CMAQ Use Case

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CMAQ - what is it?

- **C**ommunity **M**ulti-scale **A**ir **Q**uality Model (2 daily cycles per day, 06Z and 12Z, up to 48 hour forecast)
- Quantities that are verified against observations
  - 1-hr average ozone every hour
  - 8-hr average ozone every hour
  - 1-hr average 2.5-micron Particulate Matter (PM2.5, or just PM) every hour
  - 24-hr daily max of 1-hr average ozone
  - 24-hr daily max of 8-hr average ozone
  - 24-hr daily max of 1-hr PM
  - 24-hr daily average of 1-hr PM

Model files

- In directory /gpfs/hps/nco/ops/com/aqm/prod/aqm.YYYYMMDD on Cray system
- Hourly ozone files containing 1-hr and 8-hr averages
  - aqm.t${cyc}z.awpozcon.f${fhr}.148.grib2
- Hourly PM files
  - aqm.t${cyc}z.pm25.f${fhr}.148.grib2
- Daily max ozone file (measured from 4Z to 4Z)
  - aqm.t${cyc}z.max_1hr_o3.148.grib2
  - aqm.t${cyc}z.max_8hr_o3.148.grib2
- Daily max PM file
  - aqm.t${cyc}z.max_1hr_pm25.148.grib2
- Daily average PM file
  - aqm.t${cyc}z.ave_24hr_pm25.148.grib2
- All the above available in bias-corrected versions as well
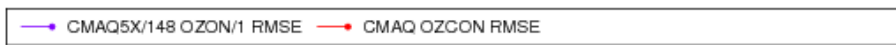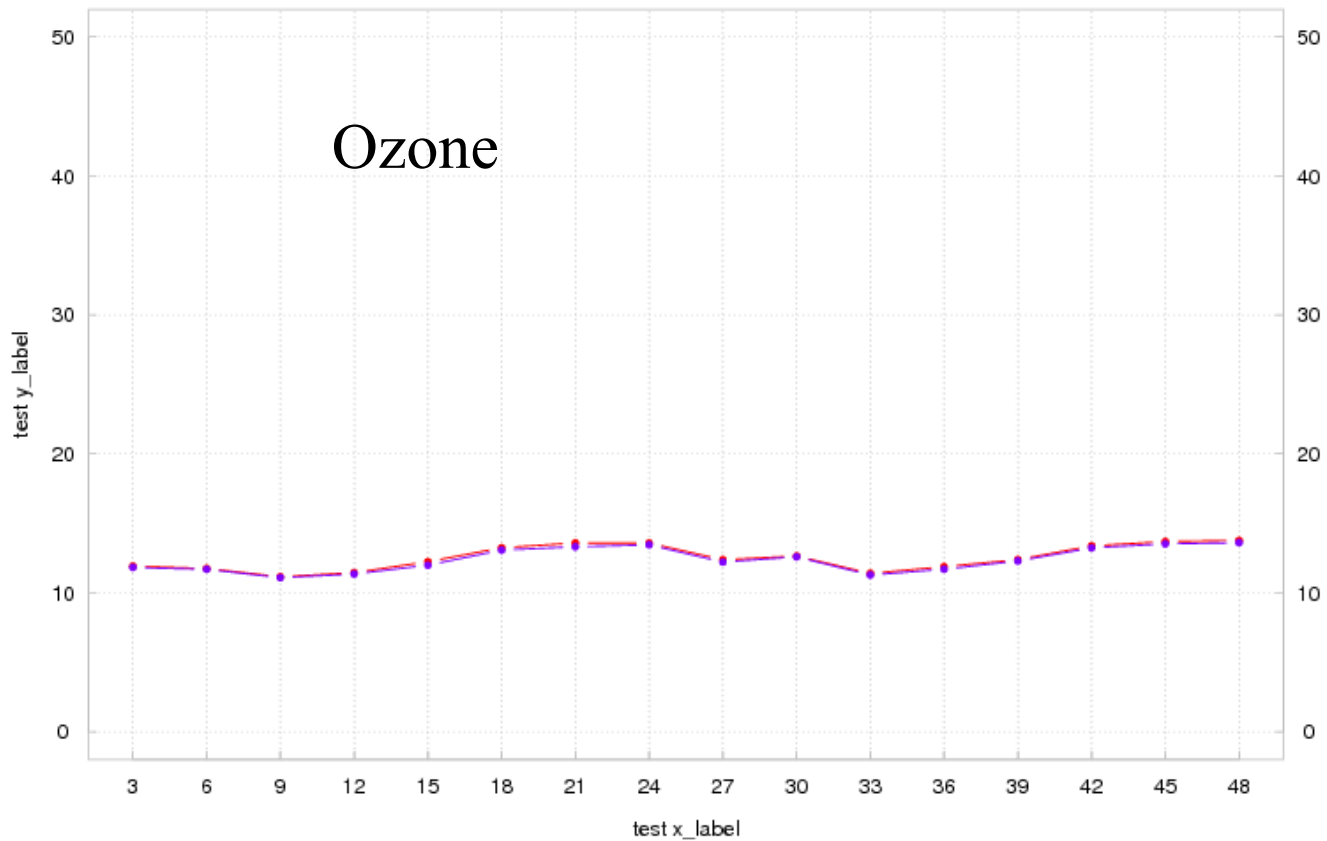
Observation BUFR files

- In the directory /com/hourly/prod/hourly.YYYYMMDD
- Ozone: aqm.12z.prepbufr.tm00
  - AIRNOW data type
- PM: aqm.12z.anowpm.pb.tm024
  - ANOWPM data type (though also from the AIRNOW data system)
- Different unit from the model file - a conversion factor is needed
- For 4Z to 4Z daily verification, two files are needed to gather the sum or average of values from a particular station
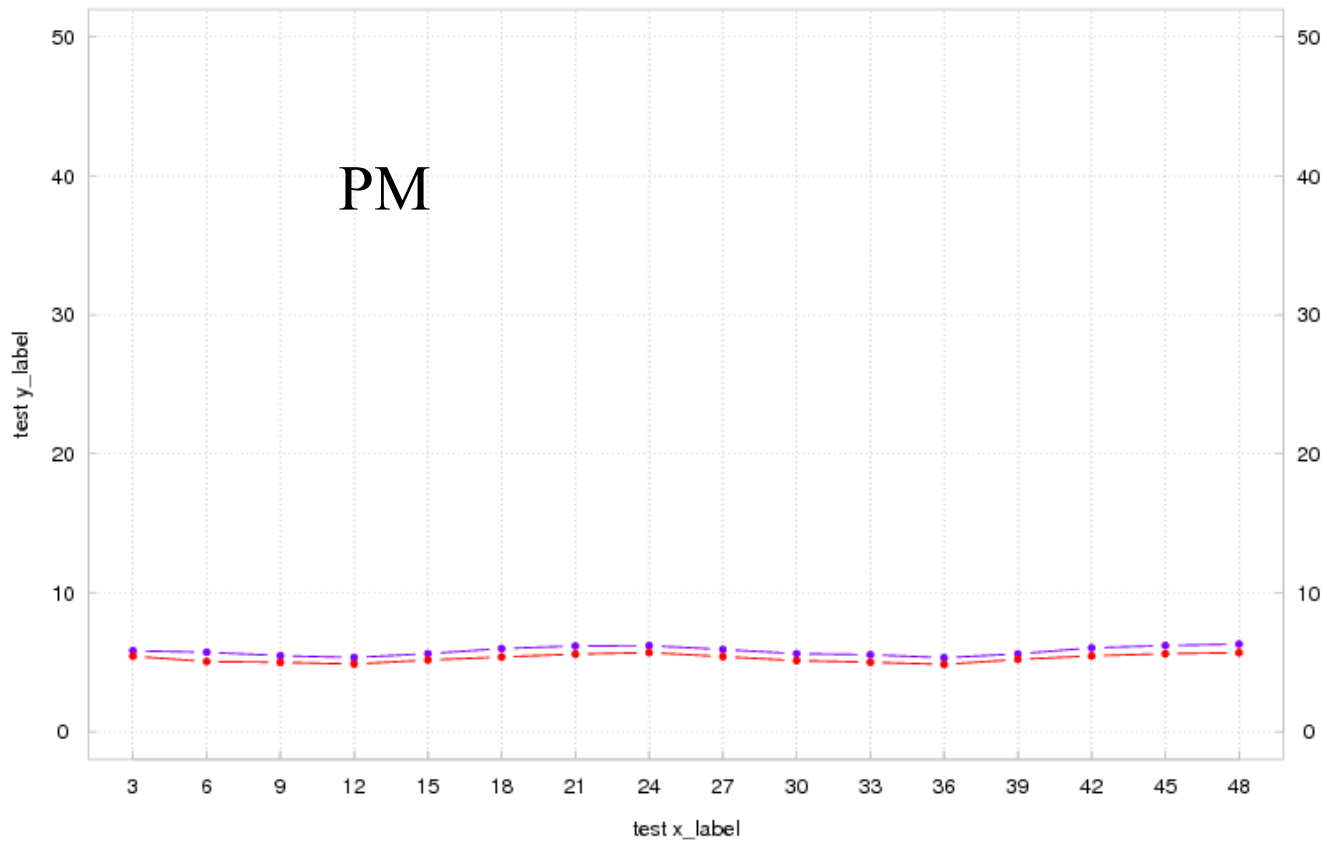
MET codes to be used

- bufr2nc
  - Modified to read in both the 1-hr and 8-hr ozone as well as the 1-hr PM
  - Reads in variable COPO (for ozone) or COPOPM (for PM)
  - Reads in 2 bufr files for the 4Z to 4Z daily verification
- point_stat
  - Reads in model grib files as well as the NetCDF version of bufr file from bufr2nc
  - Reads in OZCON (for ozone) or PMTF (for PM)
  - Factor of 10^9 multiplied to get a consistent unit with the observation
  - SL1L2 output written to .stat file to compare with VSDB (very similar results)
  - Reads in the daily model files as well

test title

Ozone

test y_label

test x_label

CMAQ5X/148 OZON/1 RMSE   CMAQ OZCON RMSE

test title

PM

test x_label

CMAQ5X/148 PM25/1 RMSE   CMAQ PMTF RMSE

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Running MET codes on AQ verification

Hourly ozone case (runs both 1-hr and 8-hr hourly averages):

pb2nc prepda.2018092700 prepda.nc.2018092700
/meso/save/Perry.Shafran/verif/nwtest/parm/PB2NCConfig_aqm -v 3

point_stat AWIP3D12.tm00 prepda.nc.2018092700
/meso/save/Perry.Shafran/verif/nwtest/parm/PointStatConfig_AIRNOW -v 3

Where prepda.2018092700 is the ozone file with hourly observations, and
AWIP3D12.tm00 is the ozone grib2 model file

Running MET codes on AQ verification

Hourly PM case:

pb2nc prepda.2018092700 prepda.nc.2018092700
/meso/save/Perry.Shafran/verif/nwtest/parm/PB2NCConfig_aqm -v 3

point_stat AWIP3D12.tm00 prepda.nc.2018092700
/meso/save/Perry.Shafran/verif/nwtest/parm/PointStatConfig_ANOWPM -v 3

Where prepda.2018092700 is the PM prepbufr observation file and AWIP3D12.tm00 is the hourly PM model file

Running MET codes on AQ verification

Daily max ozone:

pb2nc prepda.2018092812 prepda.nc.2018092812
/meso/save/Perry.Shafran/verif/nwtest/parm/PB2NCConfig_aqmmax -pbfile
prepda.2018092712-v 3

point_stat oz_DAY1 prepda.nc.2018092812
/meso/save/Perry.Shafran/verif/nwtest/parm/PointStatConfig_AIRNOW_max -v 3

Where prepda.2018092812 is the 2nd prepbufr file, prepda.2018092712 is the 1st prepbufr
file, oz_DAY1 (or oz_DAY2) is the daily ozone max

Running MET codes on AQ verification

Daily max PM:

pb2nc prepda.2018092812 prepda.nc.2018092812
/meso/save/Perry.Shafran/verif/nwtest/parm/PB2NCConfig_aqmmax -pbfile
prepda.2018092712-v 3

point_stat pm_DAY1 prepda.nc.2018092812
/meso/save/Perry.Shafran/verif/nwtest/parm/PointStatConfig_ANOWPM_max -v 3

Where prepda.2018092812 is the 2nd prepbufr file, prepda.2018092712 is the 1st prepbufr
file, pm_DAY1 (or pm_DAY2) is the daily PM max

Running MET codes on AQ verification

Daily 24-hr ave PM:

pb2nc prepda.2018092812 prepda.nc.2018092812
/meso/save/Perry.Shafran/verif/nwtest/parm/PB2NCConfig_aqmmax -pbfile
prepda.2018092712-v 3

point_stat pm_DAY1 prepda.nc.2018092812
/meso/save/Perry.Shafran/verif/nwtest/parm/PointStatConfig_ANOWPM_ave -v 3

Where prepda.2018092812 is the 2nd prepbufr file, prepda.2018092712 is the 1st prepbufr file, pm_DAY1 (or pm_DAY2) is the daily PM average

Current Status

- Currently all MET scripts have finally been configured to work for all CMAQ verification cases
- We are just now beginning the process to create a METplus use case. Not quite working yet, but we will include it when it is successfully finished