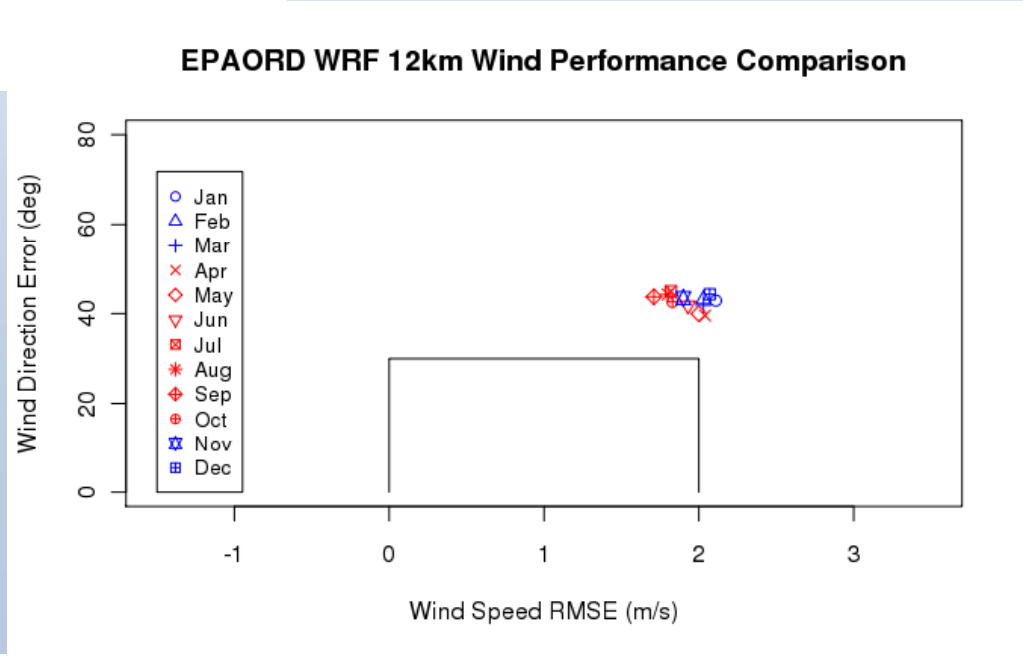
Winds (CONUS)


WESTJUMP WRF 36km Wind Performance Comparison
Wind Direction Error (deg)
0
20
40
60
80
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
-1
0
1
2
3
Wind Speed RMSE (m/s)

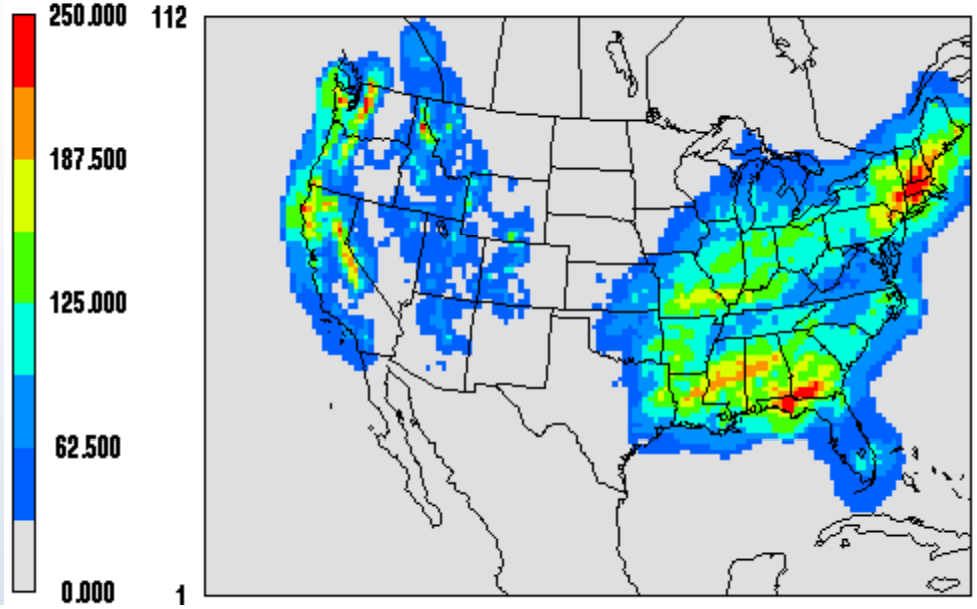

EPAORD WRF 12km Wind Performance Comparison
Wind Direction Error (deg)
0
20
40
60
80
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
-1
0
1
2
3
Wind Speed RMSE (m/s)

Winds (12km WRAP)





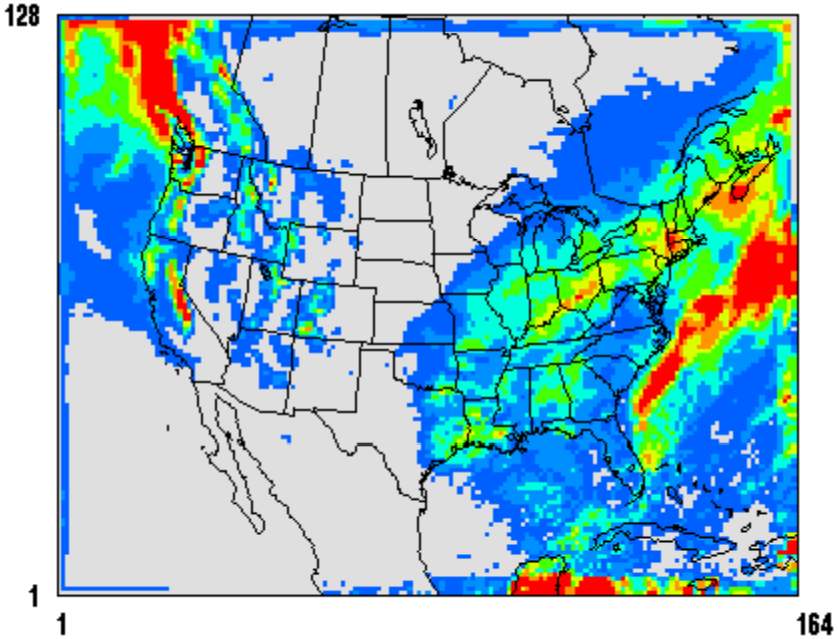
Precipitation (Feb)

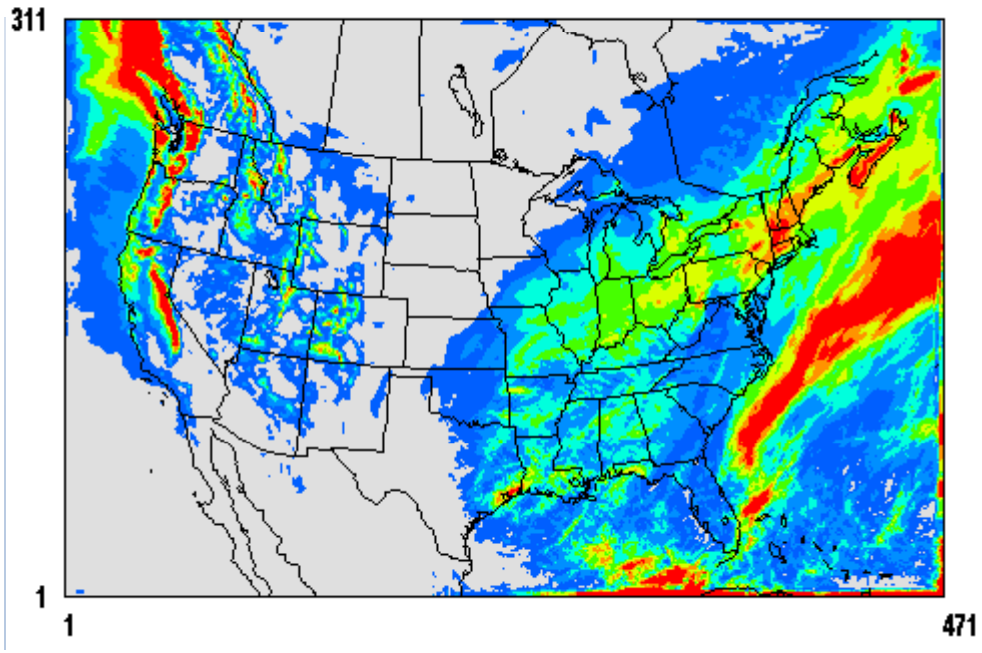


CPC Obs.

Coord.

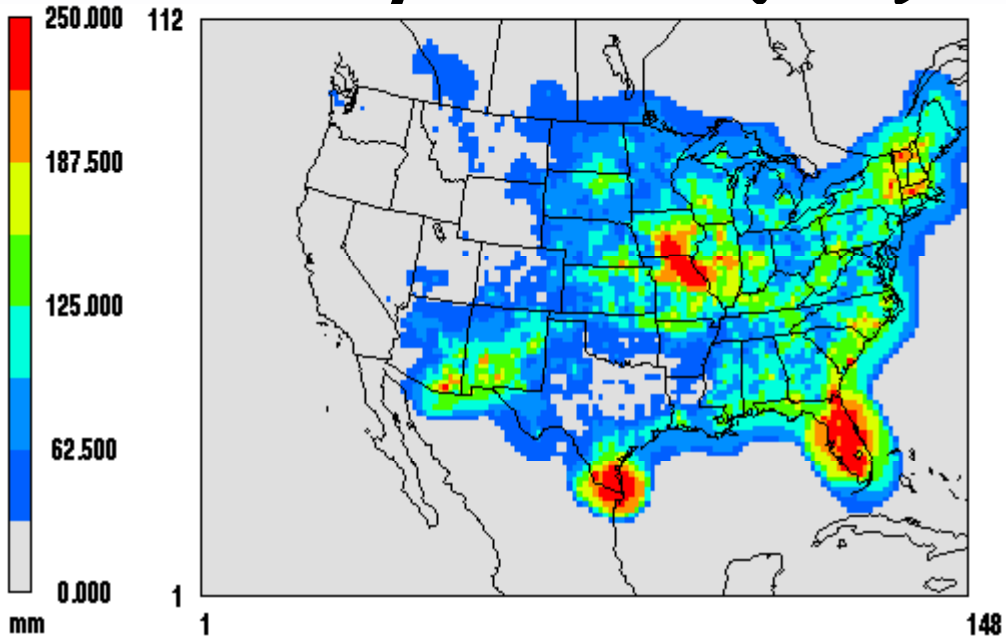
EPA ORD





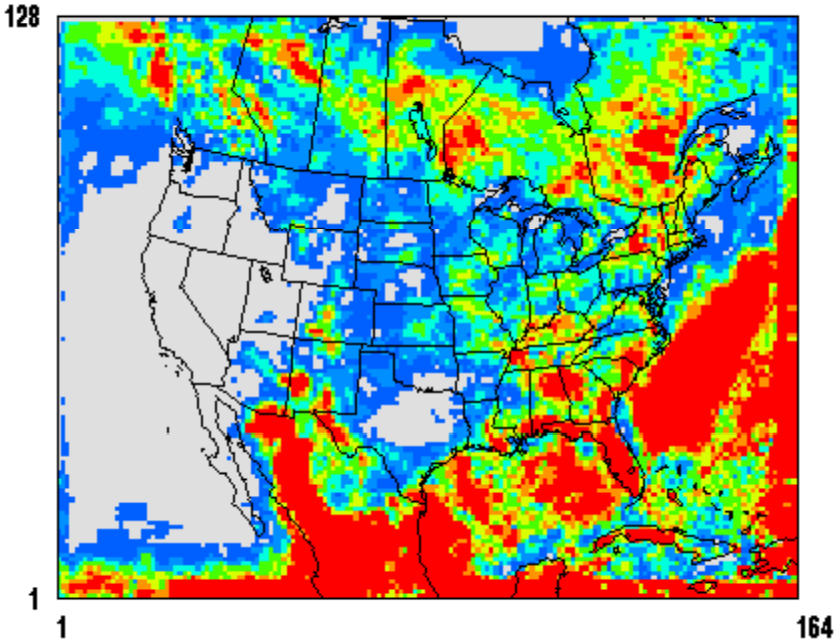
Precipitation (Jul)

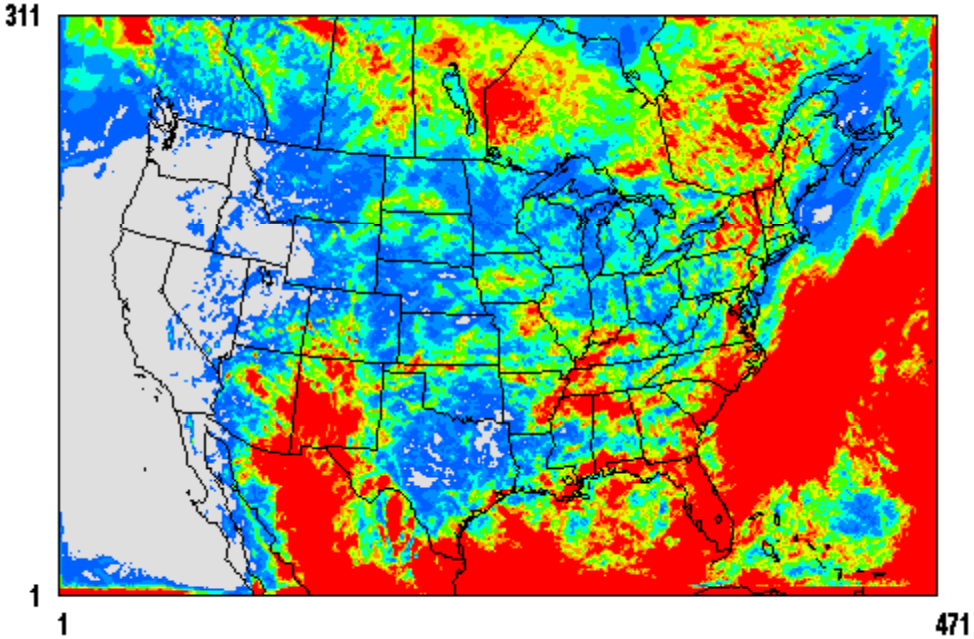
CPC Obs.



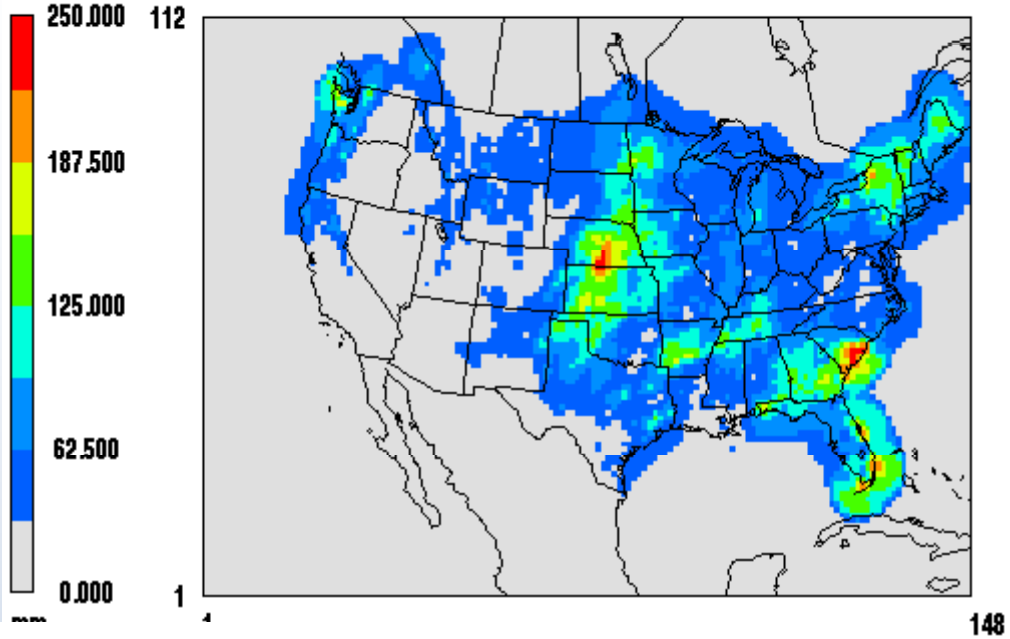
Coord.

EPA ORD





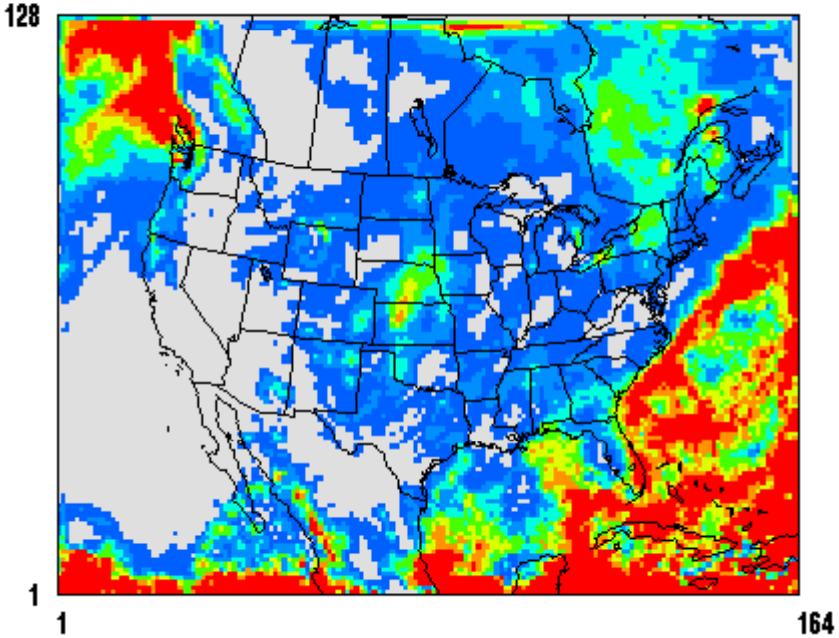
Precipitation (Oct)

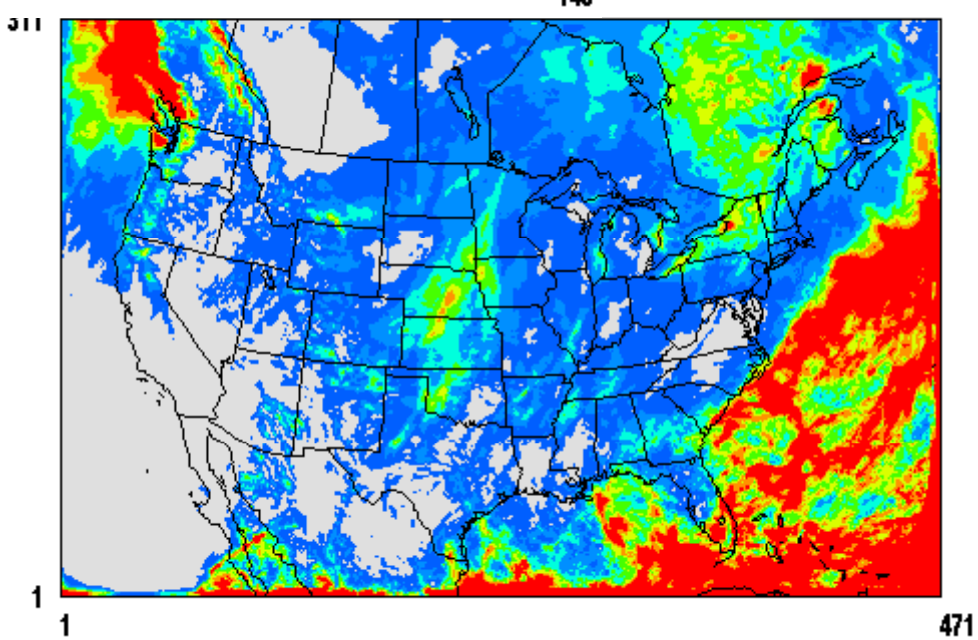


CPC Obs.

Coord.

EPA ORD





Other Ongoing Studies

- Additional Years of EPA ORD?
- 2010 Utah/BLM ARMS
- Federal Leadership Forum Three-State?