

CMAQ v4.6.5 EE meeting

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Outline

- Timeline of project - Quad chart
- Basic flow charts
- Scope of changes
- Resource changes
- Timing changes
- Input/output changes
- Others
 - Downstream/upstream job impact/dependencies
 - Filename changes (WCOSS)
 - Questions



AQ Upgrades to Emissions/Chemistry (CMAQ): V4.6.5

Project Status as of 05/06/2015



Project Information and Highlights

Lead: Jeff McQueen & Jianping Huang, EMC; Steven Earle, NCO

Scope:

1. Upgrade CMAQ as needed with improved chemistry mechanism & vertical transport Upgrade emissions with 2011 base year estimates and projections.
2. Implement BlueSky V3.5.1 smoke emission software.
3. Inclusion of additional vertical levels (35 levels).
4. Use NGAC aerosol lateral boundary conditions
5. Implement ESRL PM bias correction system.

Expected Benefits:

1. Expansion of the AQFS whereby the AQM is incrementally improved through improved chemistry and physics.
2. Implementation of a unified system for all NCO CMAQ runs.
3. Improved vertical transport, emissions, unified system for all runs.
4. Real-time lateral boundary conditions from NGAC.

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Scheduling

Milestone (NCEP)	Date	Status
EMC testing complete/ EMC CCB approval	06/29/15	
Code delivered to NCO	07/01	
Initial test complete	07/21	
Technical Information Notice Issued	08/18	
CCB approve parallel data feed	07/31	
Parallel testing begun in NCO	08/03	
IT testing begins	07/27	
IT testing ends	07/30	
Real time evaluation ends	09/02	
Management Briefing	09/15	
Implementation	09/22	

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Issues/Risks

Issues: Based on EMC priority and NCO resource availability.
+ 9% increase in run time if using 35 levels (from 96 to 122 mins)

Risks: Availability of full aerosols from NGAC may be delayed.

Mitigation: Use current operational NGAC dust only aerosols.
Increase run time is still within required availability for NDGD

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Finances

Associated Costs: NAQFC funding, Mission

Funding Sources: NAQFC : T2O 6 Man-months
NAQFC: 2 man-months for implementation, 1 man-month annually for maintenance.

Additional EMC resources for extended development, testing and evaluation.

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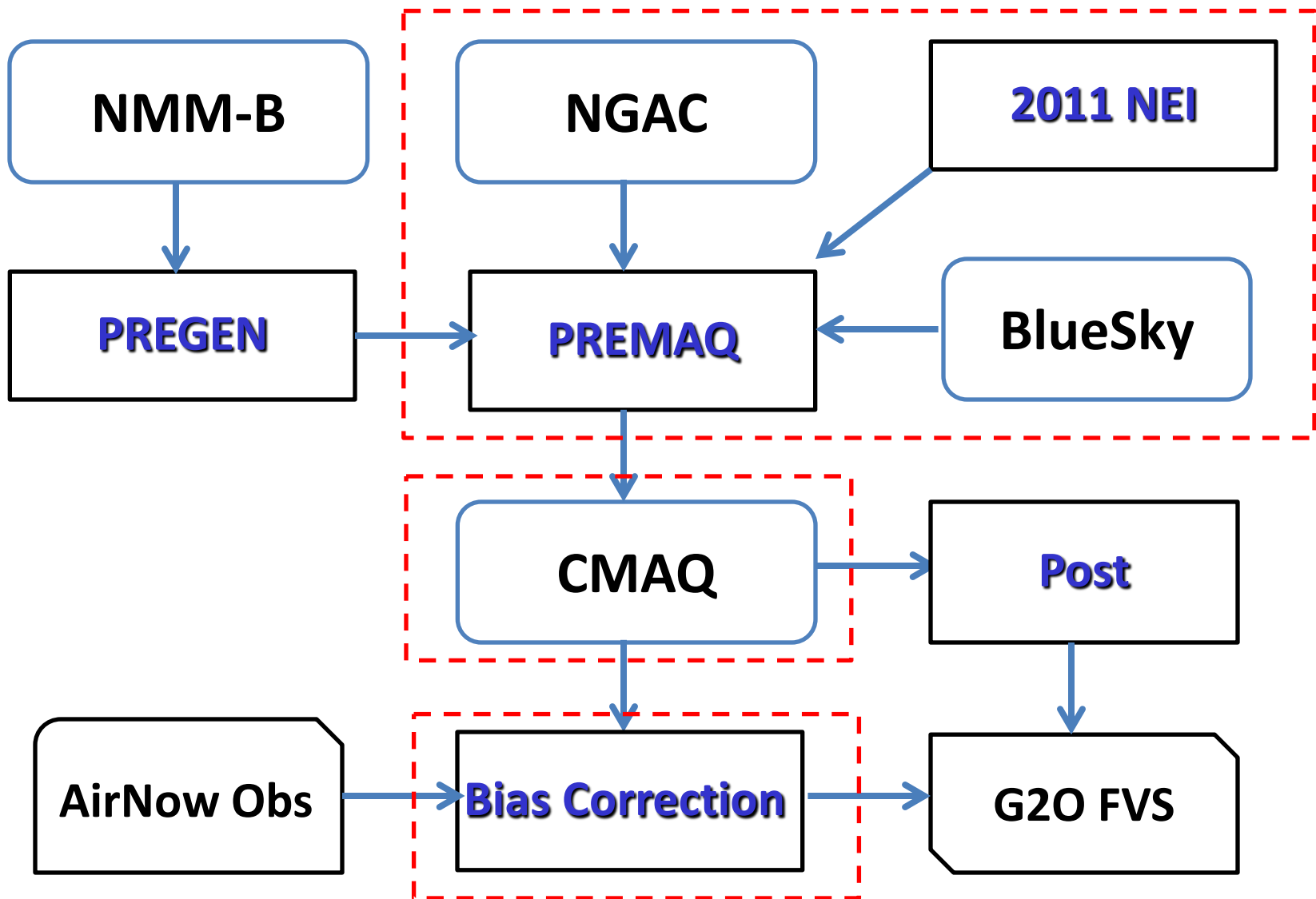
Management Attention Required

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Potential Management Attention Needed

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On Target



Flow chart of CMAQ v4.6.5 (new Changes as indicated by the red dashed boxes)

Comparison of NEI2005 and NEI2011

NEI2005v1	NEI2011v1	Source Description
ag	ag	Agricultural NH3
afdust	afdust	Anthropogenic fugitive dust
alm	c1c2rail	Class I and I marine sources, railroad
	c3marine	Class III marine sources (ocean going ships)
othmb	othon	Mexican and Canadian mobile sources
nr	nonroad	Nonroad (US)
nonpt	nonpt	Other area sources
othar	othar	Mexican and Canadian area sources
mb	Onroad (_catx)	onroad
	onroad_rfl	Vehicle refueling
N/A	np_oilgas	Non-point oil and gas sources
N/A	rwc	Residential wood combustion
othpt	othpt	Mexican and Canadian point sources
ptegu	ptegu	EGU point sources
	ptegu_pk	Peak-hour EGU point sources
ptnonipm	ptnonipm	Non-ipm point sources
N/A	pt_oilgas	Oil and gas point sources

Emission updates

NEI2005v1	NEI2011v1	FY2015 Update	FY2016 Update
ag	ag	X	
afdust	afdust		X
alm	c1c2rail	X	
	c3marine		X
othmb	othon	X	
nr	nonroad	X	
nonpt	nonpt	X	
othar	othar	X	
mb	Onroad (_catx)		X
	onroad_rfl		X
N/A	np_oilgas	X	
N/A	rcw	X	
othpt	othpt	X	
ptegu	Ptegu	?	?
	ptegu_pk	?	?
ptnonipm	ptnonipm	?	?
N/A	pt_oilgas	?	?

Upgrade: USFS BlueSky V3.5.1 Fire Emissions Package

~/lib/sorc : (new, local)

- netcdf-3.6.3 (optimized for gfortran;
WCOSS netCDF not compatible)
- gdal-1.6.0 (BlueSky main core library)
- ioapi-3.0 (for CMAQ SMOKE emission model ready files)
- mapserver-5.6.3 (mapping, location, and projection)

~/sorc :

- hysplit_feps.fd/ (new)
- hysplit_bluesky351.fd/ (new)
- hysplit_fires/ (modified)

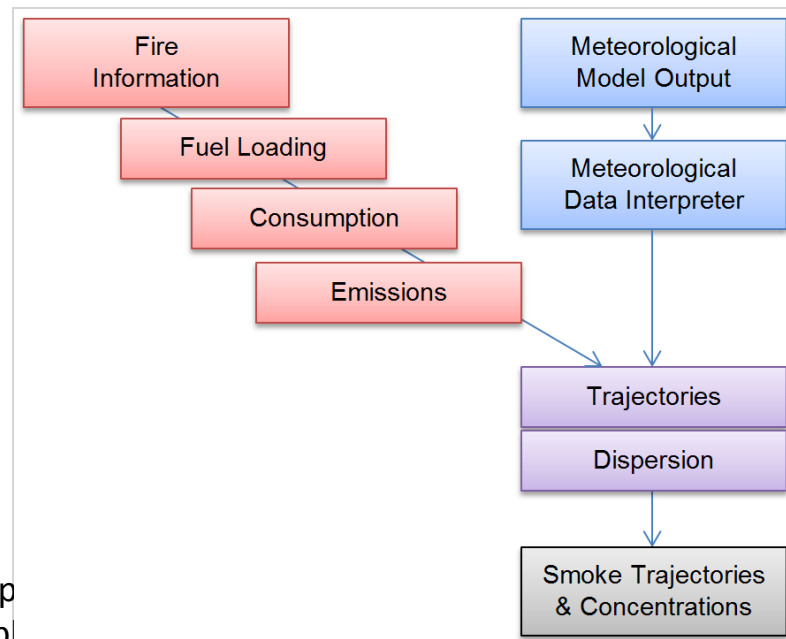
~/exec :

- 6 executables (hysplit_feps_consumption, _emissions, _output_plumerise, _timeprofile, _weather) from hysplit_feps

~/ush : (called by existing Bluesky jobs, scripts)

- BlueSky/ (new)
 - One executable (from hysplit_bluesky351.fd)
 - Dependent python modules (BASE, CONSUME, FCCS, FEPS)
- Remove 13 pearl scripts
- Modified 3 smoke_config*.sh (CONUS, Alaska, and Hawaii) for new BlueSky input/output

~/fix : Add 28 new files and remove 6 old files



Scope of changes

- Libraries

 - ~/lib/sorc/lib.f90 (46 new *.f90)

 - ~/lib/sorc/lib.bias (14 new *.f90)

- Source codes

 - ~/sorc/aqm_ngac_dust_dlbc.fd (NGAC lbc, new)

 - ~/sorc/aqm_subset.fd (new, extracting data for BC)

 - ~/sorc/aqm_subc.fd (new, extracting data for BC)

 - ~/sorc/aqm_combine.fd (new for BC)

Scope of changes (cont.)

- Source codes

- ~/sorc/aqm_interpolate_update.fd (new for BC)

- ~/sorc/aqm_bias_correct.fd (new for BC)

- ~/sorc/aqm_post_bias_cor.fd (new for BC)

- ~/sorc/aqm_post_maxi_bias_cor.fd (new for BC)

- Jobs

- ~/jobs/JAQM_POST_BiCor_CS

Scope of changes (cont.)

- **Scripts**

- ~/scripts/exaqm_post_pm25_bicor_cs.sh.ecf

- ~/scripts/exaqm_premaq_cb05_cs.sh.ecf (35 vertical levels)

- **ush**

- ~/ush/aqm_bicor_prep_cs.sh

- ~/ush/aqm_bicor_interp_cs.sh

- ~/ush/aqm_bicor_pm25_cs.sh

- ~/ush/aqm_bicor_post_cs.sh

- ~/ush/aqm_bicor_post_maxi_cs.sh

Scope of changes (cont.)

- Fix

- LBC replacement files (12)

- aqm_conus_12km_geos_200601_static_35L.ncf

...

- aqm_conus_12km_geos_200612_static_35L.ncf

- A new IC file (35 levels)

- aqm_icon_cmaq46_cb05_conus12_L35.ncf

Scope of changes (cont.)

- Parm
 - New config files for Bias Correction
 - aqm.t12z.grdcro2d.ncf
 - config.interp
 - config.pm25_bias_cir
 - site.valid.20140617.12z.list
 - temp25pm_aero4

Resource changes

Jobs	Operational	Experimental
JAQM_PREMAQ_CS	one task, Phase I	one task, Phase II
JAQM_FORECAST_CS	Phase I, 127 tasks, 7 nodes	Phase II, 257 tasks, 11 nodes
JAQM_POST_BiCor_CS	None	One task (Phase II)

No Changes for Alaska and Hawaii

Timing changes

Jobs	Operational	Experimental
JAQM_PREMAQ_CS	20 minutes (one task, Phase I, significantly increased with smoke fires)	20 minutes (one task, Phase II, increased to 40 minutes with smoke fires)
JAQM_FORECAST_CS	36 minutes (Phase I, 127 tasks, 7 nodes)	51 minutes (Phase II, 127 tasks, 6 nodes) 30 minutes (Phase II, 257 tasks, 11 nodes)
JAQM_POST_BiCor_CS	None	One task (Phase II, 8 minutes for one-month training period)

No Changes for Alaska and Hawaii

Input/output changes

- `$COMOUT/aqm.$yyyymmdd`
 - `aqm_conus_geos_ngac_dust_$yyyy$mm$dd_35L.ncf`
 - created by 06z cycle for today 06z, 12z, and 18z, 00z used previous day LBC
 - `$COMOUT/aqm.$yyyymmdd/` (new, can be sent to ftp site for focus groups)
 - `aqm.t${cyc}z.25pm${hh}.bc`
 - `aqm.t${cyc}z.25pm${hh}.grib2.bc`
 - `aqm.t${cyc}z.1hpm25-max.227.grib2.bc`
 - `aqm.t${cyc}z.24hpm25-ave.227.grib2.bc`
- File size change: 278G → 367G per day (CONUS)
(+32%)
- No file change for AK (56 GB) and HI (7G) per day.

Pending CMAQ package bugzilla items

- [Bug 42](#) - aqm_post_Hlpmwrf includes 4 local versions of w3lib subroutines
 - reported on 2010-03-08. Resolved
- [Bug 107](#) - Automatic ingest process of the ARL Emission input files for AQM model.
 - Completed in April, 2015...QC Emission file checking script provided to **NCO**

Pending CMAQ package bugzilla items (cont.)

- [Bug 184](#) - Remove GO TO statements in AQM source codes
 - Reported on 2014-09-30 (need to be resolved !)
- [Bug 185](#) - Remove sleep statements from AQM
 - Reported on 2014-09-3(no need for sleeping 30 minute in prep, forecast, and post jobs within all three domains in production)

Others: Downstream/Upstream impact/dependencies

- **Upstream**
 - NMM-B grib2 files (implement with NAM upgrade)
 - NGAC (current dust and full aerosol in 2016 Q1)
 - HYSPLIT smoke emissions (updated Bluesky)
 - AIRNOW PM2.5 bufr obs
- **Downstream**
 - NDGD : will provide BC GRIB2 files
 - Verification: Add BC PM verification

Others: Filename changes

- Bias-corrected PM2.5 files (new)
 - aqm.t\${cyc}z.25pm\${hh}.bc
 - aqm.t\${cyc}z.25pm\${hh}.grib2.bc
 - aqm.t\${cyc}z.pm25_24hr_ave.227.grib2.bc
 - aqm.t\${cyc}z.pm25_24hr_max.227.grib2.bc

Others: Questions

- Archive AIRNOW BUFR data and BC interpolated CMAQ PM files
 - /com/aqm/prod/bias/data (~/) → 750 MB/DAY (one month)
 - ~/grid/\$yr/\$yyyy\$mm\$dd/aqm.t\${cyc}z.O3_pm25.ncf, sfc_met_n_PBL.t\${cyc}z.ncf, spec_humid.t\${cyc}z.ncf
- ~/airnow/\$yyyy/\$year\$mm\$dd/b008/xx031 (one month)
- ~/interpolated/\$yyyy/\$mm → 1.5 MB/DAY (one year)
 - forecasts.interp.\$yyyy\$mm\$dd.\${cyc}z.ncf

Question:

How long can bias correction required interpolated files be saved at /com/aqm/prod/bias/data?