NCEP Verification
surface ozone concentrations
PBL

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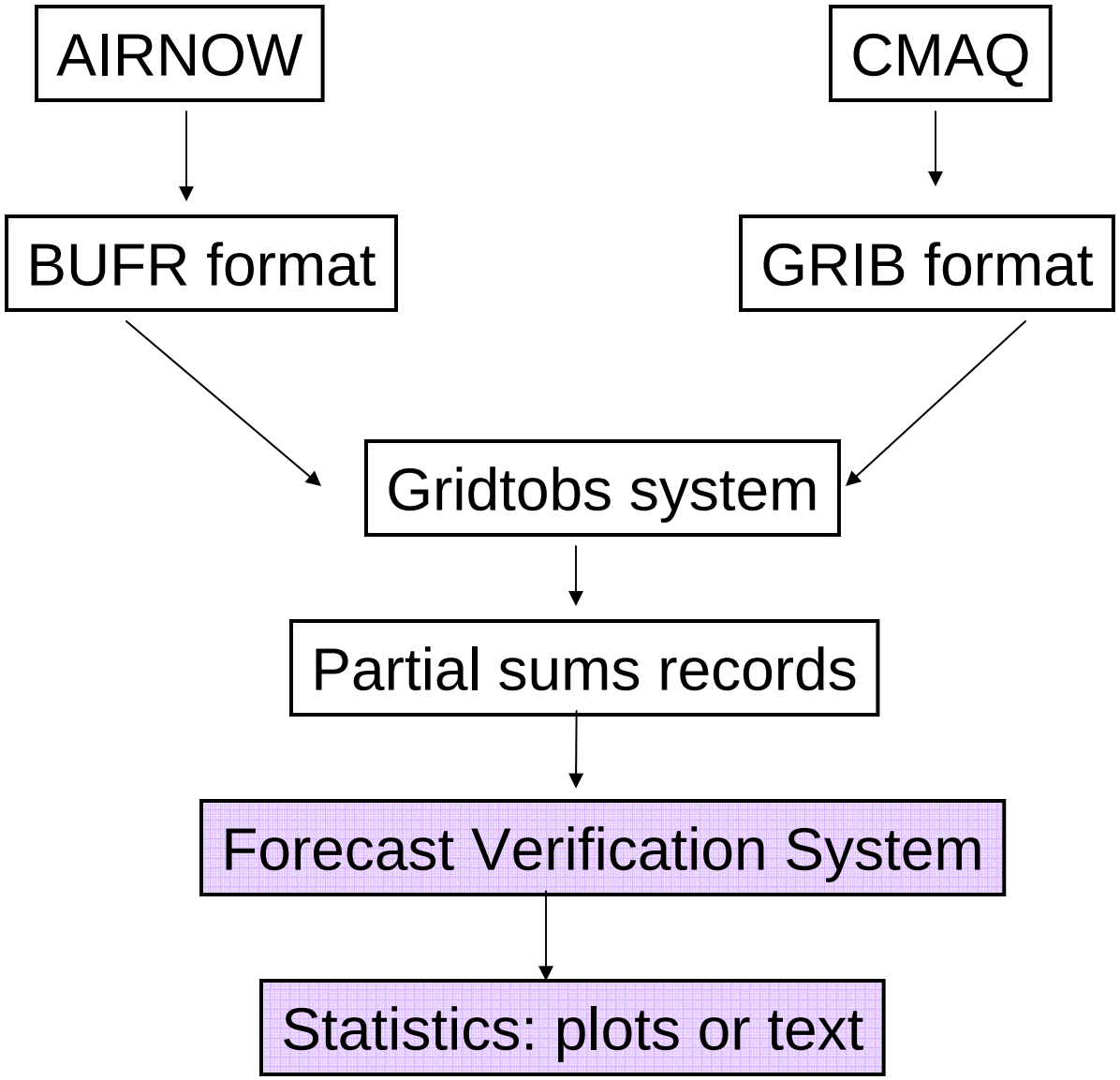
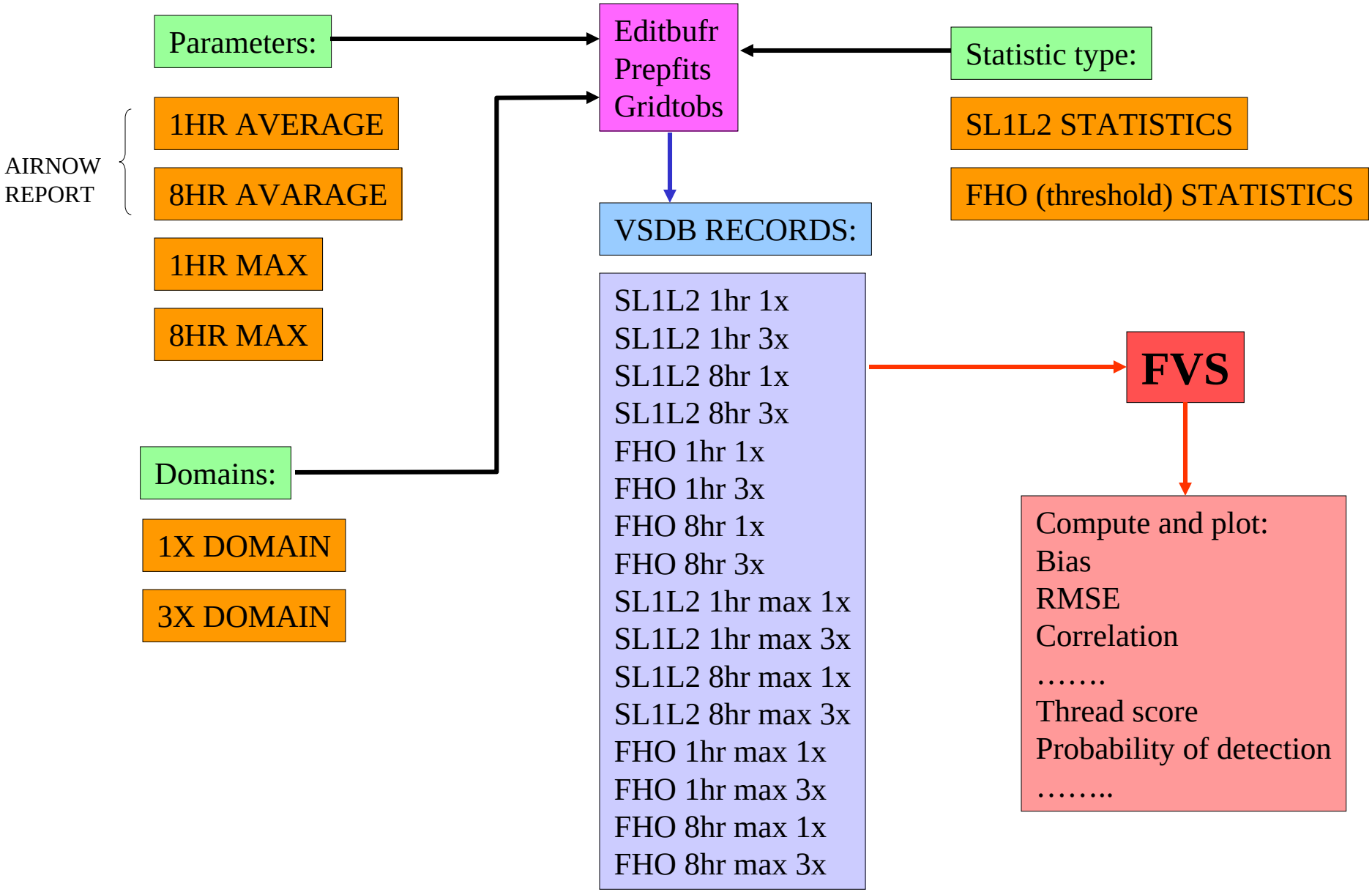
NCEP/EMC

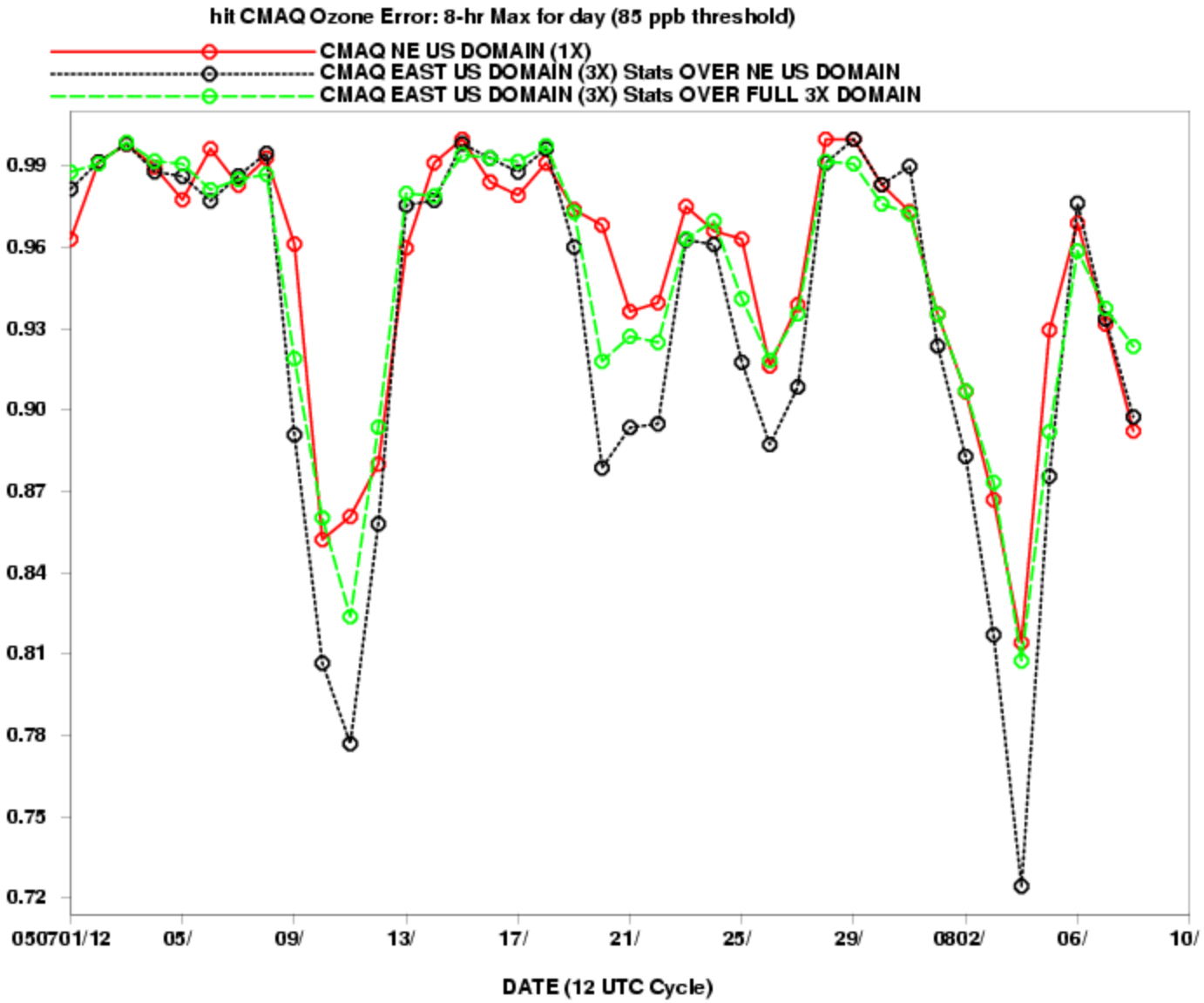
Focus group meeting
Sep 07, 2005

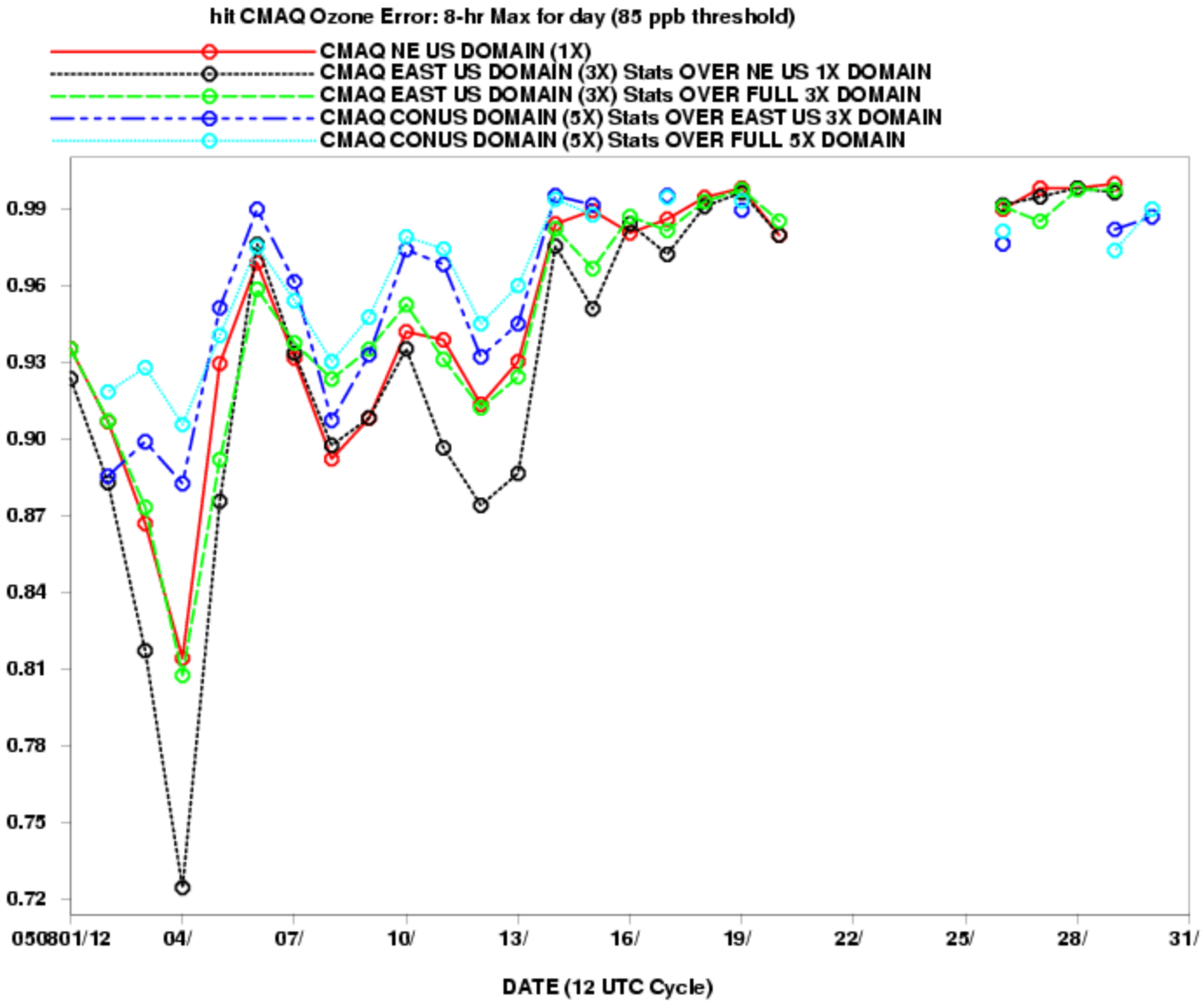
Ozone Verification system at NCEP

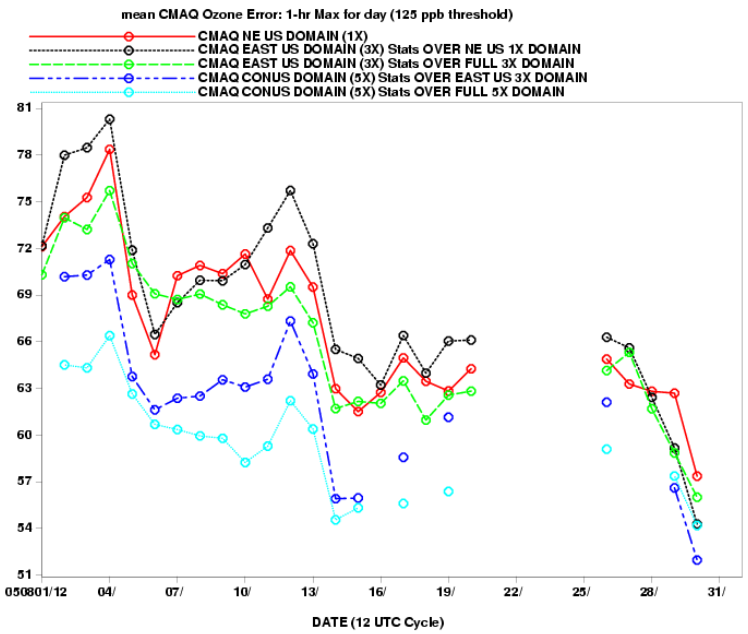


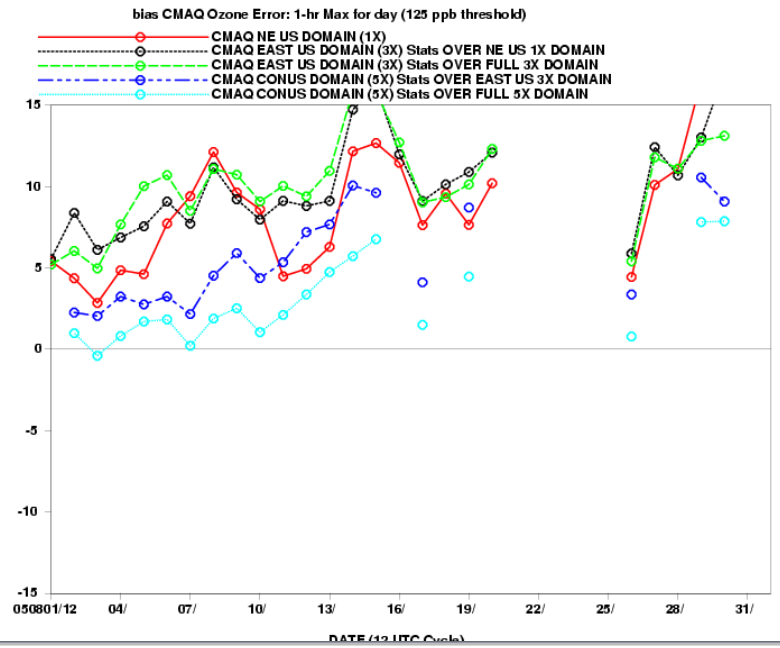
SURFACE OZONE VERIFICATION

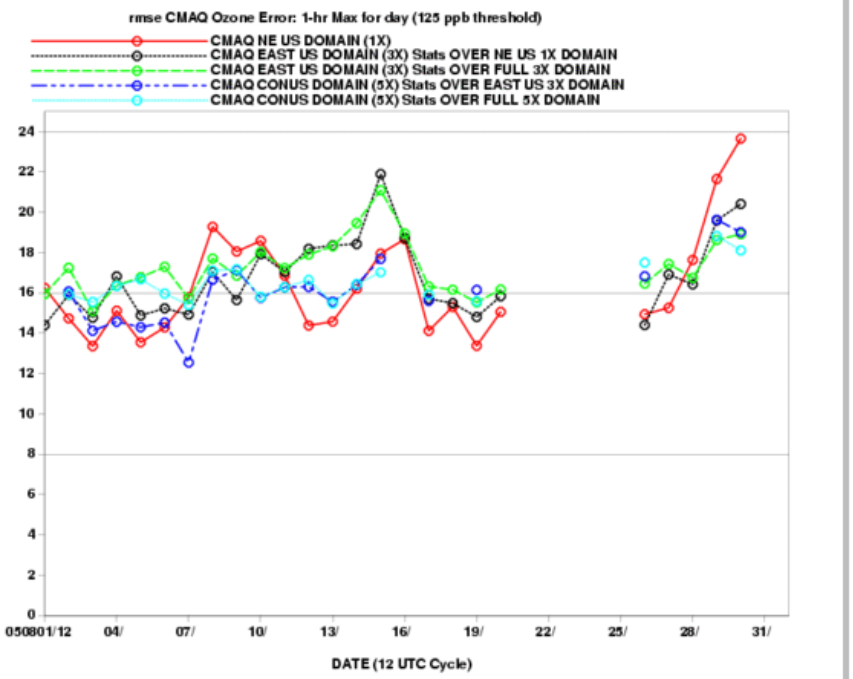


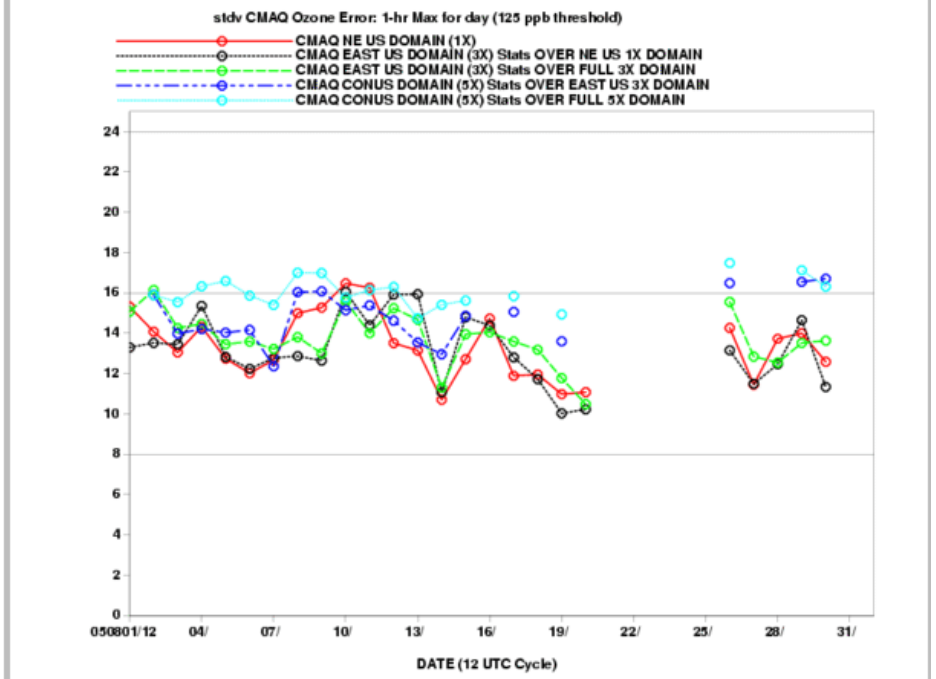

hit CMAQ Ozone Error: 8-hr Max for day (85 ppb threshold)
CMAQ NE US DOMAIN (1X)
CMAQ EAST US DOMAIN (3X) Stats OVER NE US DOMAIN
CMAQ EAST US DOMAIN (3X) Stats OVER FULL 3X DOMAIN
0.99
0.96
0.93
0.90
0.87
0.84
0.81
0.78
0.75
0.72
050701/12
05/
09/
13/
17/
21/
25/
29/
0802/
06/
10/
DATE (12 UTC Cycle)

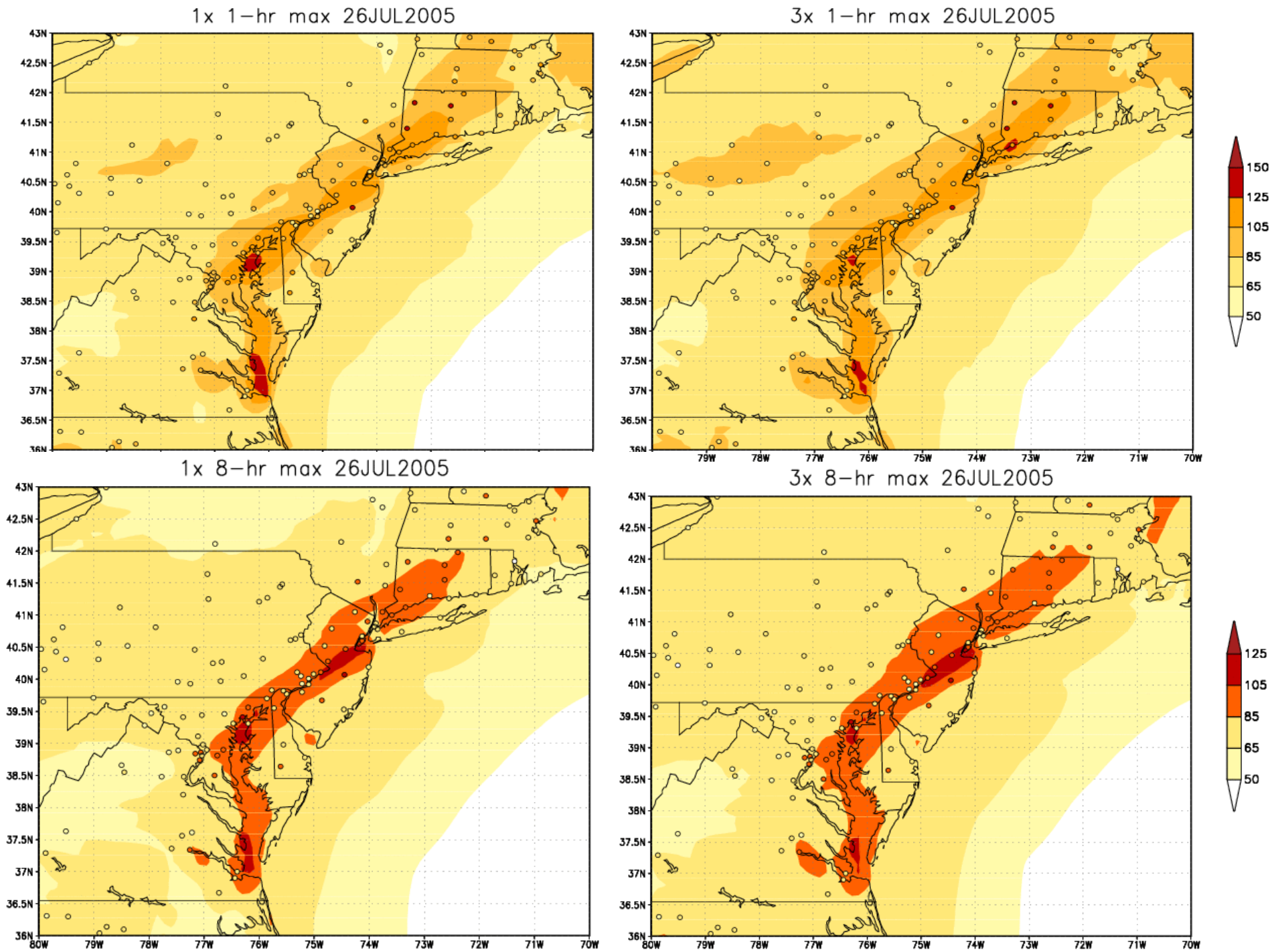

hit CMAQ Ozone Error: 8-hr Max for day (85 ppb threshold)
CMAQ NE US DOMAIN (1X)
CMAQ EAST US DOMAIN (3X) Stats OVER NE US 1X DOMAIN
CMAQ EAST US DOMAIN (3X) Stats OVER FULL 3X DOMAIN
CMAQ CONUS DOMAIN (5X) Stats OVER EAST US 3X DOMAIN
CMAQ CONUS DOMAIN (5X) Stats OVER FULL 5X DOMAIN
0.99
0.96
0.93
0.90
0.87
0.84
0.81
0.78
0.75
0.72
050801/12
04/
07/
10/
13/
16/
19/
22/
25/
28/
31/
DATE (12 UTC Cycle)


mean CMAQ Ozone Error: 1-hr Max for day (125 ppb threshold)
CMAQ NE US DOMAIN (1X)
CMAQ EAST US DOMAIN (3X) Stats OVER NE US 1X DOMAIN
CMAQ EAST US DOMAIN (3X) Stats OVER FULL 3X DOMAIN
CMAQ CONUS DOMAIN (5X) Stats OVER EAST US 3X DOMAIN
CMAQ CONUS DOMAIN (5X) Stats OVER FULL 5X DOMAIN
81
78
75
72
69
66
63
60
57
54
51
050801/12
04/
07/
10/
13/
16/
19/
22/
25/
28/
31/
DATE (12 UTC Cycle)


bias CMAQ Ozone Error: 1-hr Max for day (125 ppb threshold)
CMAQ NE US DOMAIN (1X)
CMAQ EAST US DOMAIN (3X) Stats OVER NE US 1X DOMAIN
CMAQ EAST US DOMAIN (3X) Stats OVER FULL 3X DOMAIN
CMAQ CONUS DOMAIN (5X) Stats OVER EAST US 3X DOMAIN
CMAQ CONUS DOMAIN (5X) Stats OVER FULL 5X DOMAIN
15
10
5
0
-5
-10
-15
050801/12
04/
07/
10/
13/
16/
19/
22/
25/
28/
31/


rmse CMAQ Ozone Error: 1-hr Max for day (125 ppb threshold)
CMAQ NE US DOMAIN (1X)
CMAQ EAST US DOMAIN (3X) Stats OVER NE US 1X DOMAIN
CMAQ EAST US DOMAIN (3X) Stats OVER FULL 3X DOMAIN
CMAQ CONUS DOMAIN (5X) Stats OVER EAST US 3X DOMAIN
CMAQ CONUS DOMAIN (5X) Stats OVER FULL 5X DOMAIN
24
22
20
18
16
14
12
10
8
6
4
2
0
050801/12
04/
07/
10/
13/
16/
19/
22/
25/
28/
31/
DATE (12 UTC Cycle)


stdv CMAQ Ozone Error: 1-hr Max for day (125 ppb threshold)
CMAQ NE US DOMAIN (1X)
CMAQ EAST US DOMAIN (3X) Stats OVER NE US 1X DOMAIN
CMAQ EAST US DOMAIN (3X) Stats OVER FULL 3X DOMAIN
CMAQ CONUS DOMAIN (5X) Stats OVER EAST US 3X DOMAIN
CMAQ CONUS DOMAIN (5X) Stats OVER FULL 5X DOMAIN
24
22
20
18
16
14
12
10
8
6
4
2
0
050801/12
04/
07/
10/
13/
16/
19/
22/
25/
28/
31/
DATE (12 UTC Cycle)


1x 1-hr max 26JUL2005
3x 1-hr max 26JUL2005
1x 8-hr max 26JUL2005
3x 8-hr max 26JUL2005
43N
42.5N
42N
41.5N
41N
40.5N
40N
39.5N
39N
38.5N
38N
37.5N
37N
36.5N
36N
80W
79W
78W
77W
76W
75W
74W
73W
72W
71W
70W
150
125
105
85
65
50

PBL height calculation in models and observations

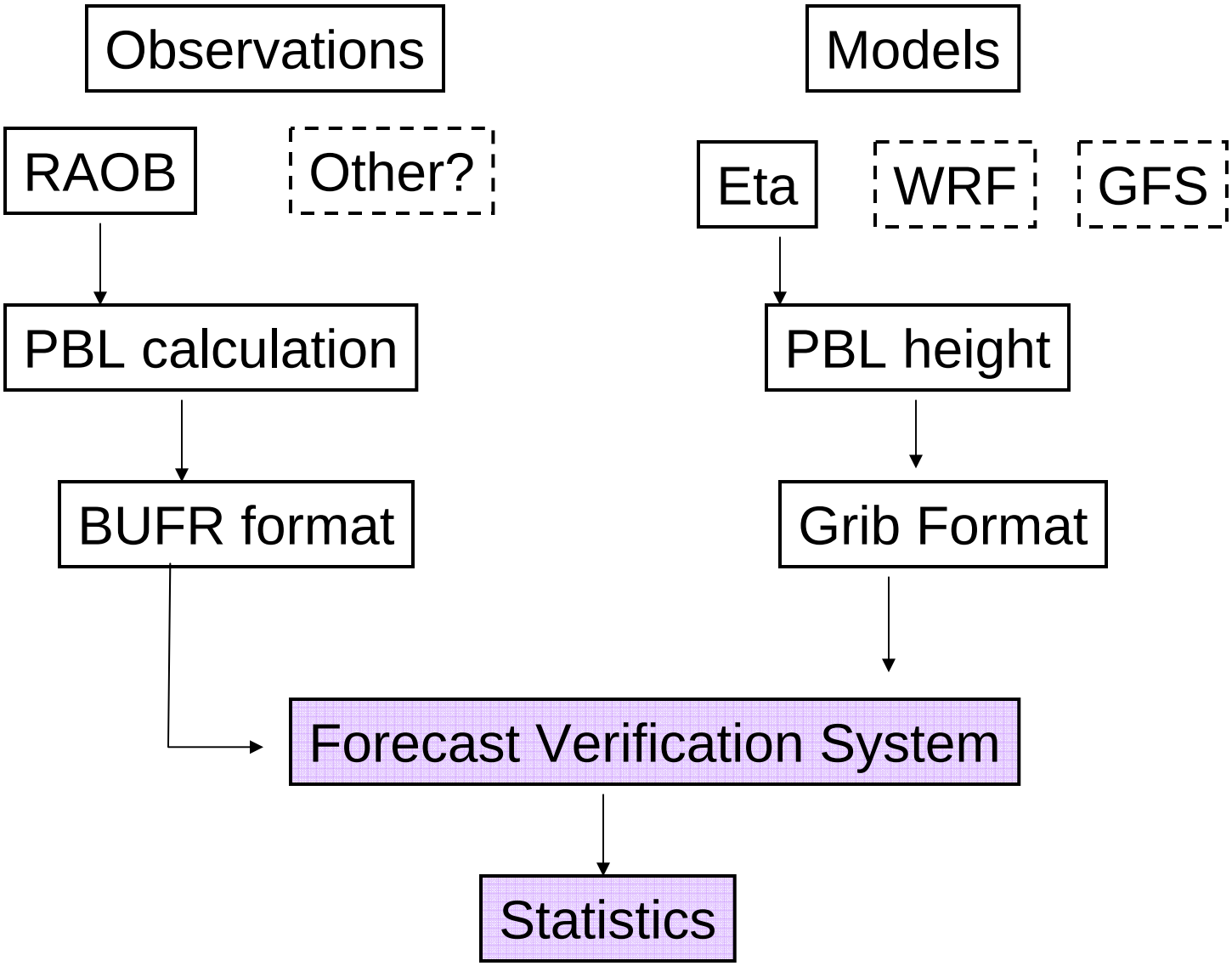
NAM (Eta):

- TKE scheme in internal computations
- No direct output
- Post-processing diagnostic using Critical Richardson Number approach (GFS)

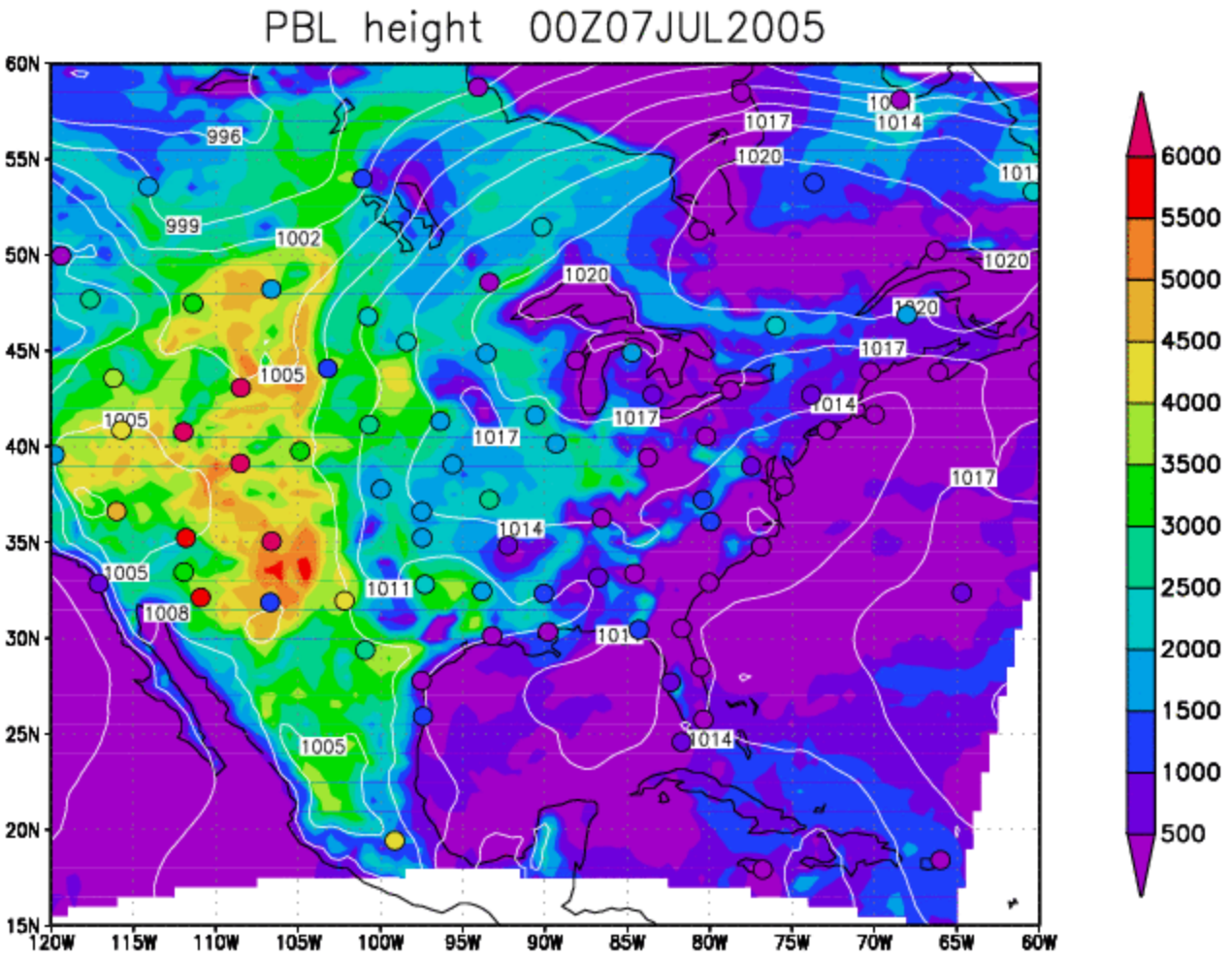
Rawinsonds:

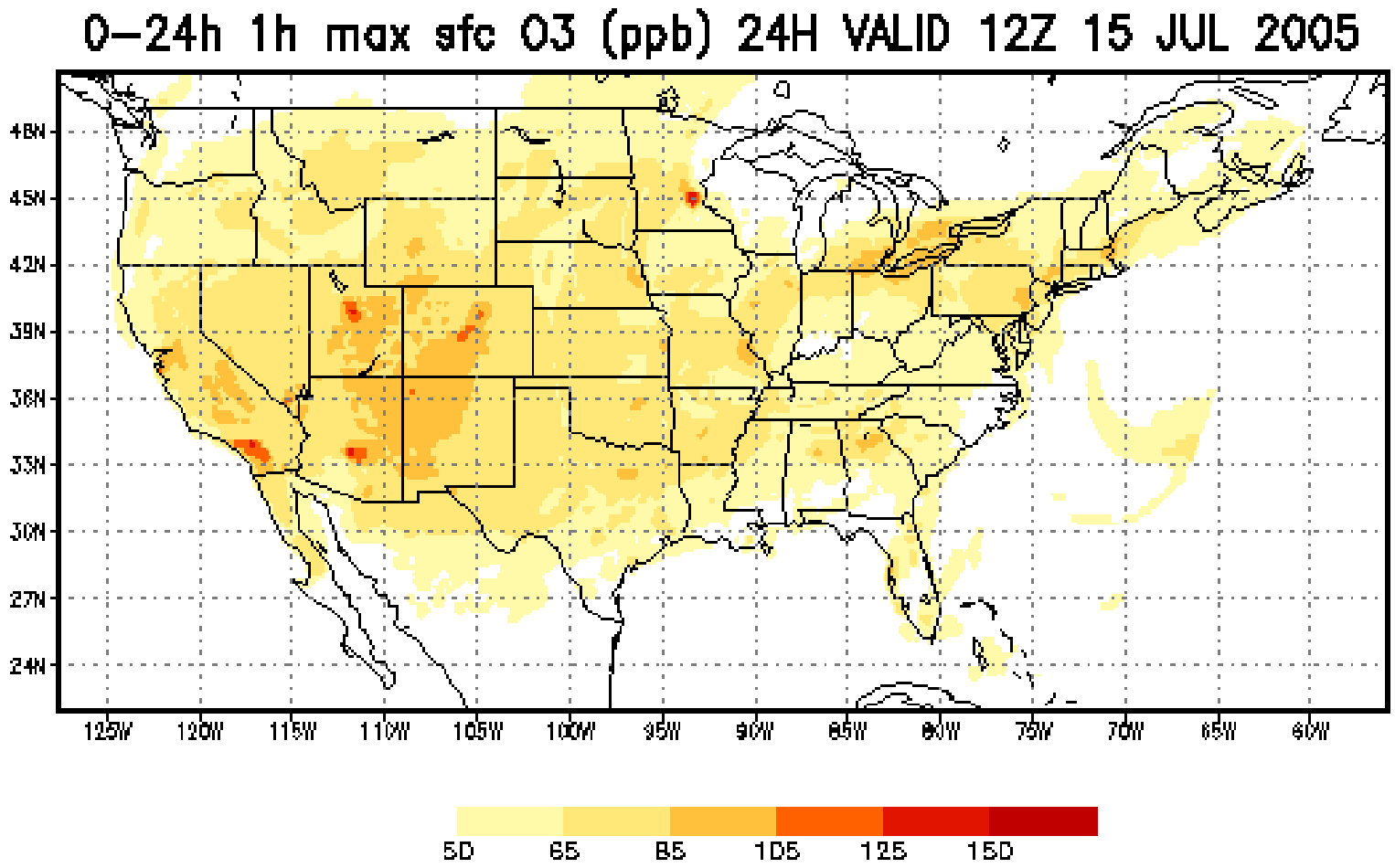
- Critical Richardson Number (0.25)
- Surface fluxes set to zero

Verification system for PBL

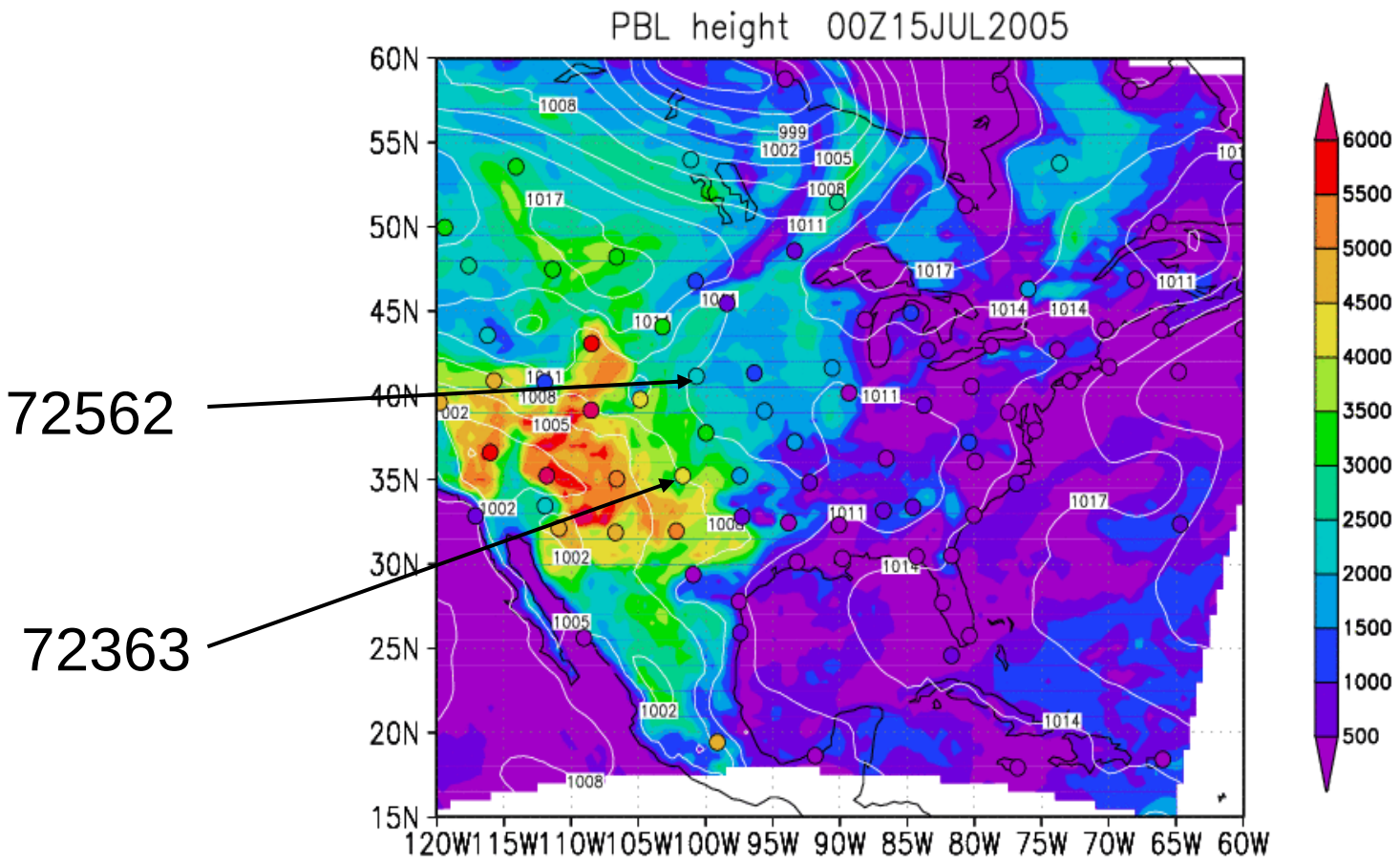


PBL Height Eta 12Z + 12 hrs vs rawinsondes




0-24h 1h max sfc O3 (ppb) 24H VALID 12Z 15 JUL 2005
48N
45N
42N
39N
36N
33N
30N
27N
24N
125W
120W
115W
110W
105W
100W
95W
90W
85W
80W
75W
70W
65W
60W
50
65
85
105
125
150

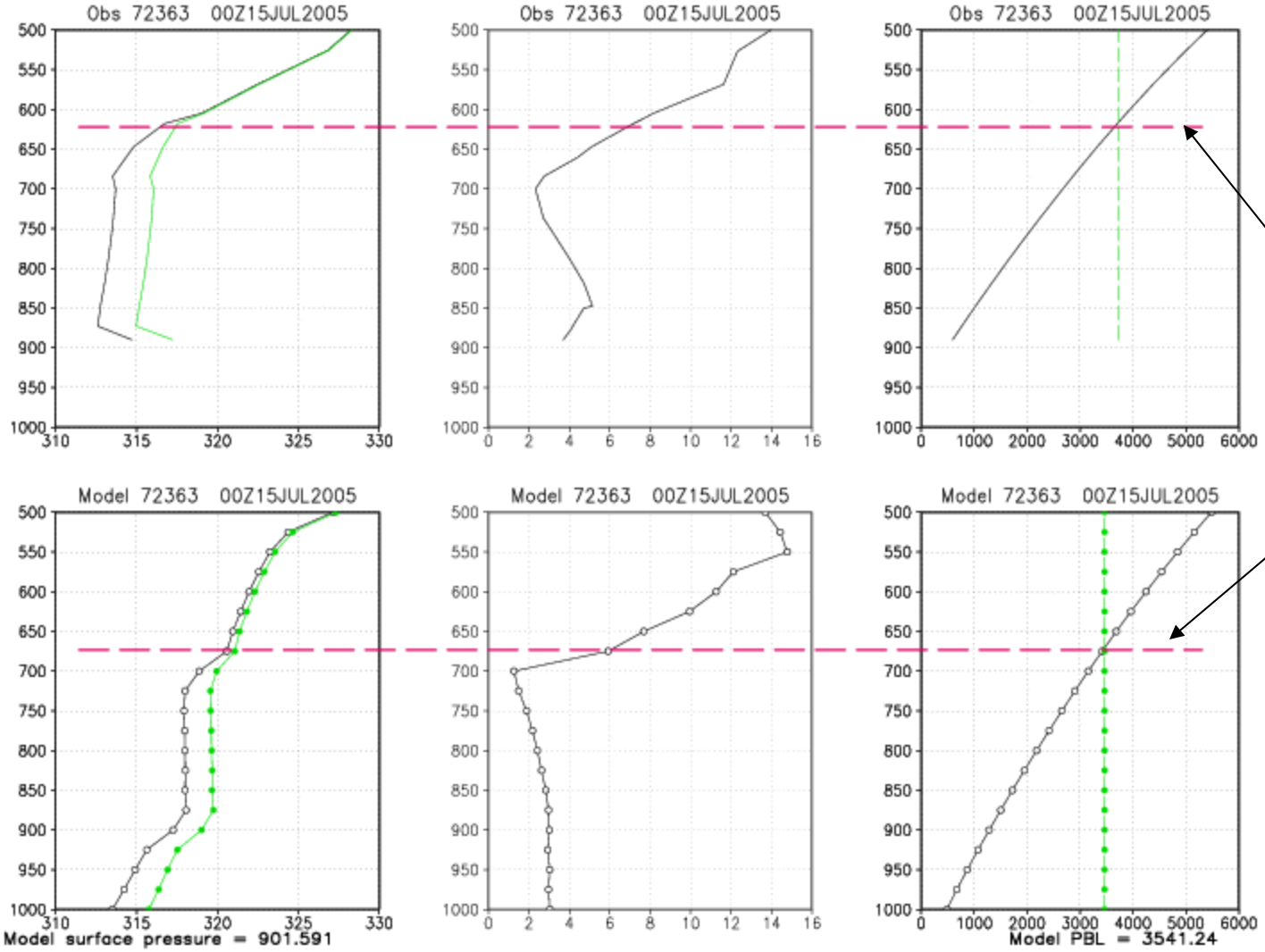
PBL Height Eta 12Z + 12 hrs vs rawinsondes



Pot. Temp, Virt. Pot. Temp **Wind** **Height**

Obs

Model

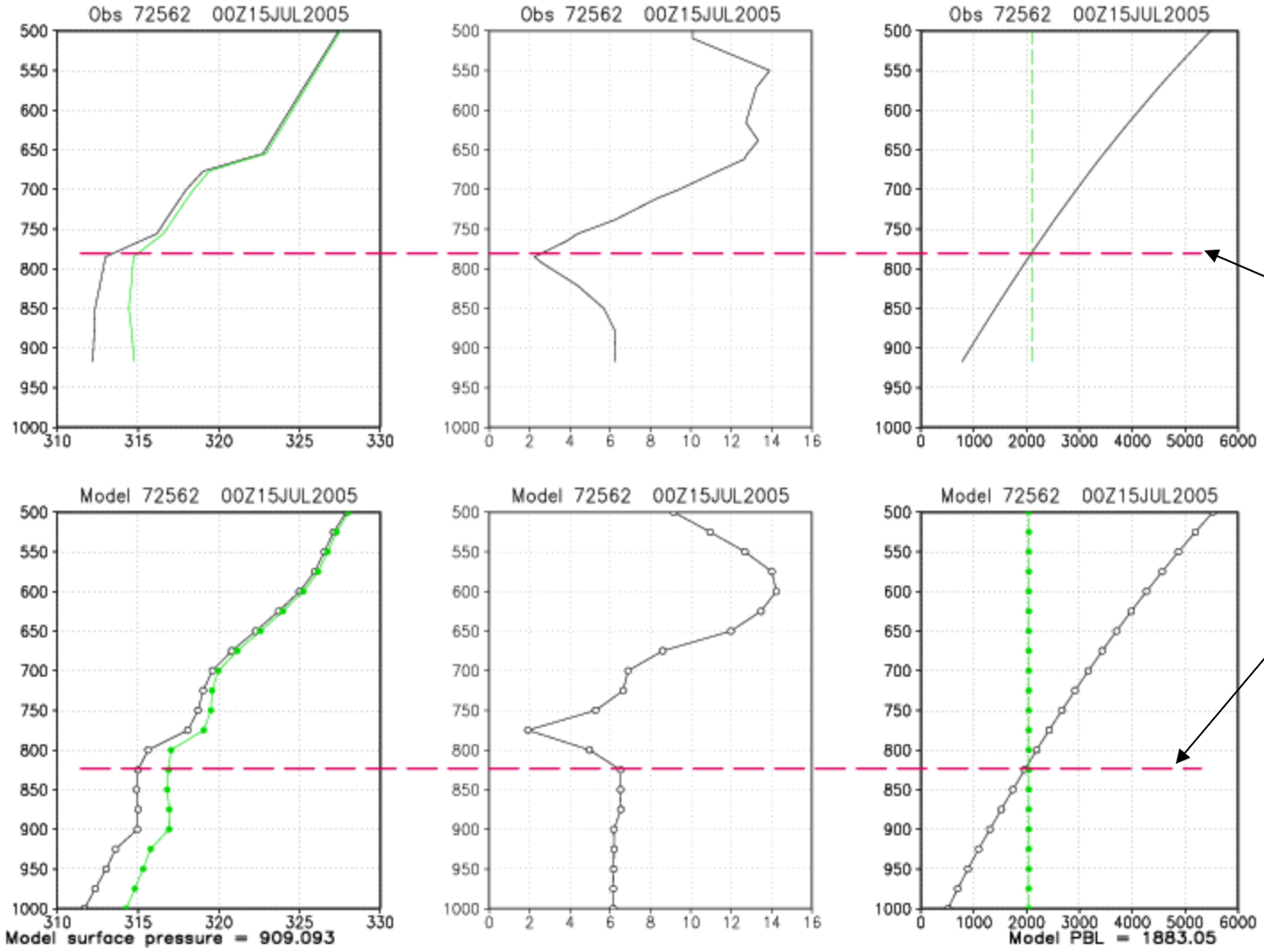


PBL Height

Pot. Temp, Virt. Pot. Temp **Wind** **Height**

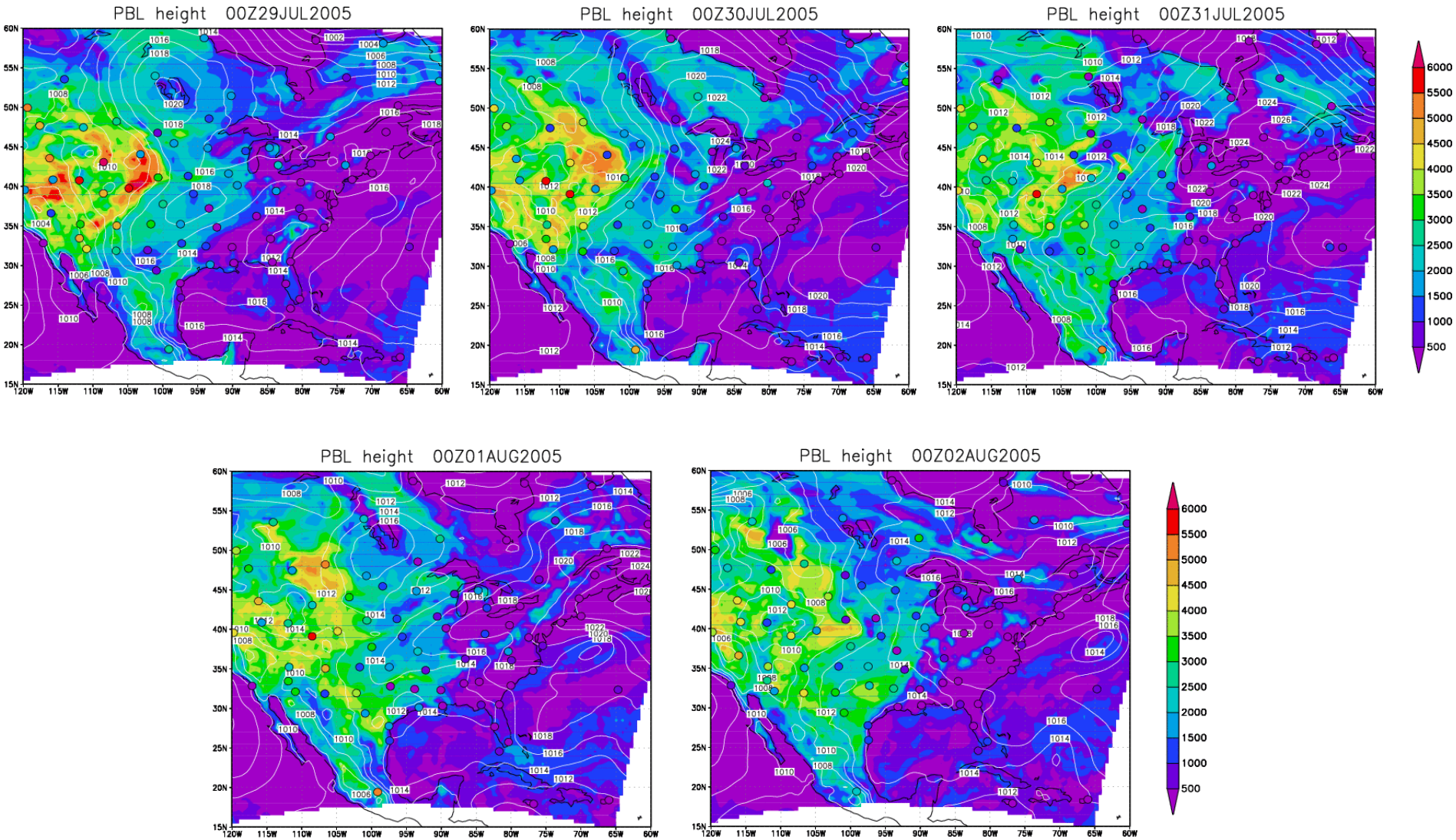
Obs

Model

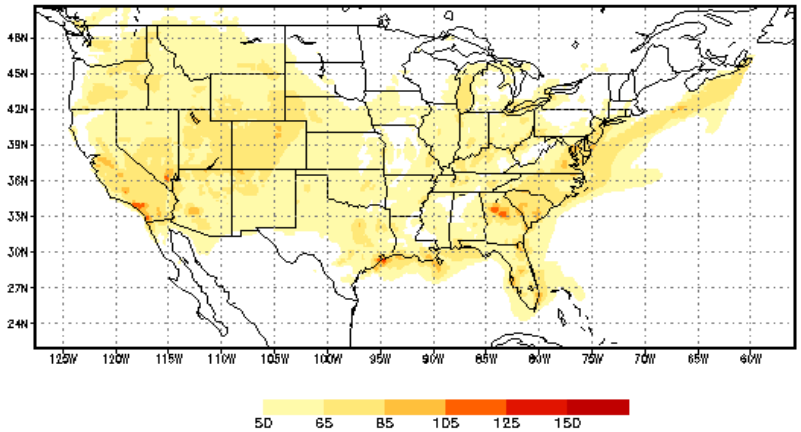


PBL Height

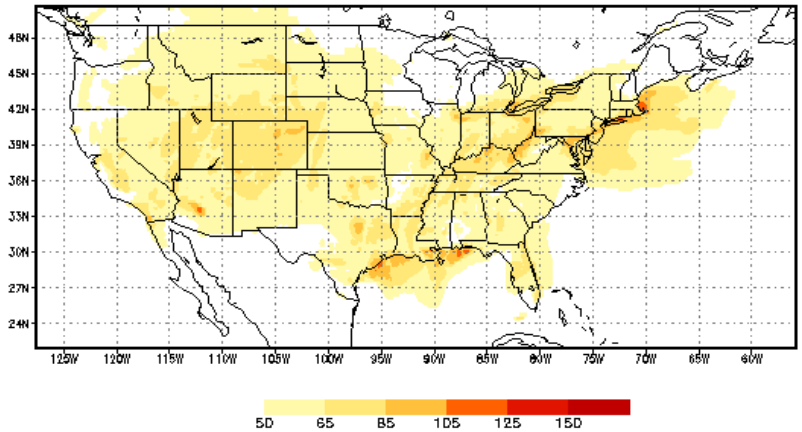
PBL Height Eta 12Z + 12 hrs vs rawinsondes



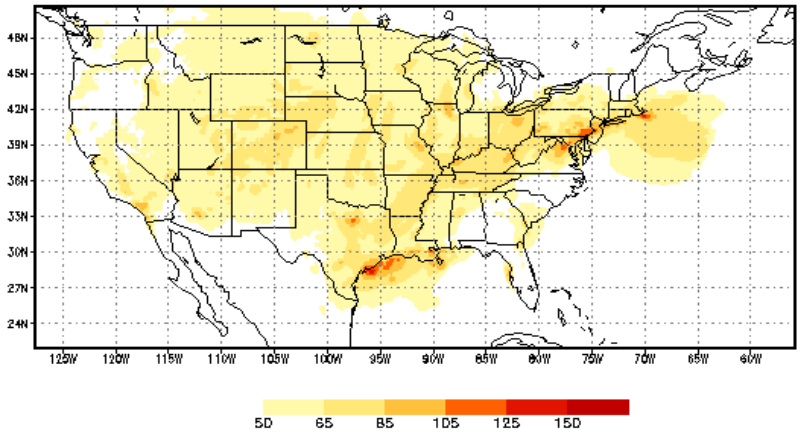
0–24h 1h max sfc O3 (ppb) 24H VALID 12Z 29 JUL 2005



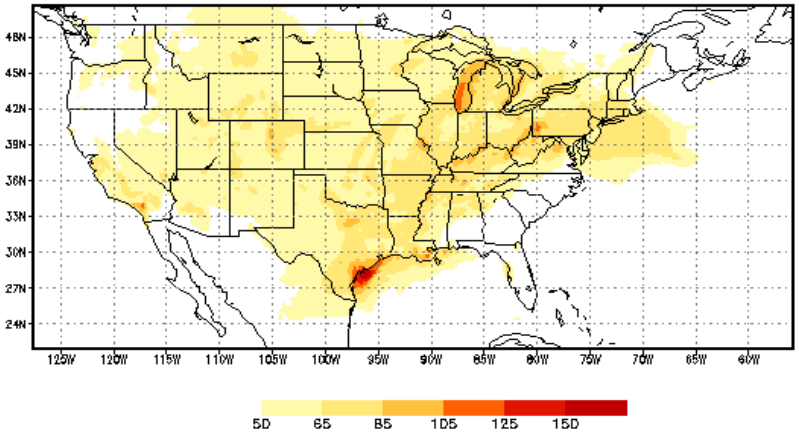
0–24h 1h max sfc O3 (ppb) 24H VALID 12Z 30 JUL 2005



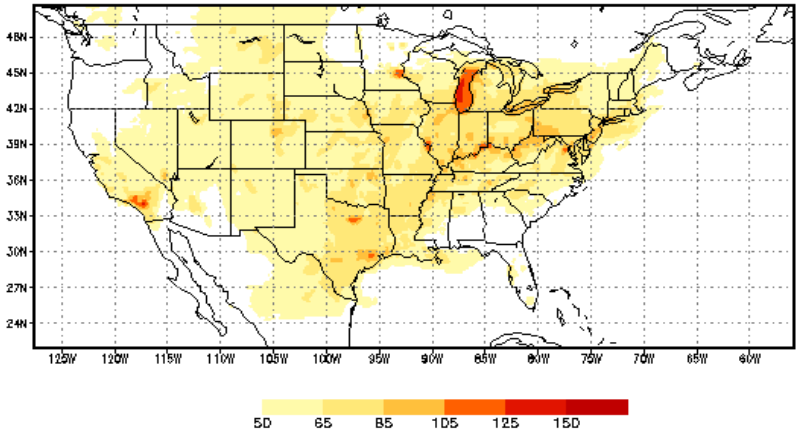
0–24h 1h max sfc O3 (ppb) 24H VALID 12Z 31 JUL 2005

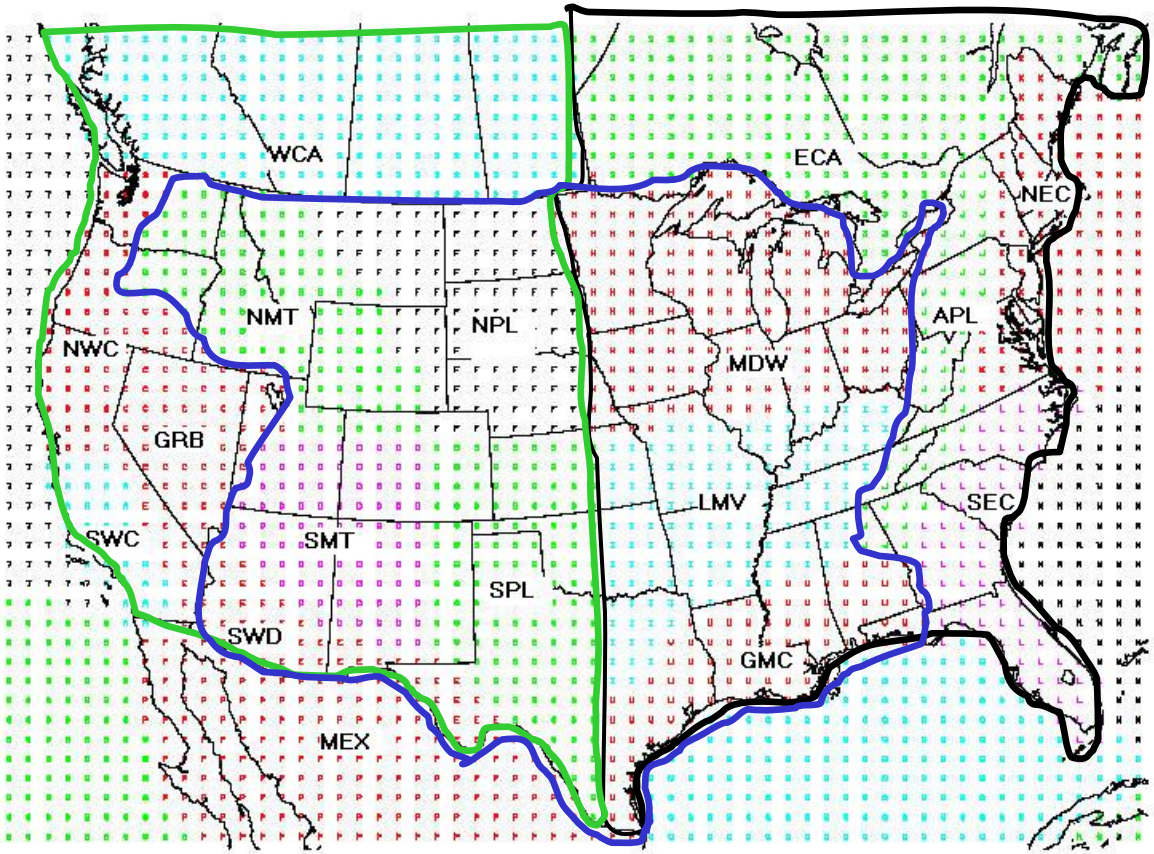


0–24h 1h max sfc O3 (ppb) 24H VALID 12Z 01 AUG 2005



0–24h 1h max sfc O3 (ppb) 24H VALID 12Z 02 AUG 2005



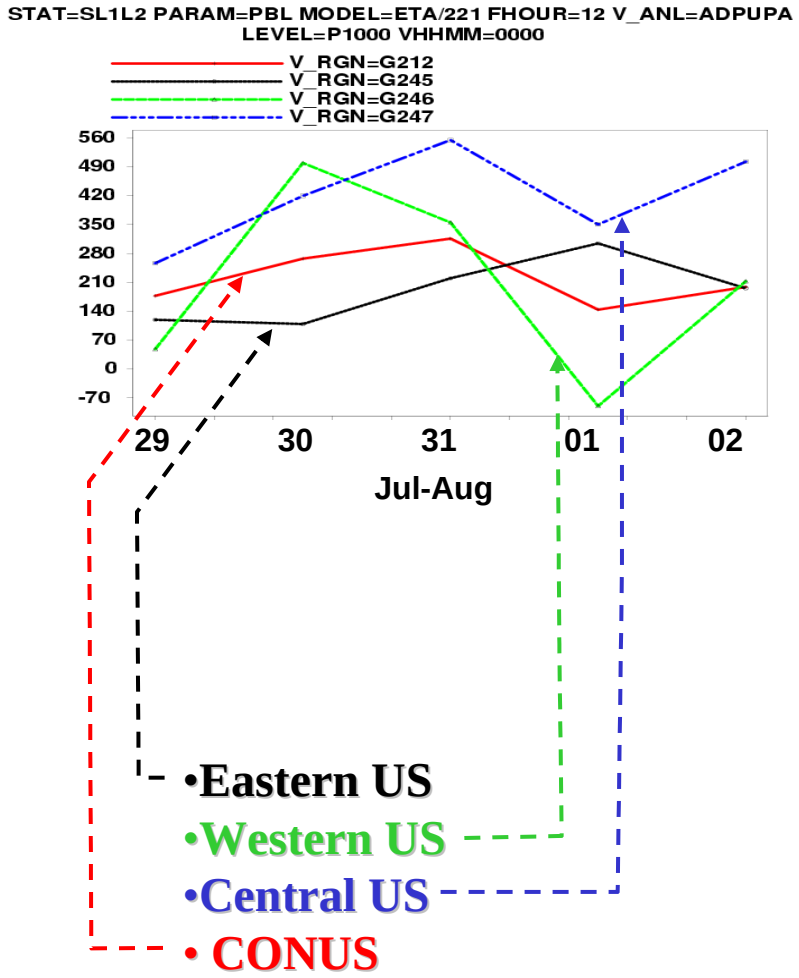


•**Eastern US Nest : NEC, APL, SEC, GMC, MDW, LMV, ECA**

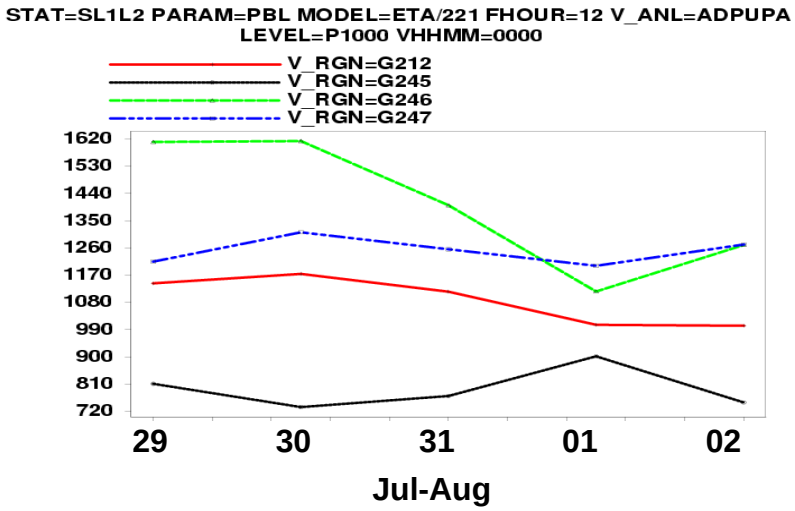
•**Western US Nest : NPL, SPL, NMT, SMT, GRB, SWD, NWC, SWC, WCA**

•**Central US Nest : GMC, MDW, LMV, NPL, SPL, NMT, SMT, SWD**

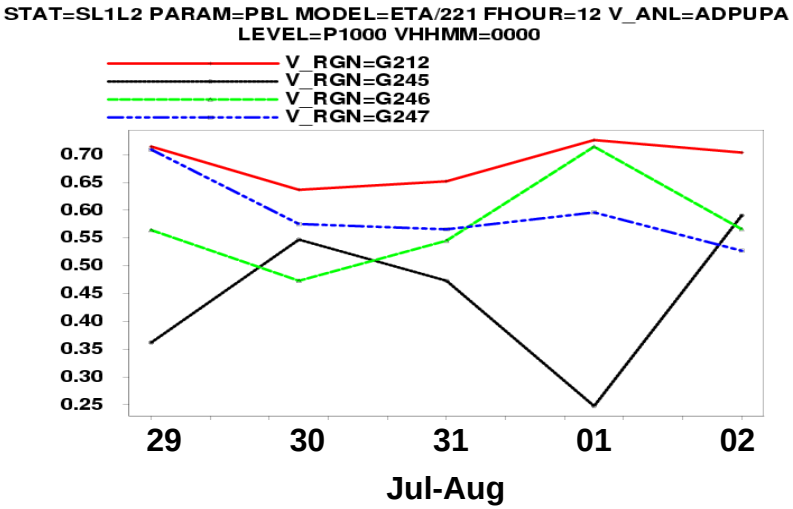
BIAS



RMSE



CORRELATION



Conclusions and future plans:

- Relatively good agreement between model and observations
- High PBL over mountains results in very high ozone concentrations
- Improve algorithm of PBL calculation from RAOB
- Put PBL verification into daily routine
- Verify Different models
- Different sub-domains
- Compare to LIDAR data