AIRPACT Air Quality Forecasting for PNW2001

Joe Vaughan, Brian Lamb, Hal Westberg,

Brad Fritz and Lee Bamesberger, WSU

Clint Bowman, Cristiana Figueroa-Kaminsky,

Sally Otterson, WA Dept. of Ecology

Rob Wilson and Jeff Arnold, EPA Region X

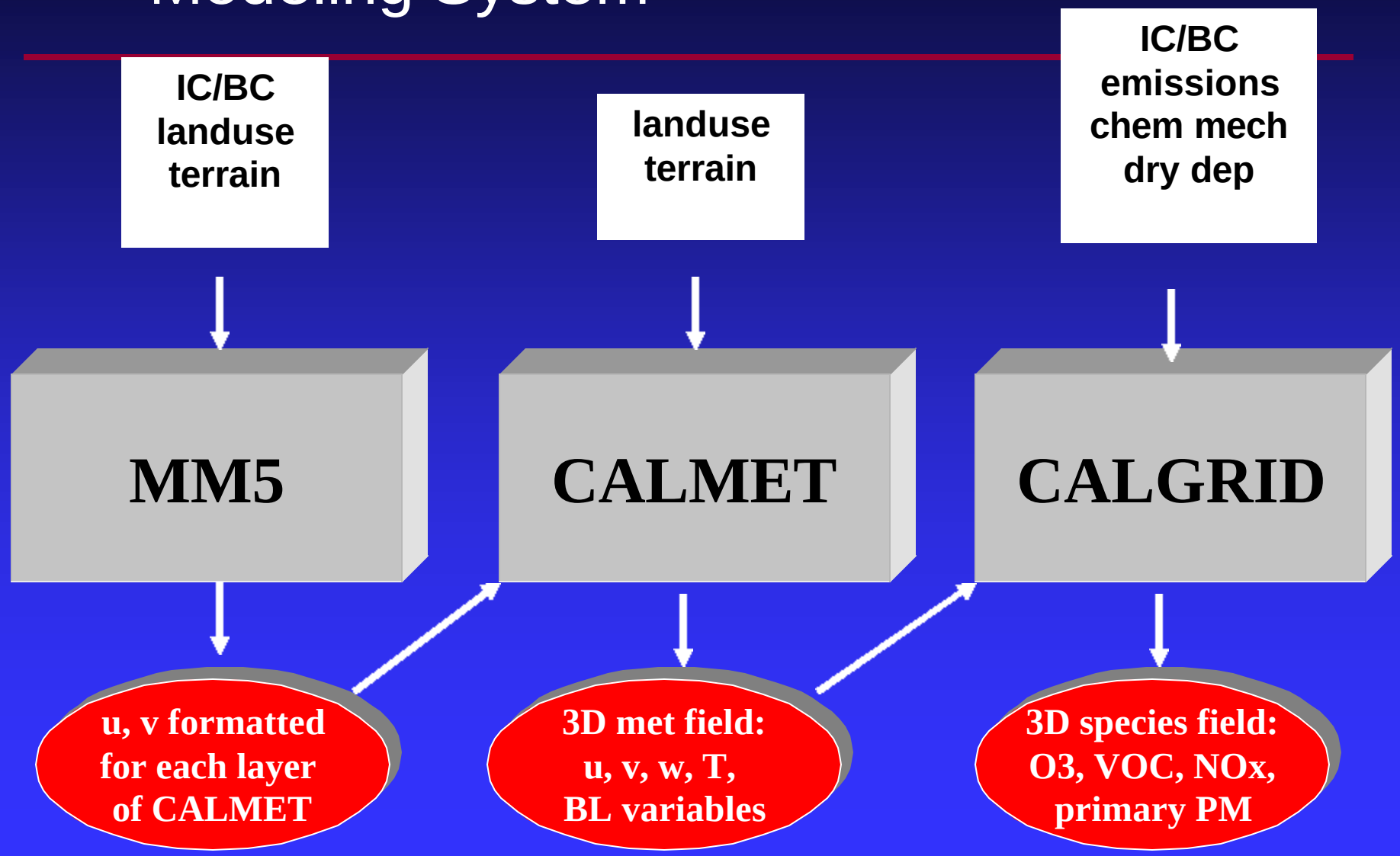
Cliff Mass, Mark Albright and Dan Jaffe, UW

Len Barrie, Rich Barchet, Jerome Fast

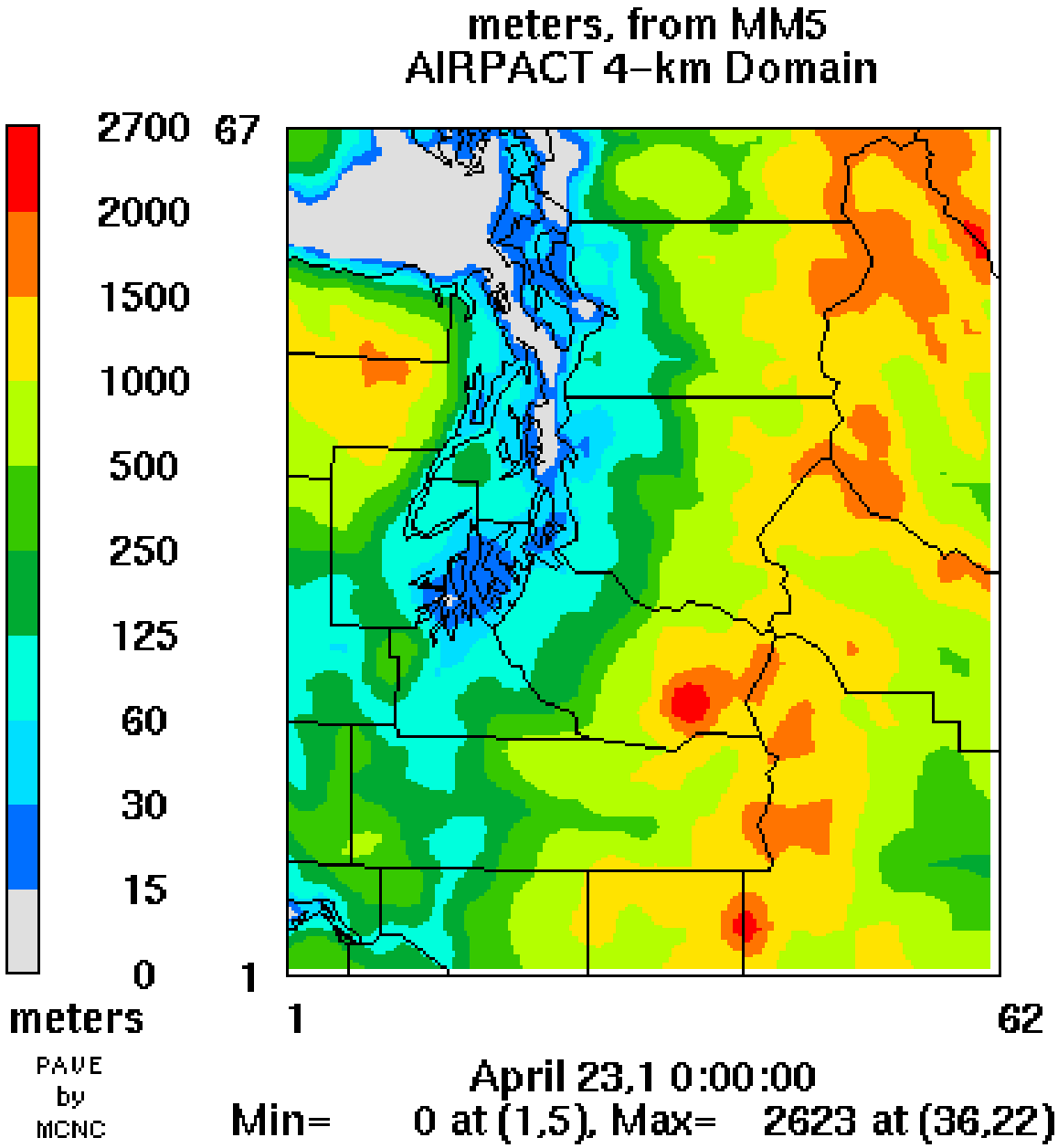
and Tom Jobson, PNNL

www.airpact.wsu.edu

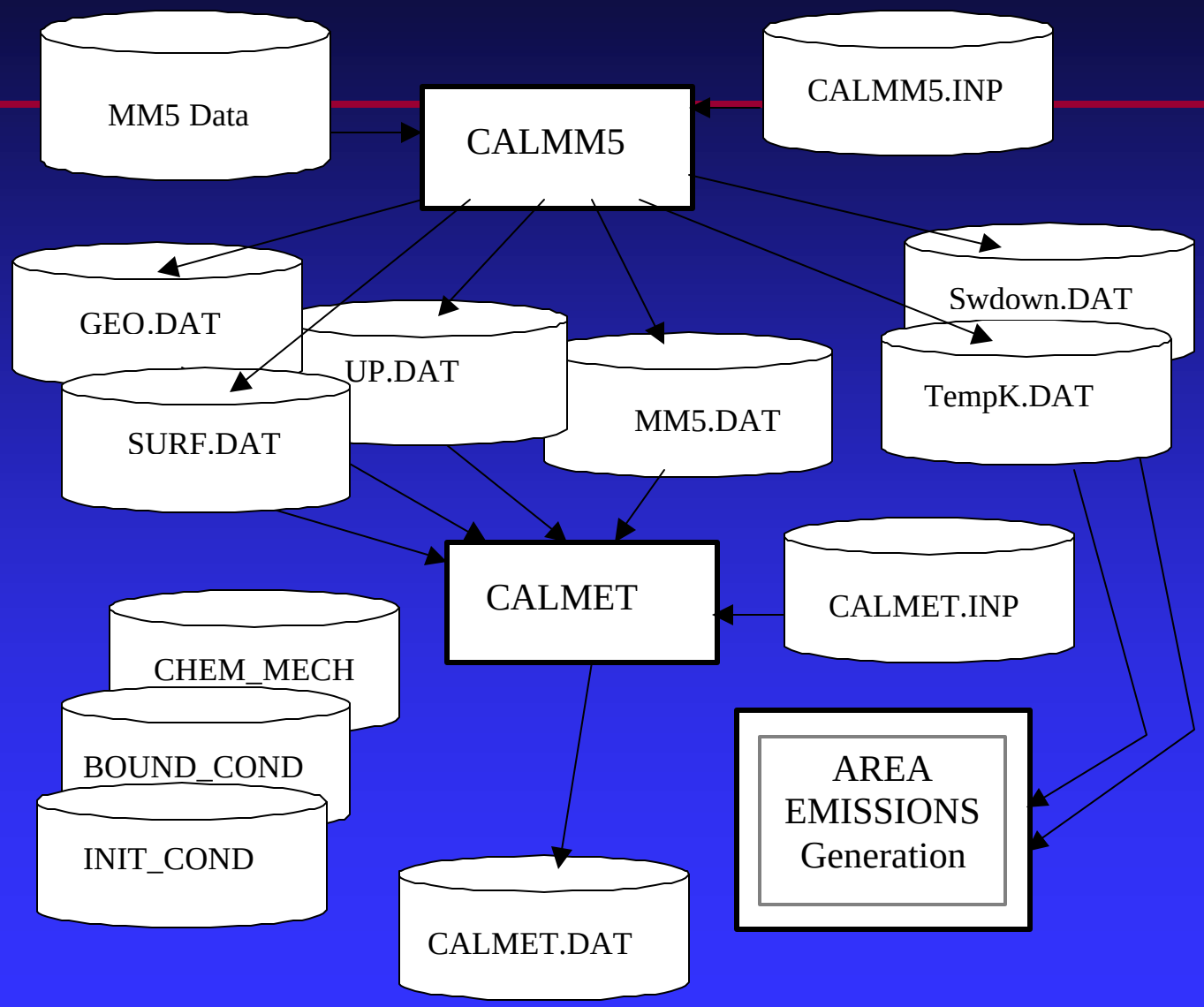
AIRPACT Regional Air Quality Modeling System

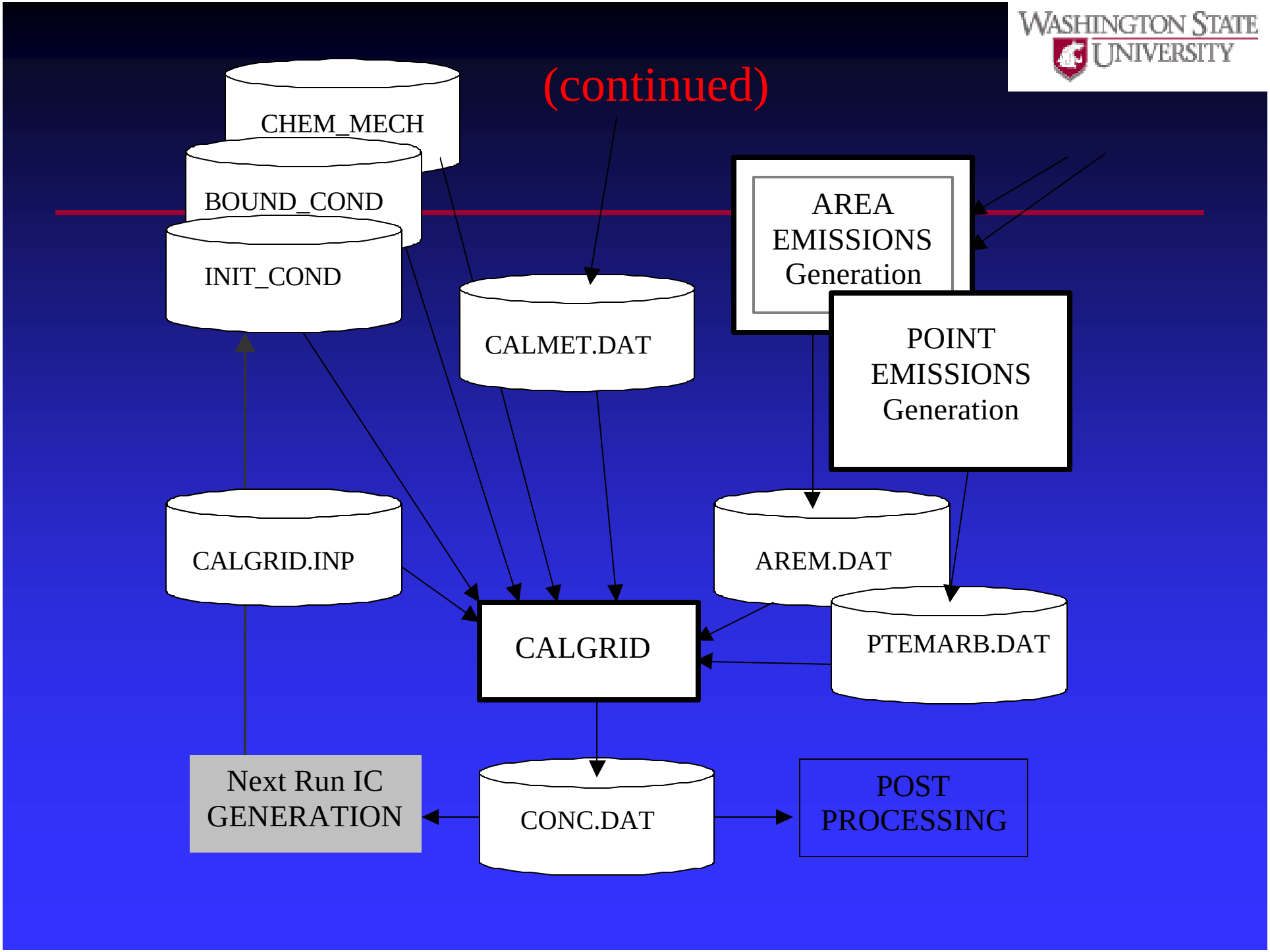


CALMET ELEVATIONS

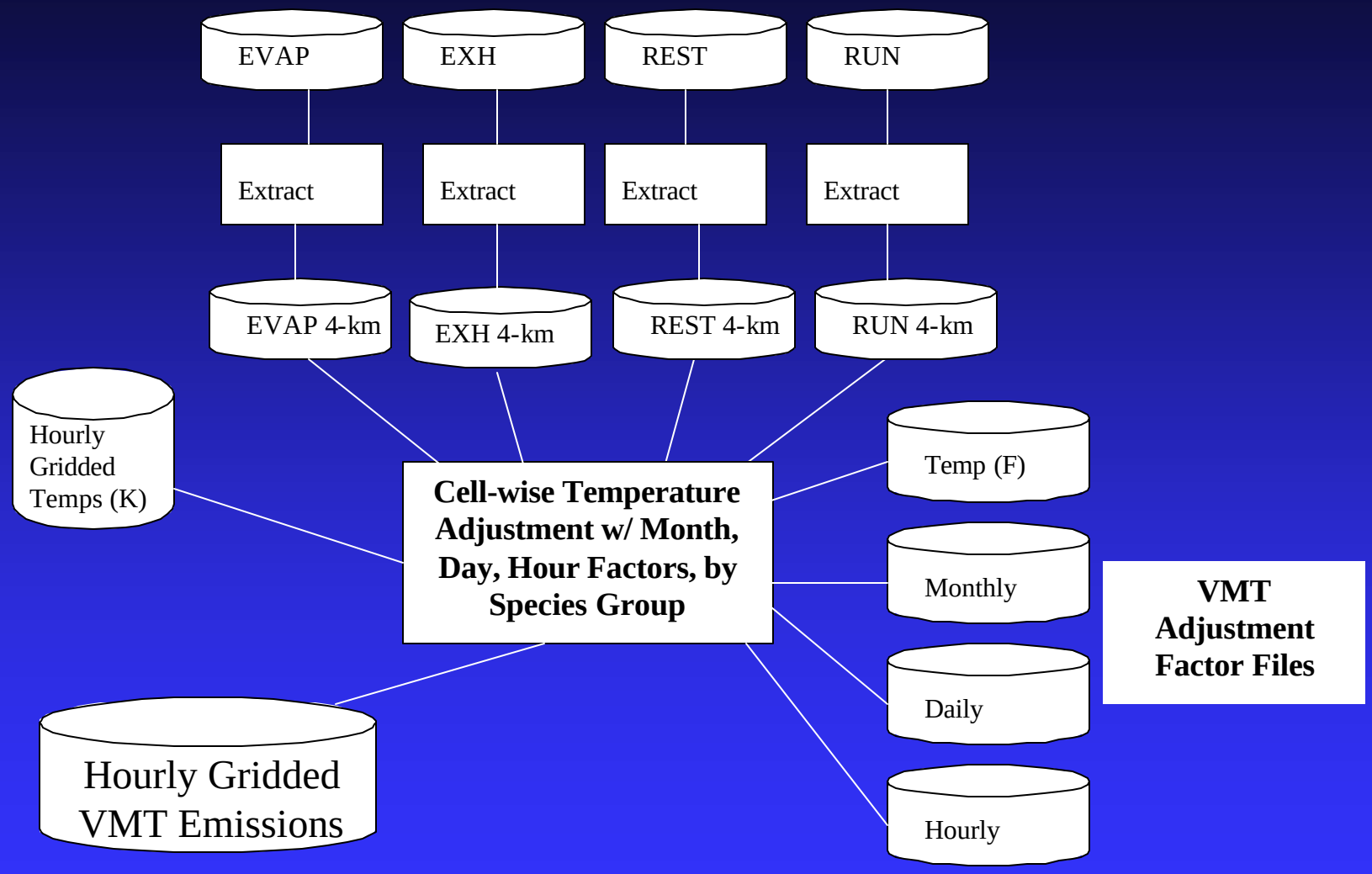


AIRPACT Air Quality Simulation System

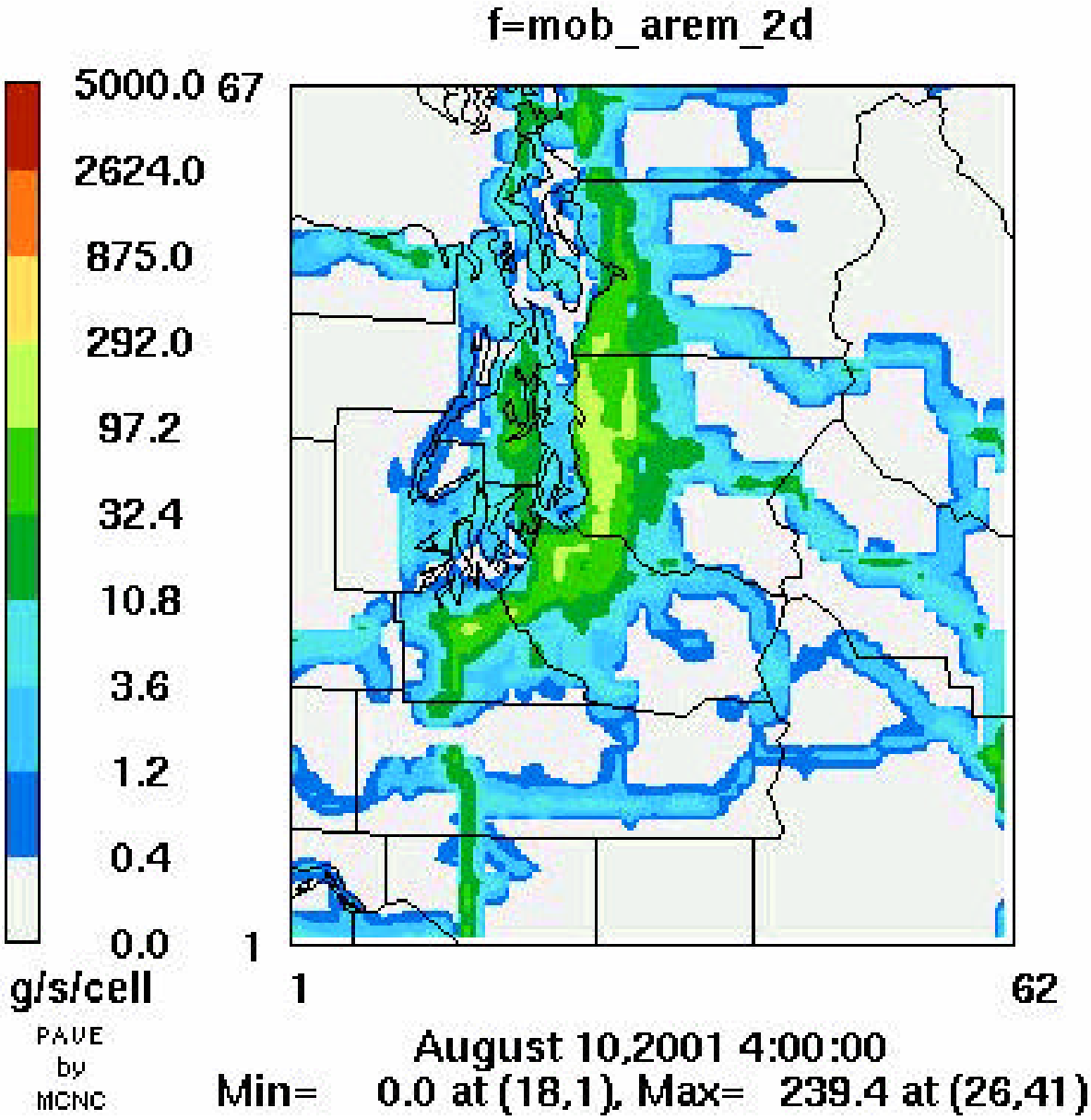



(continued)
CHEM_MECH
BOUND_COND
INIT_COND
CALMET.DAT
AREA EMISSIONS Generation
POINT EMISSIONS Generation
CALGRID.INP
AREM.DAT
PTEMARB.DAT
CALGRID
Next Run IC GENERATION
CONC.DAT
POST PROCESSING

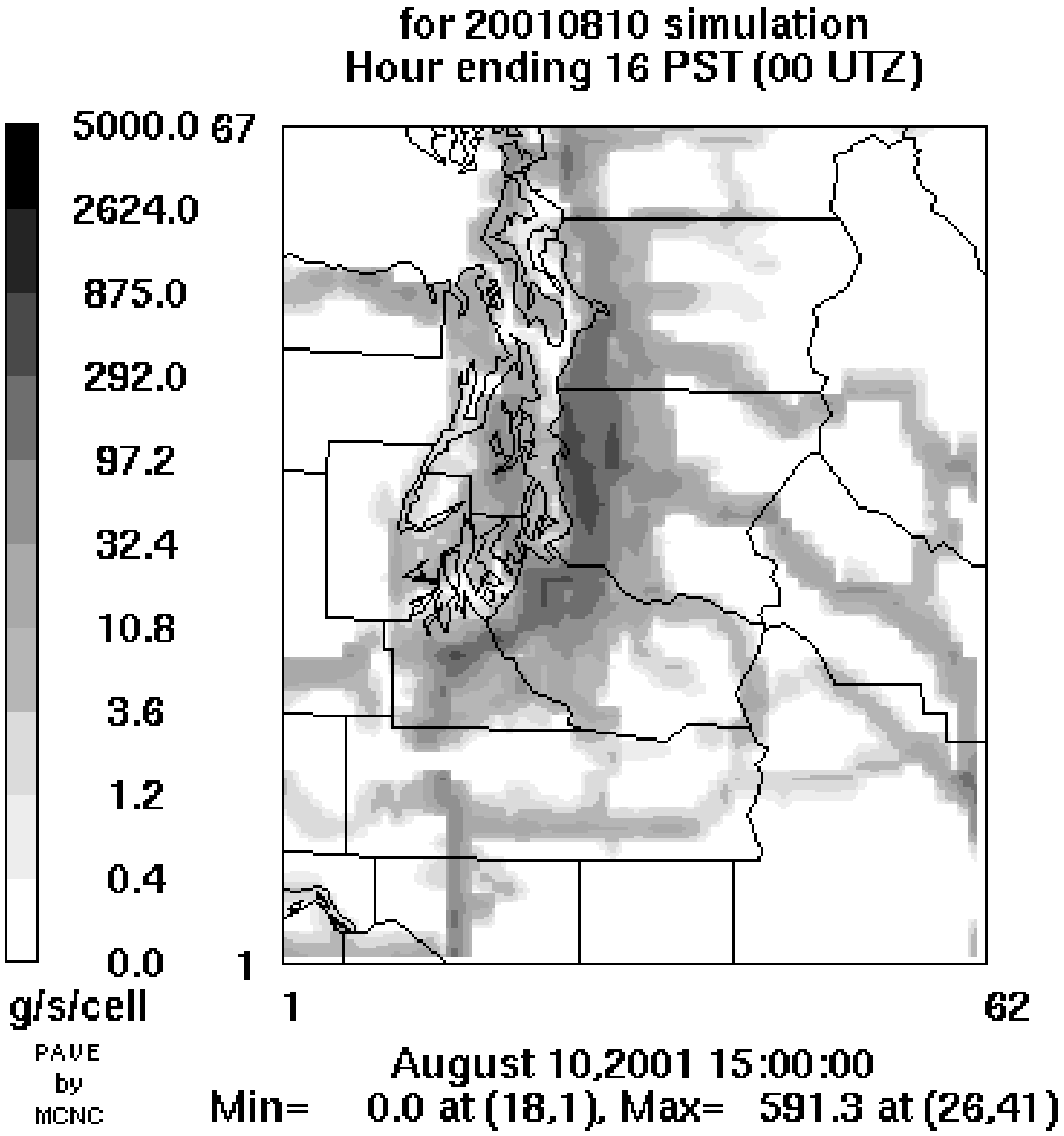
Mobile Emissions Generation w/ MM5 Temperatures



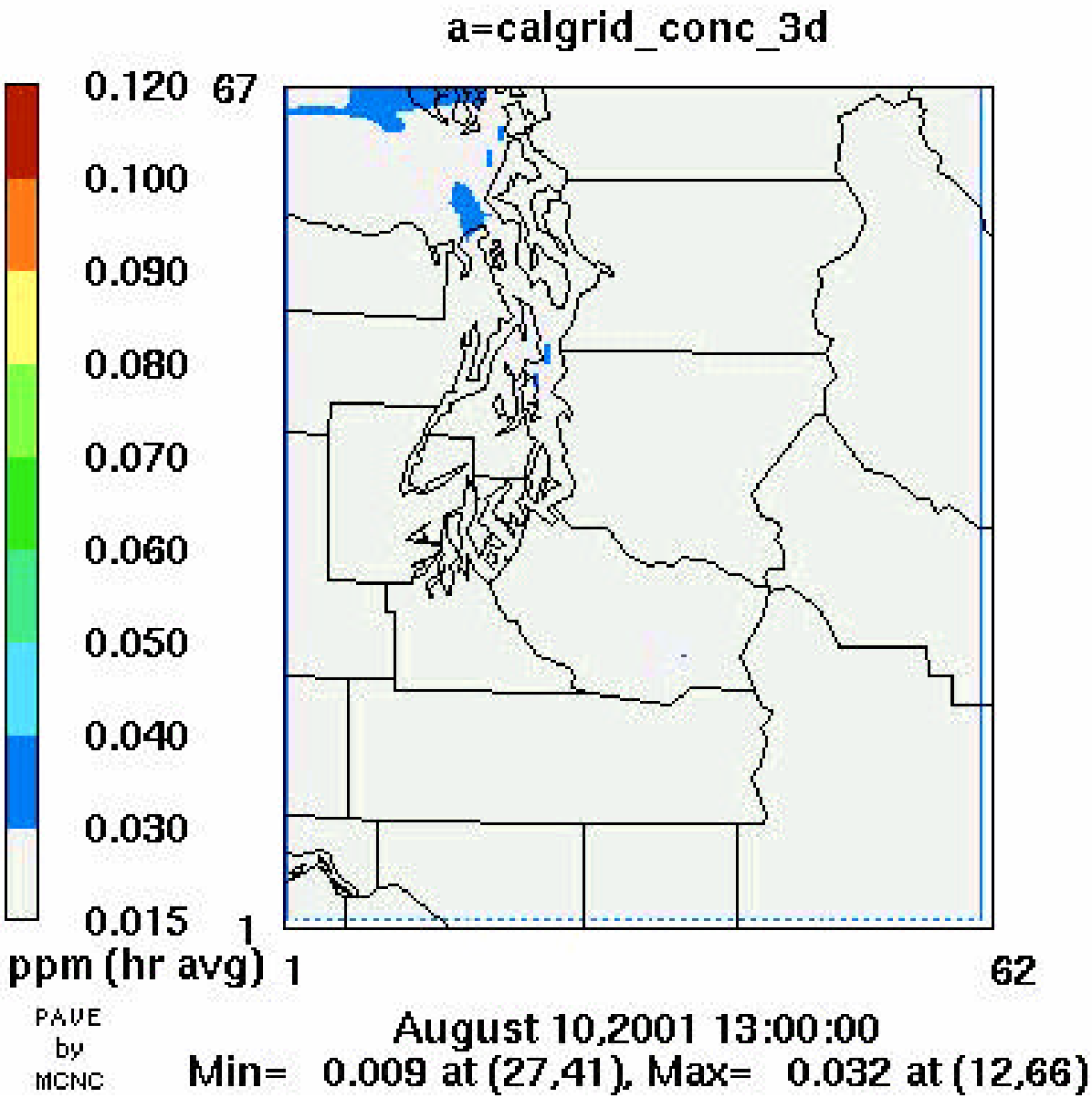
Layer 1 COf


f=mob_arem_2d
5000.0
2624.0
875.0
292.0
97.2
32.4
10.8
3.6
1.2
0.4
0.0
g/s/cell
67
1
1
62
PAVE
by
MCNC
August 10,2001 4:00:00
Min= 0.0 at (18,1), Max= 239.4 at (26,41)

Mobile CO Emissions



Layer 1 O3a



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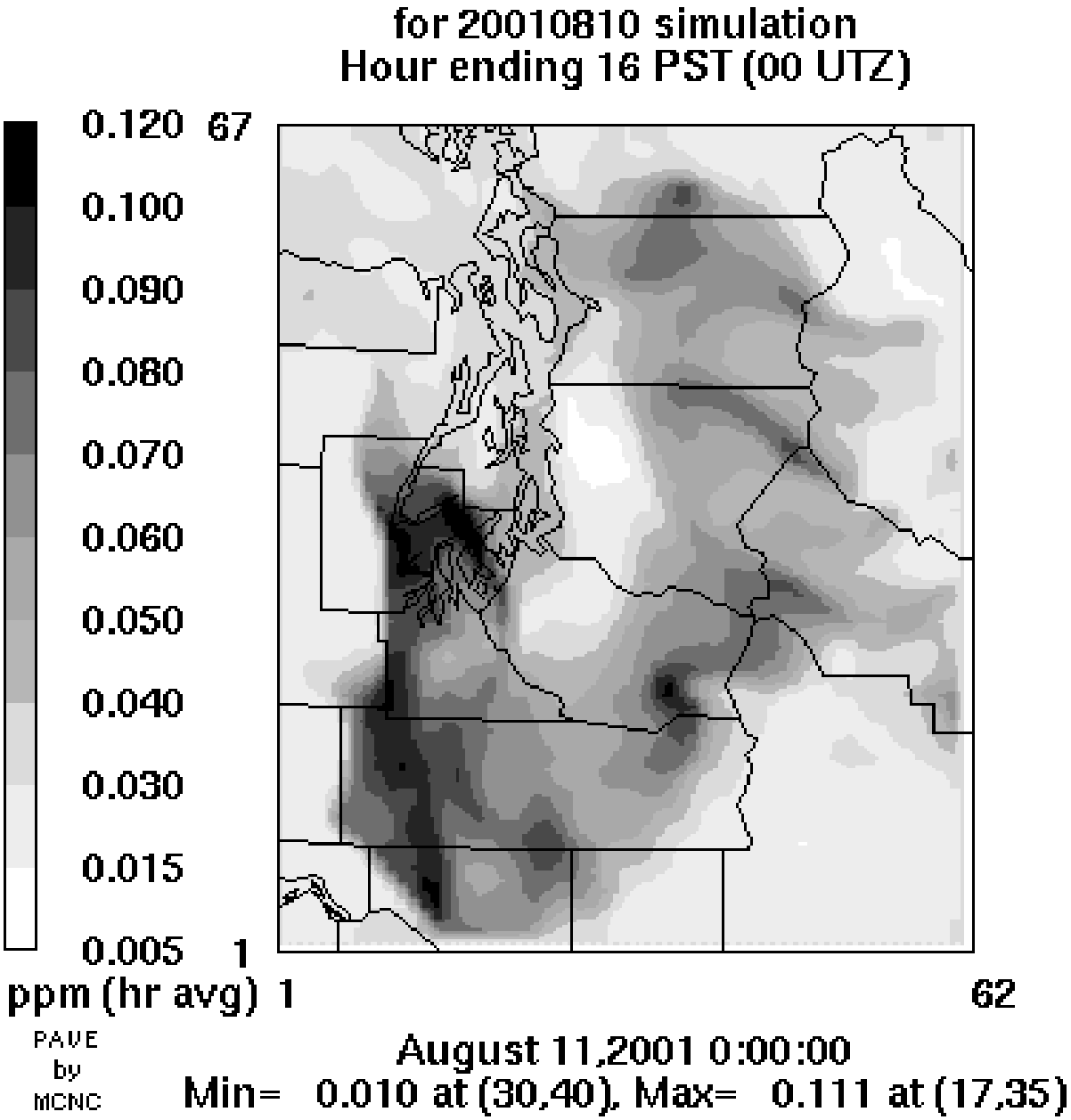
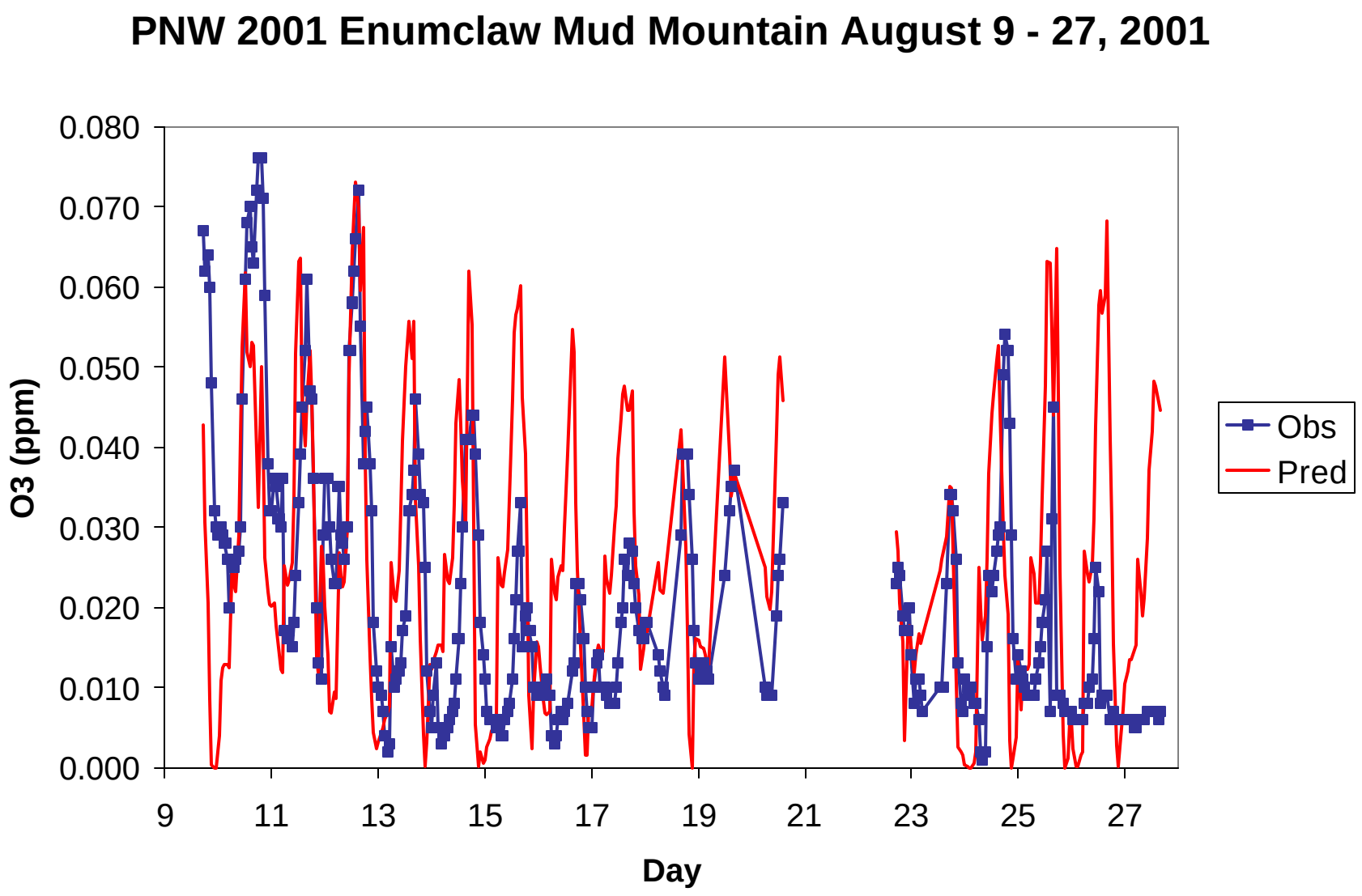
CALGRID O3

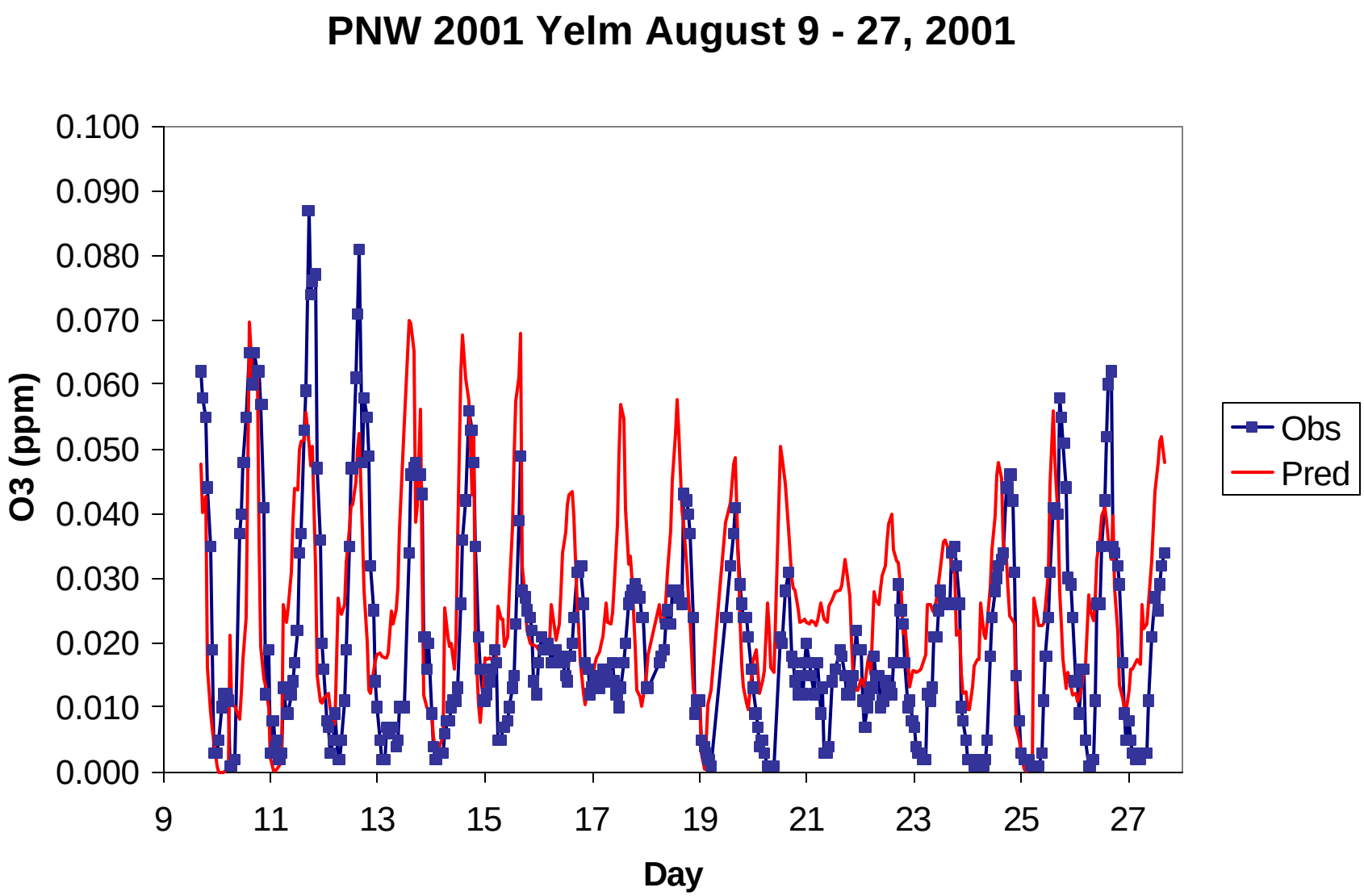


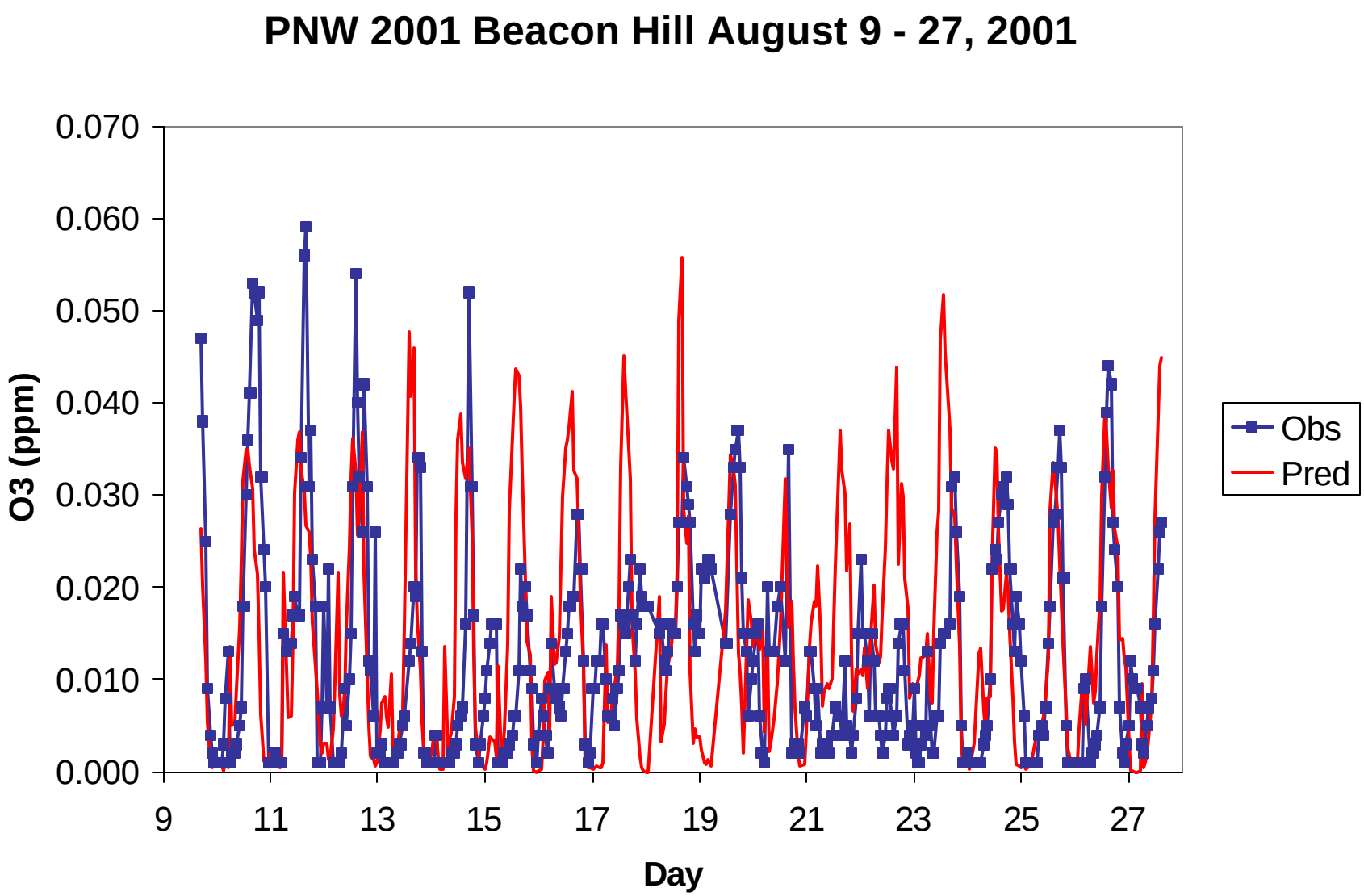
http://airpact.ce.wsu.edu

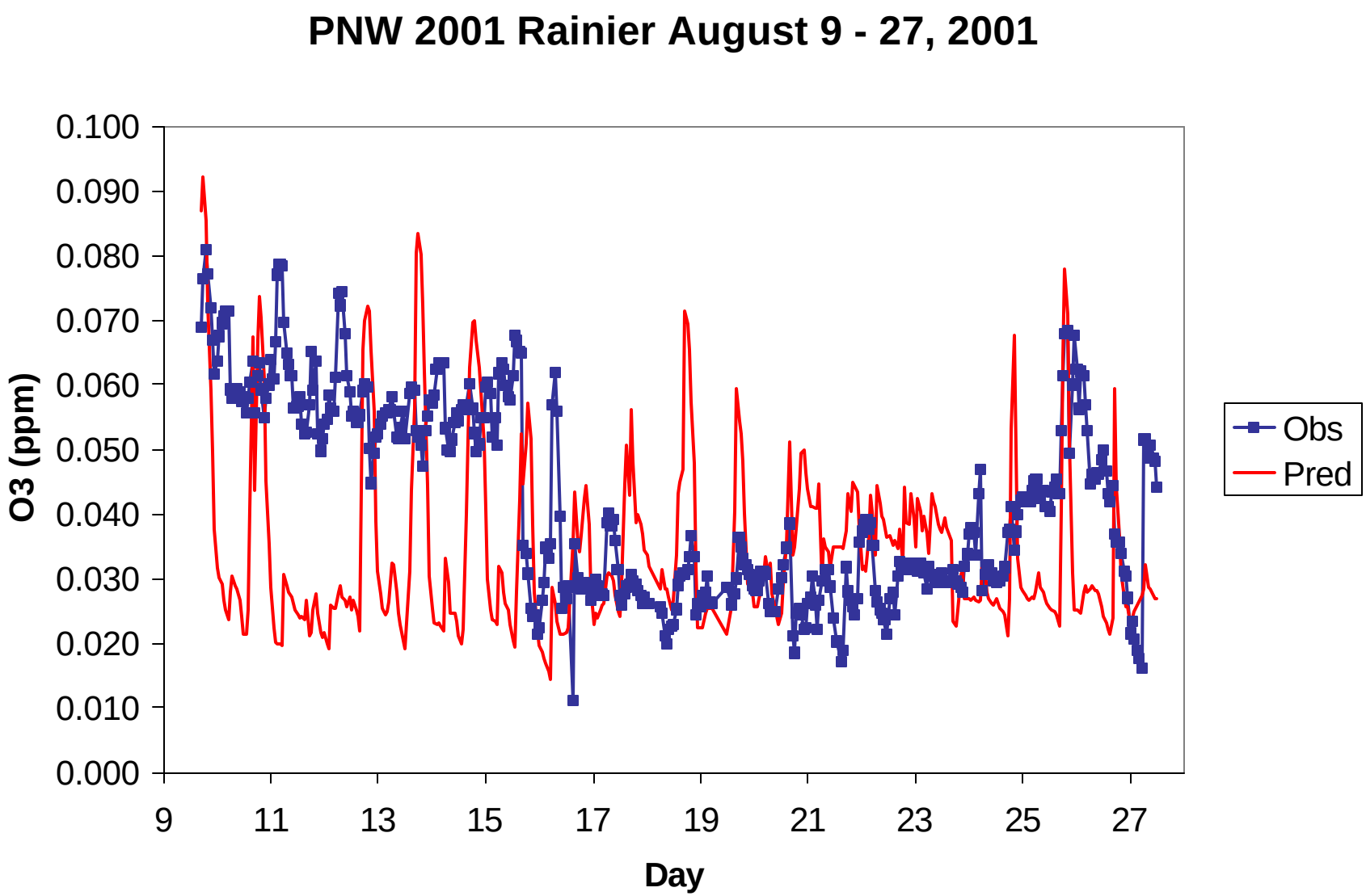
PNW2001 AIRPACT Operations

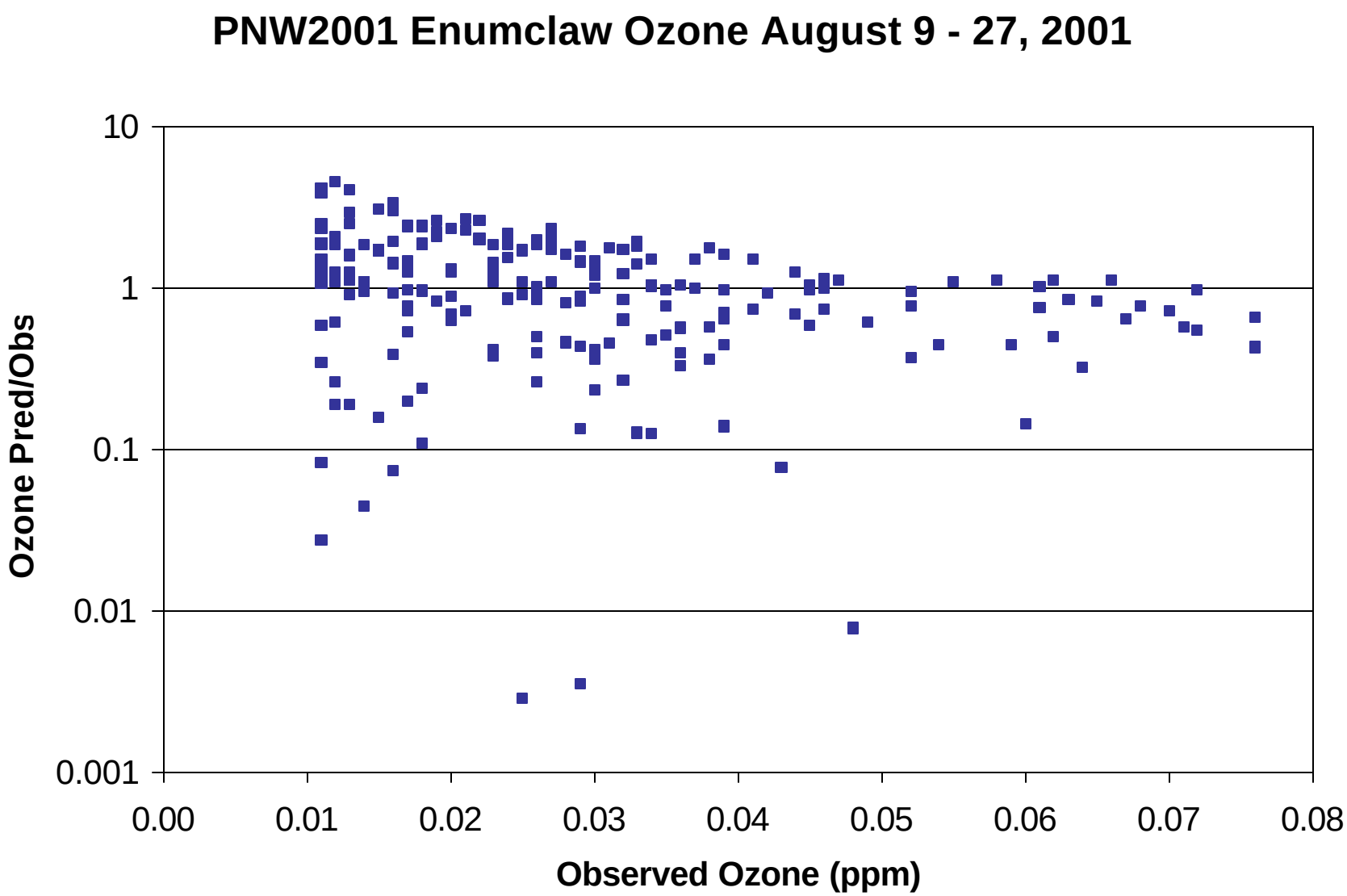
- Routine Operations
  - Starts after the MM5 4-km run from 00Z initialization.
  - Uses forecast hours 12 through 36 from MM5 run.
  - 24-hour CALGRID run on DEC/Alpha (one processor) runs in 67 min CPU time.
  - Currently finishes by ~ 3 AM PST.
  - Verification using Ecology data runs a day later.
- PNW 2001
  - Operated continuously during August field period.
  - Automated delivery of forecast results to PNNL.
  - Archived forecast results and Ecology observations from field program period

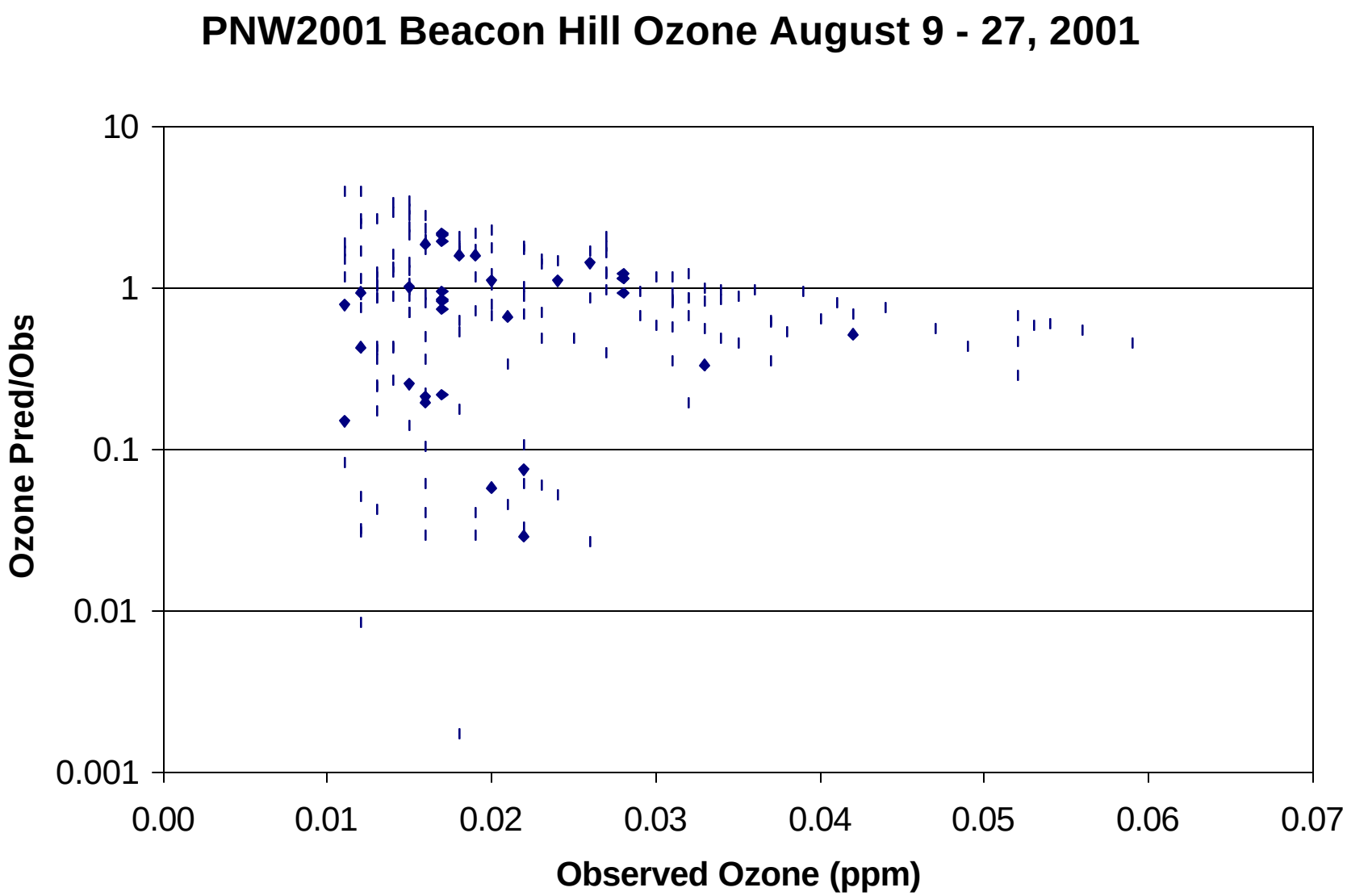

PNW 2001 Enumclaw Mud Mountain August 9 - 27, 2001
O3 (ppm)
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
9
11
13
15
17
19
21
23
25
27
Day
Obs
Pred

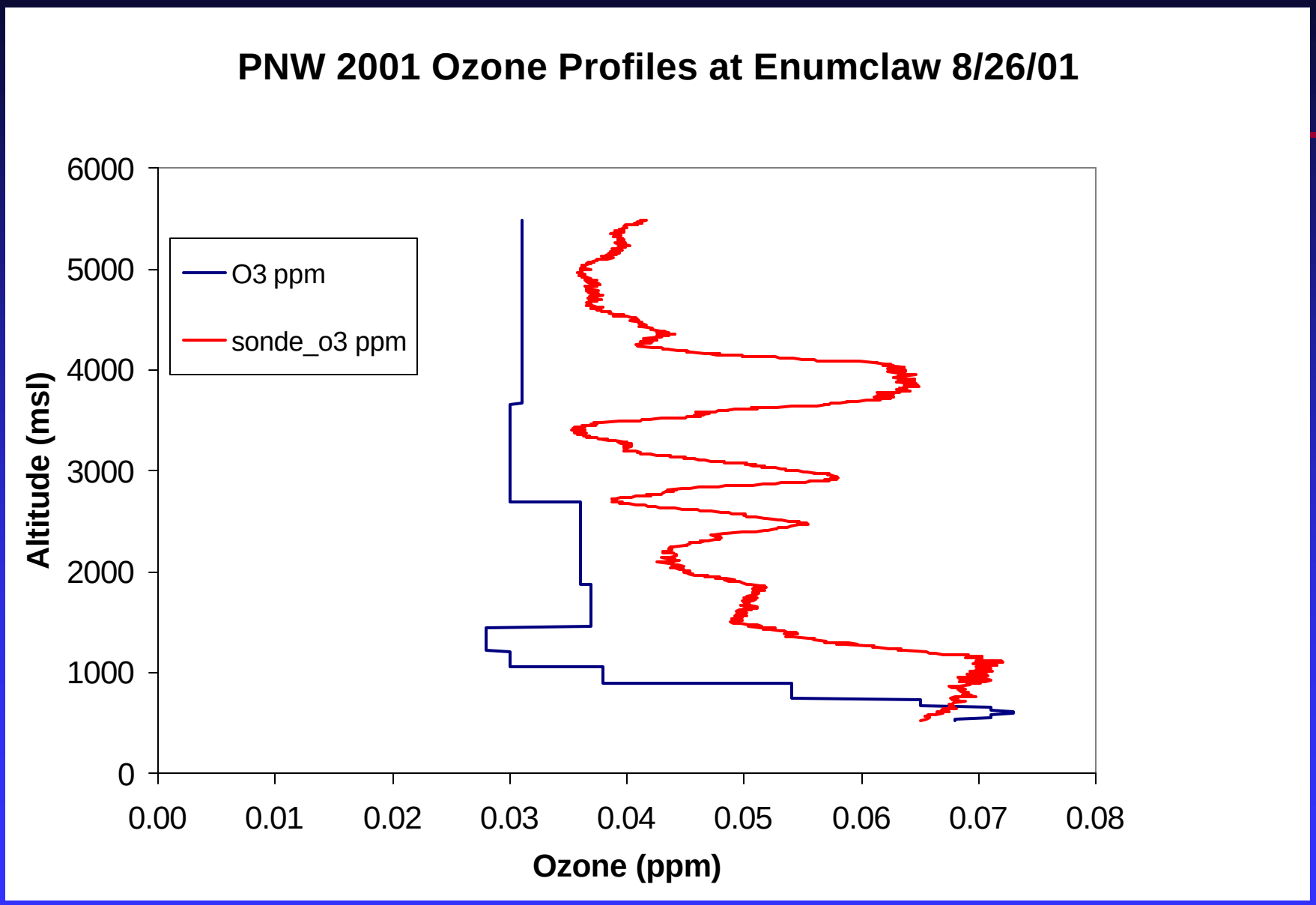

PNW 2001 Yelm August 9 - 27, 2001
O3 (ppm)
0.100
0.090
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
9
11
13
15
17
19
21
23
25
27
Day
Obs
Pred

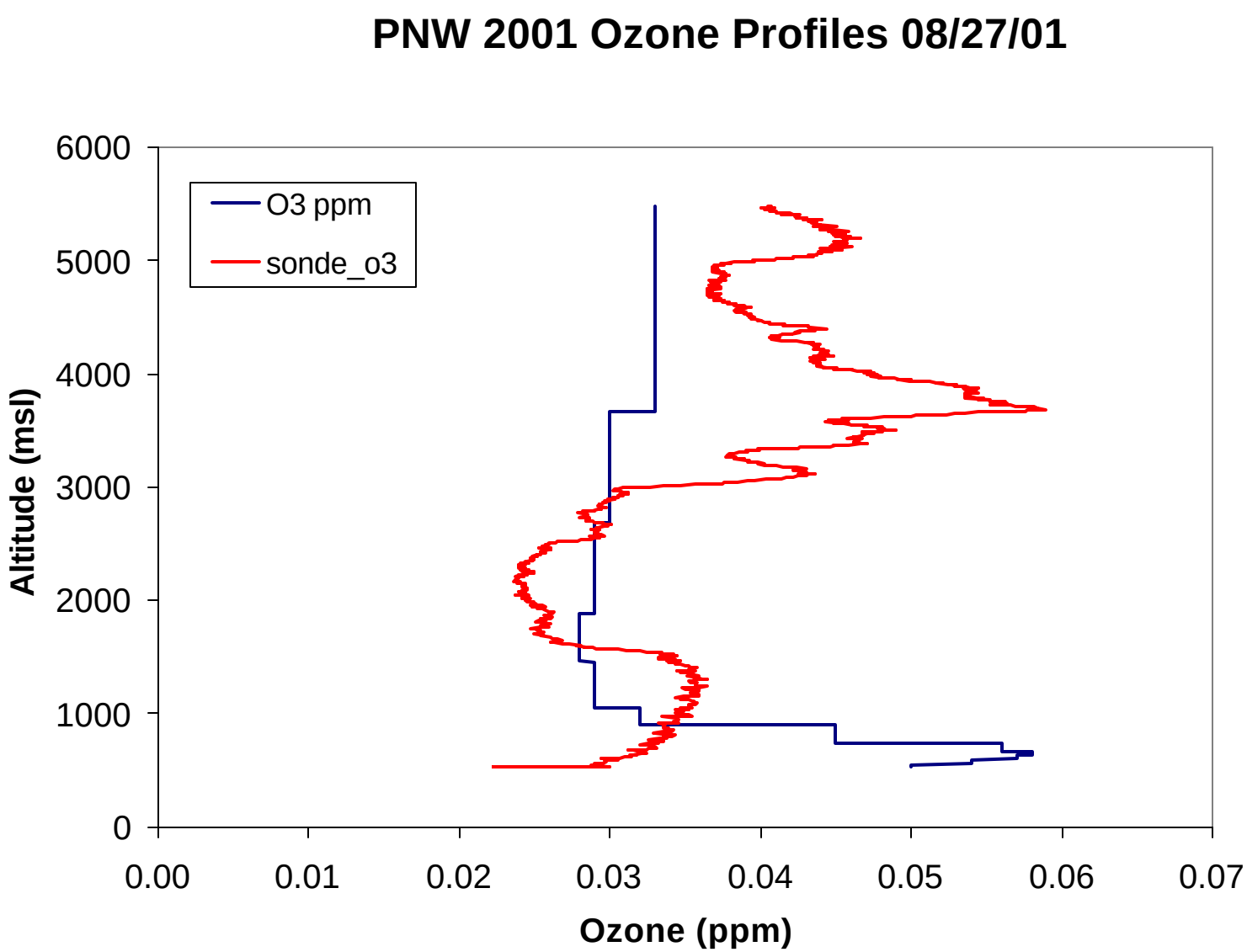

PNW 2001 Beacon Hill August 9 - 27, 2001
O3 (ppm)
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
9
11
13
15
17
19
21
23
25
27
Day
Obs
Pred

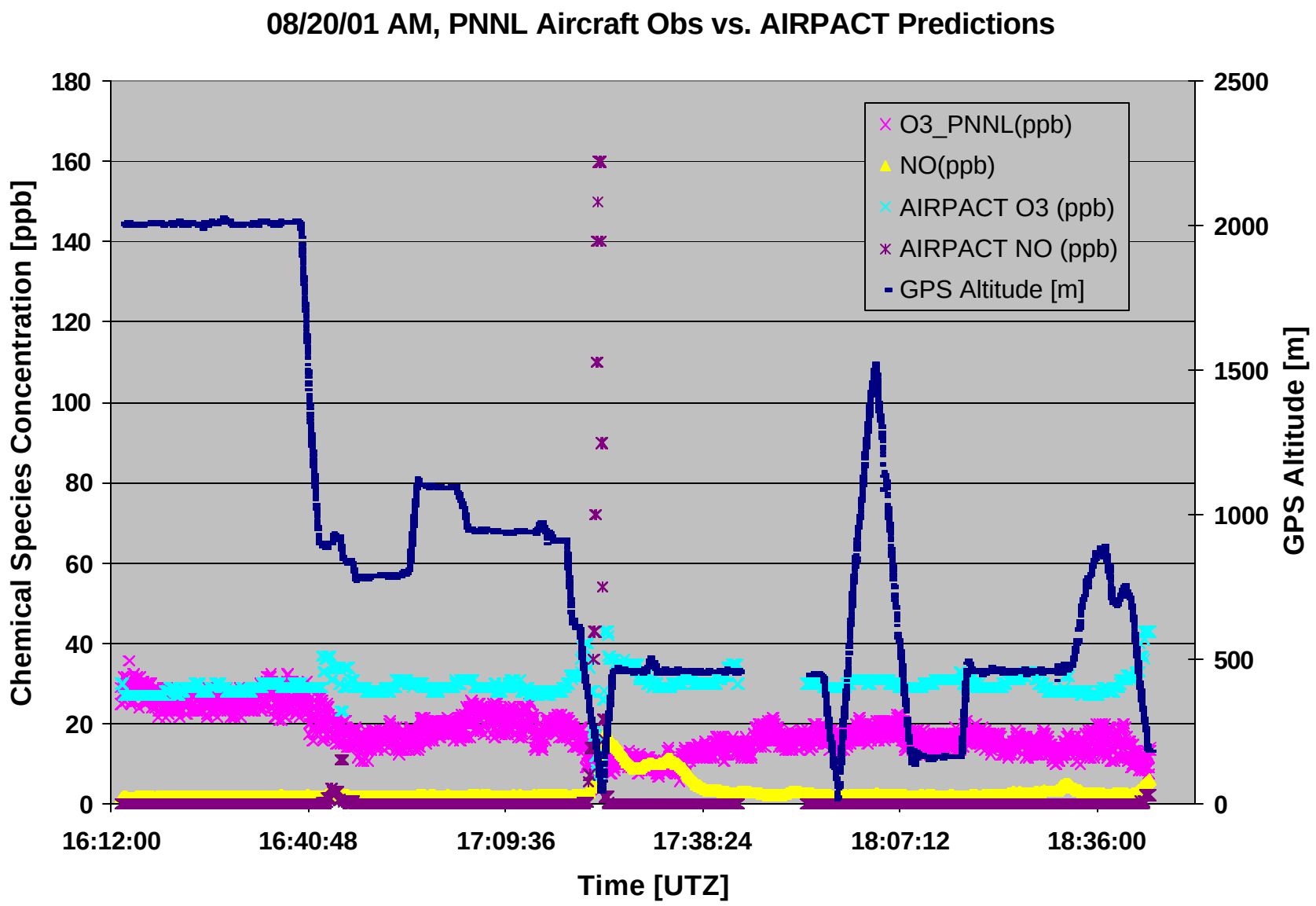

PNW 2001 Rainier August 9 - 27, 2001
O3 (ppm)
0.100
0.090
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
9
11
13
15
17
19
21
23
25
27
Day
Obs
Pred

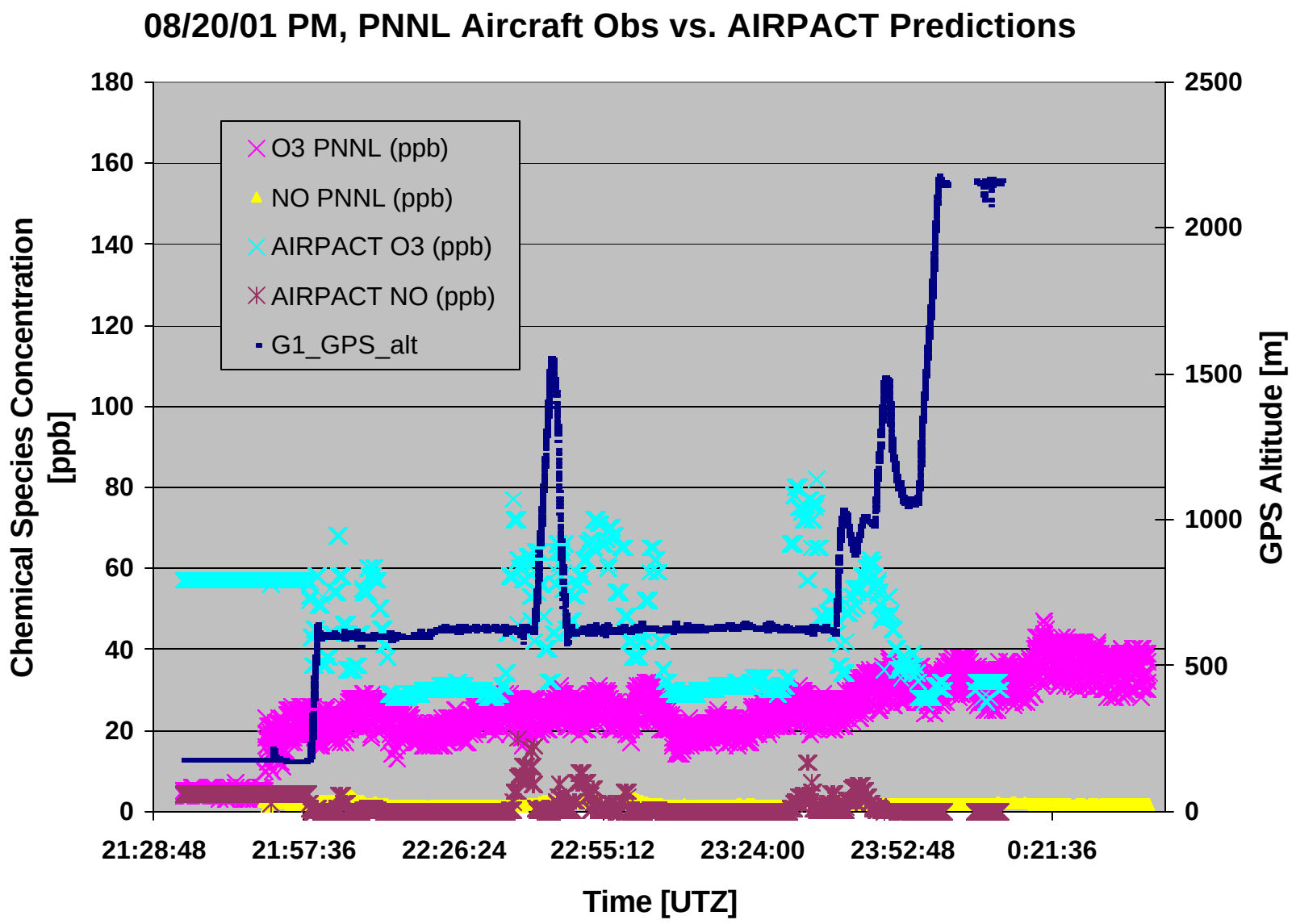

PNW2001 Enumclaw Ozone August 9 - 27, 2001
Ozone Pred/Obs
10
1
0.1
0.01
0.001
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
Observed Ozone (ppm)


PNW2001 Beacon Hill Ozone August 9 - 27, 2001
Ozone Pred/Obs
10
1
0.1
0.01
0.001
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
Observed Ozone (ppm)

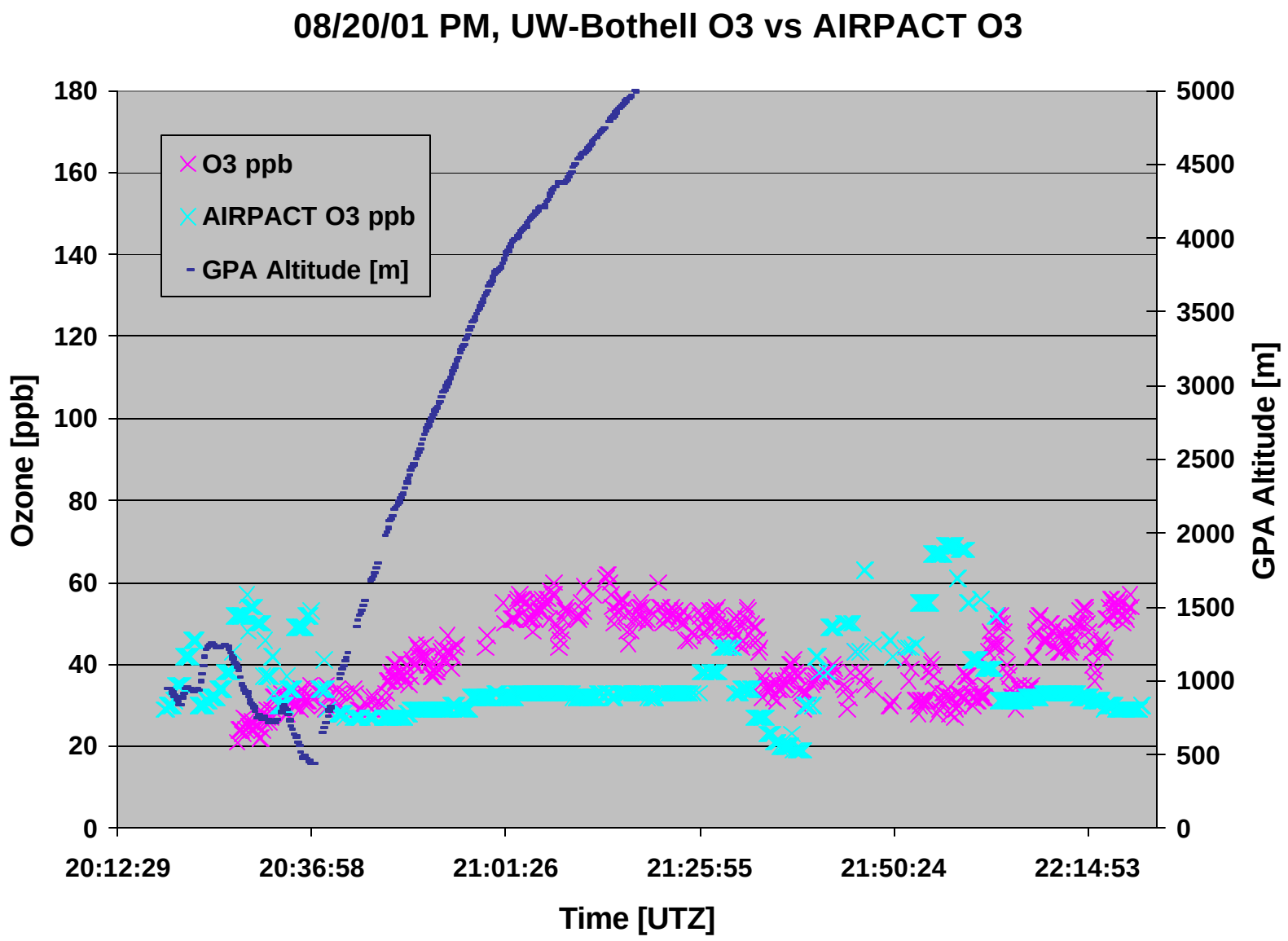

PNW 2001 Ozone Profiles at Enumclaw 8/26/01
O3 ppm
sonde_o3 ppm
Altitude (msl)
6000
5000
4000
3000
2000
1000
0
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
Ozone (ppm)


PNW 2001 Ozone Profiles 08/27/01
O3 ppm
sonde_o3
Altitude (msl)
6000
5000
4000
3000
2000
1000
0
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
Ozone (ppm)


08/20/01 AM, PNNL Aircraft Obs vs. AIRPACT Predictions
Chemical Species Concentration [ppb]
GPS Altitude [m]
Time [UTZ]
O3_PNNL(ppb)
NO(ppb)
AIRPACT O3 (ppb)
AIRPACT NO (ppb)
GPS Altitude [m]
180
160
140
120
100
80
60
40
20
0
2500
2000
1500
1000
500
0
16:12:00
16:40:48
17:09:36
17:38:24
18:07:12
18:36:00



08/20/01 PM, PNNL Aircraft Obs vs. AIRPACT Predictions
O3 PNNL (ppb)
NO PNNL (ppb)
AIRPACT O3 (ppb)
AIRPACT NO (ppb)
G1_GPS_alt
Chemical Species Concentration [ppb]
GPS Altitude [m]
Time [UTZ]
180
160
140
120
100
80
60
40
20
0
2500
2000
1500
1000
500
0
21:28:48
21:57:36
22:26:24
22:55:12
23:24:00
23:52:48
0:21:36


08/20/01 PM, UW-Bothell O3 vs AIRPACT O3
O3 ppb
AIRPACT O3 ppb
GPA Altitude [m]
Ozone [ppb]
GPA Altitude [m]
Time [UTZ]
0
20
40
60
80
100
120
140
160
180
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
20:12:29
20:36:58
21:01:26
21:25:55
21:50:24
22:14:53

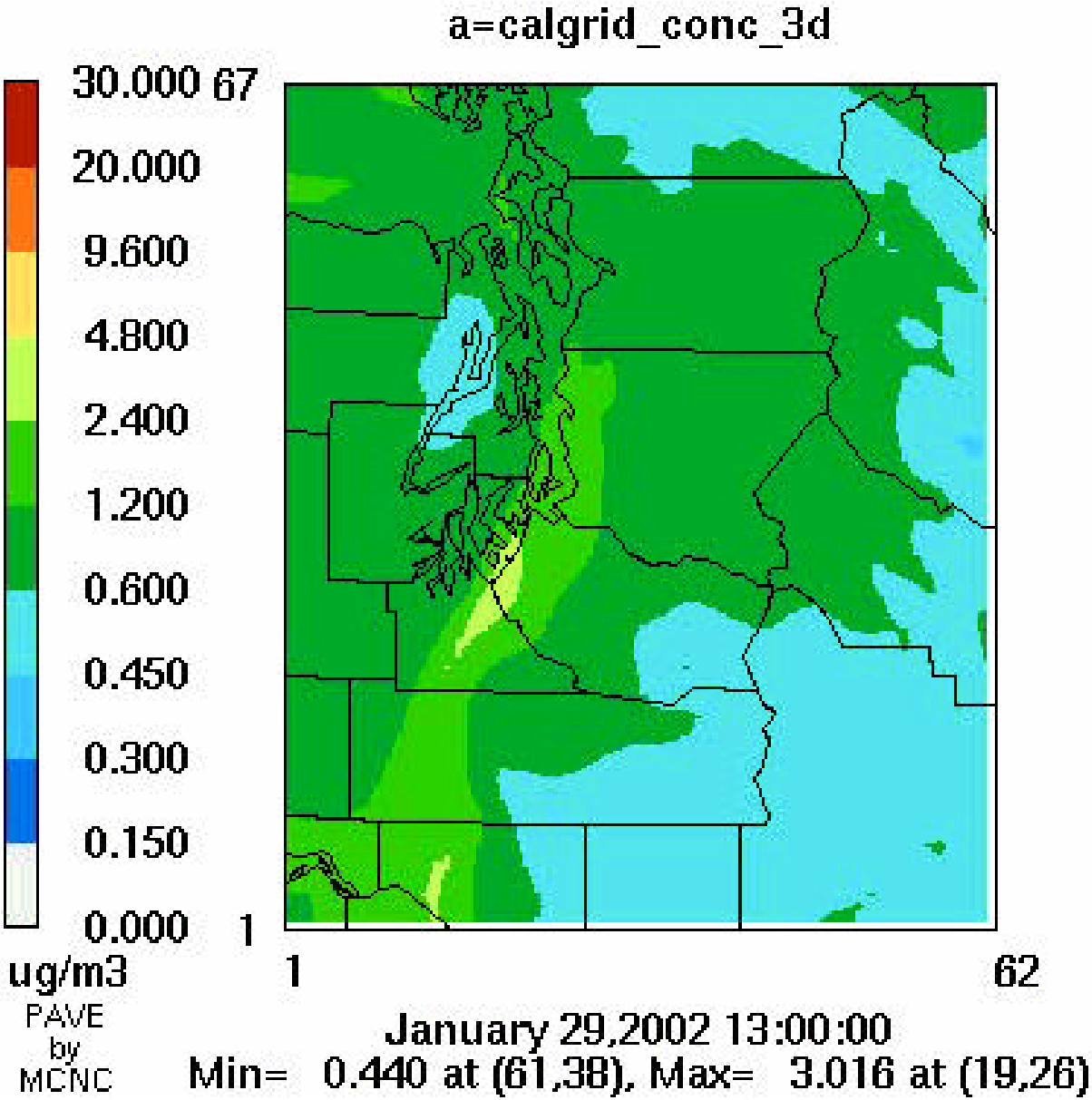
What's Next for PNW2001?

- Detailed flight day(s) analysis
  - Winds and Trajectories
  - Boundary Layer behavior
  - Flight path + Ground obs >> 3-d conceptual picture
  - 3-d Visualization of CALGRID model output?
  - Chemistry evaluation using NOy and individual VOC information
- Emissions evaluation vs observations
  - Compound ratios: observed & predicted
- CMAQ Model Simulations?
  - Selected period during PNW2001
- Combination of data with Canadian PAC2001

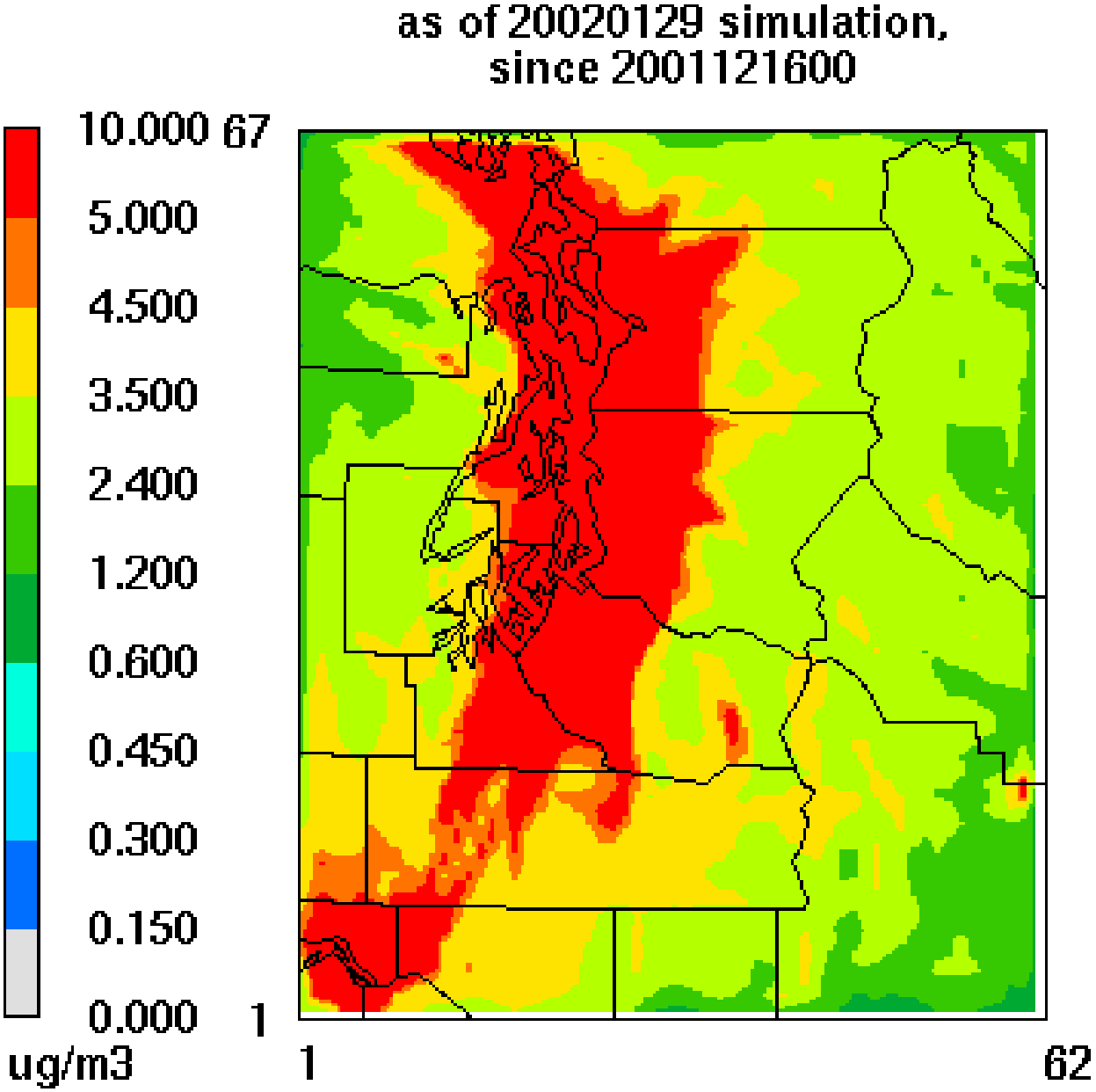
AIRPACT Diesel Particulate Modeling

- No secondary particulate chemistry or physics.
- Particulate conserved as a tracer.
- Initial Conditions are ‘Daisy-chained’ from previous model run.
- Statistics being accumulated (3 months).
- *Verification using PM2.5 being coded.*
- Particulate diesel emissions from WA Dept. of Ecology for mobile and area sources.

Layer 1 PARTa

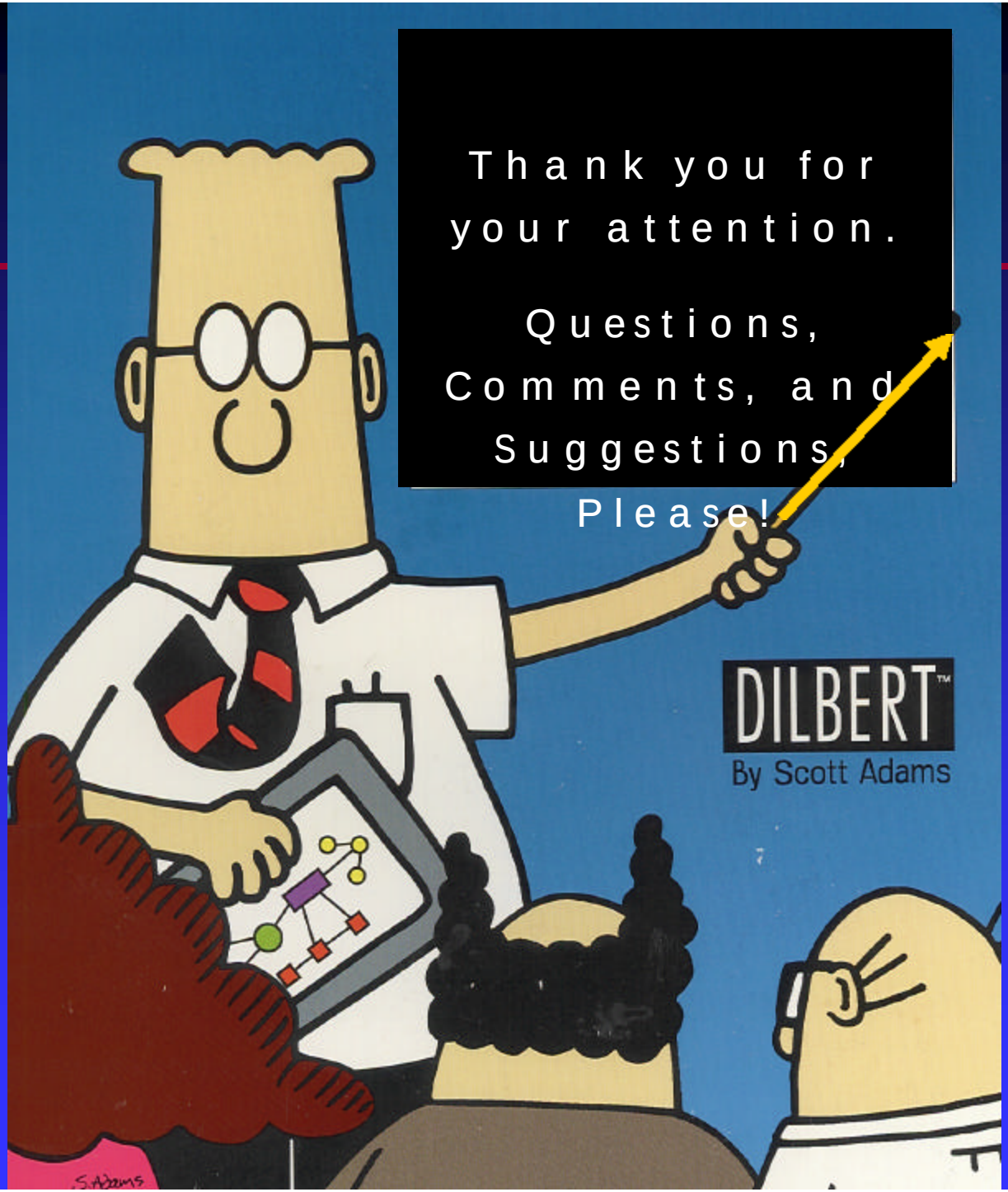


Maximum PART by cell



Acknowledgments

- Funding through EPA EMPACT program.
- Assistance from Staff at UW.
- Support from Puget Sound Clean Air Agency.
- Benefited from codes/assistance by:
  - Mike Barna (now at CIRA).
  - Guangfeng Jiang (now at PNL).
  - Susan O'Neill at WSU.
- Support for netCDF and PAVE use from MCNC Environmental Programs group.

Thank you for your attention.

Questions, Comments, and Suggestions, Please!