The Q2FY16 RTMA/URMA Upgrade Package (v2.4.0)

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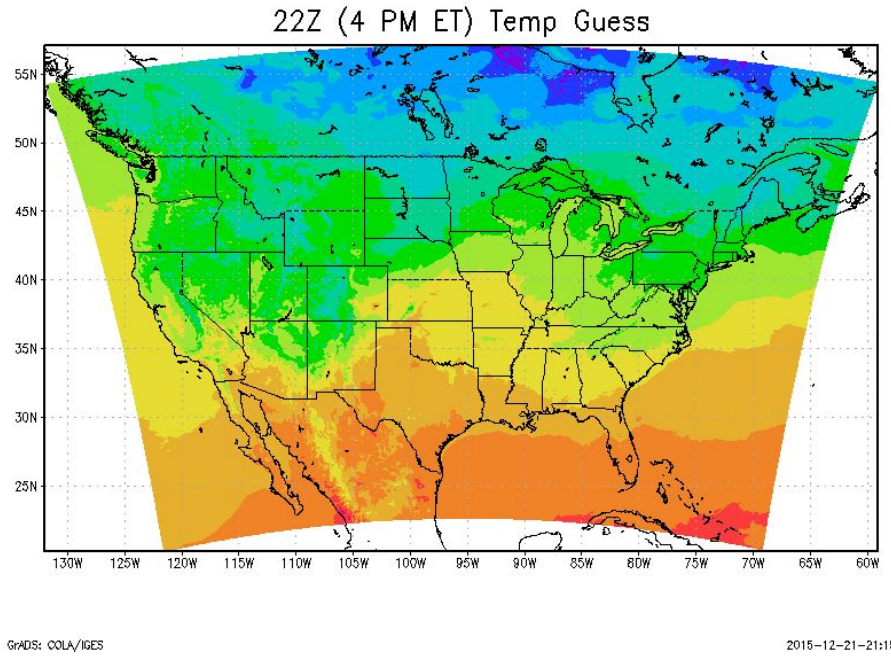
Overview

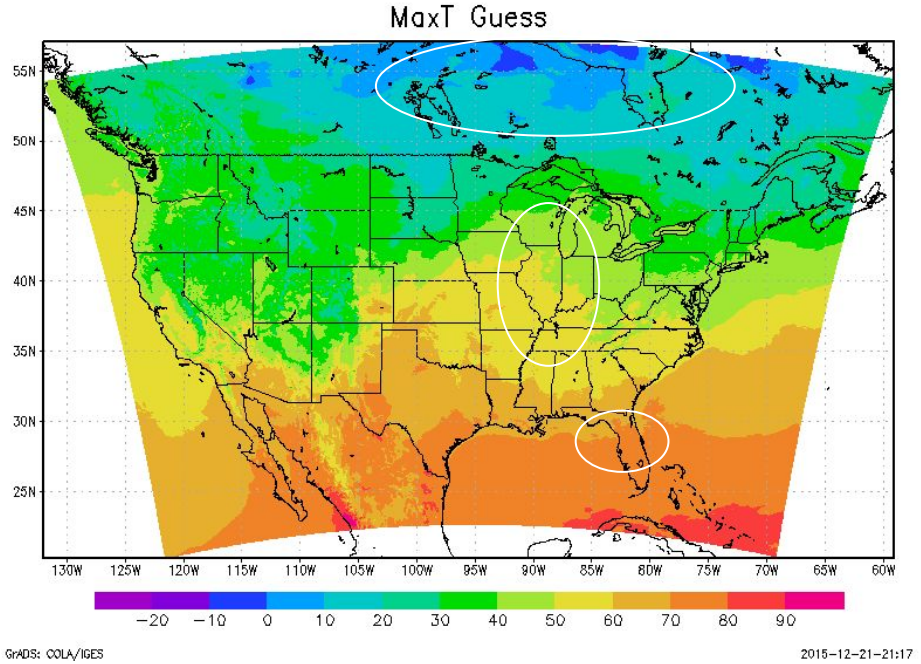
- Min/maxT analysis (requested by NBM project)
- URMA-ALASKA (to support NBM project)
- Variational QC (requested by numerous customers)
  - Wind VarQC pulled out
- Precip analysis changes
- Ongoing issues, customer feedback
- Future Plans

Min/max Temperature

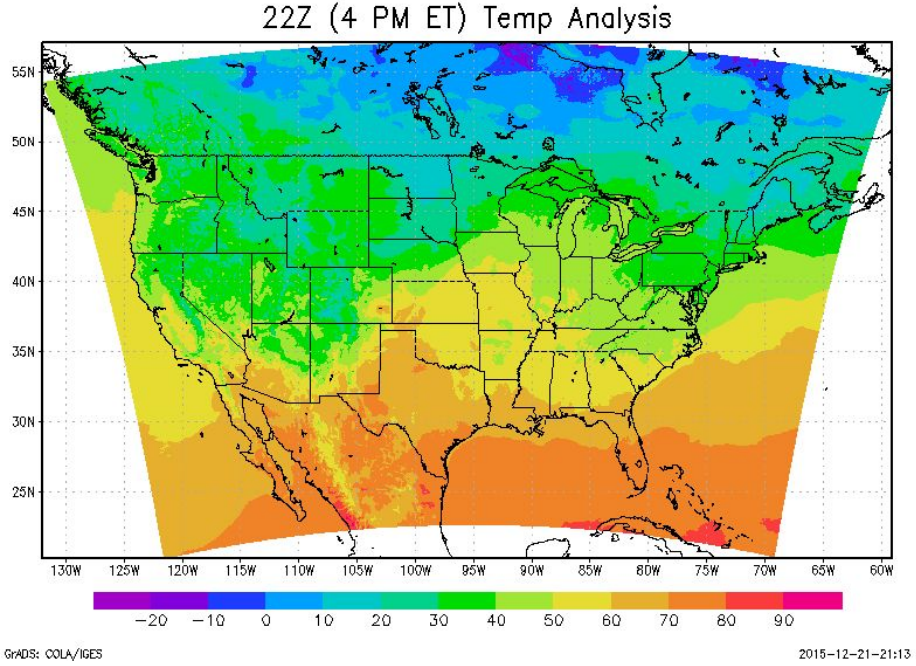
- NBM forecast variable
- Implementing for CONUS and Alaska only now
  - PR and HI coming with next upgrade (Q3FY16)
- MinT analyzed in 20Z URMA, MaxT in 08Z URMA (for all domains)
- Use NDFD time range (8P-7A and 7A-7P LOCAL time)
- Min/max ob ‘calculator’ provided by MDL (Bruce Veenhuis)
  - Same subroutine used to calculate min/max for MOS
  - Uses 6-hourly (00/06/12/18Z) mins/maxes from METAR sites
  - Adjusted to use hourly obs only when needed (eg mesonets)
- Local time zone needed
  - Time zone grids provided by MDL (Geoff Wagner)
  - Fixed file (dictionary) has time zone for individual stations
- Two serial jobs generate min/maxT obs and background during 07 and 19Z post-processing (wall time ~10 minutes)

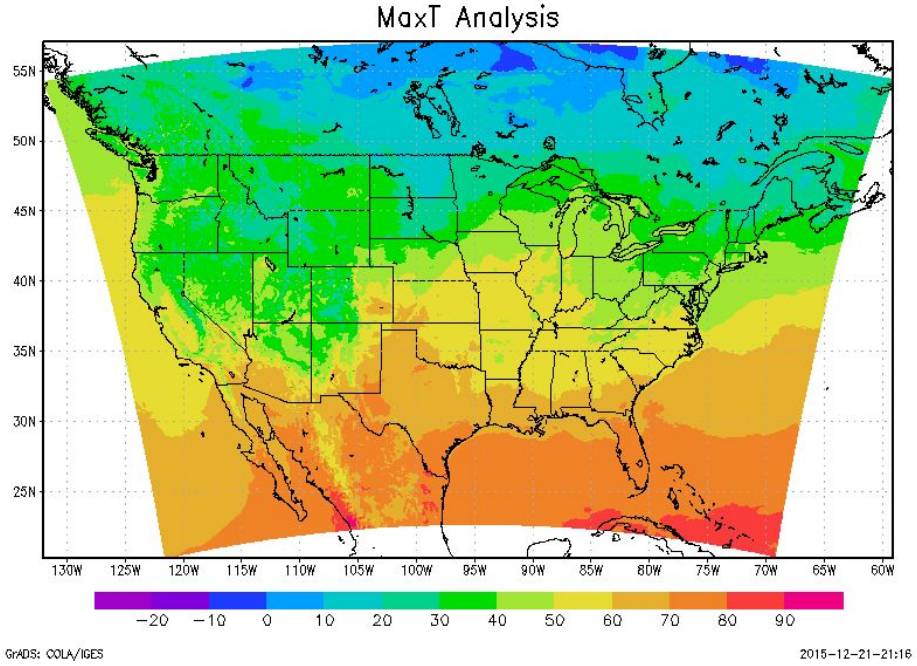
MaxT Background Field



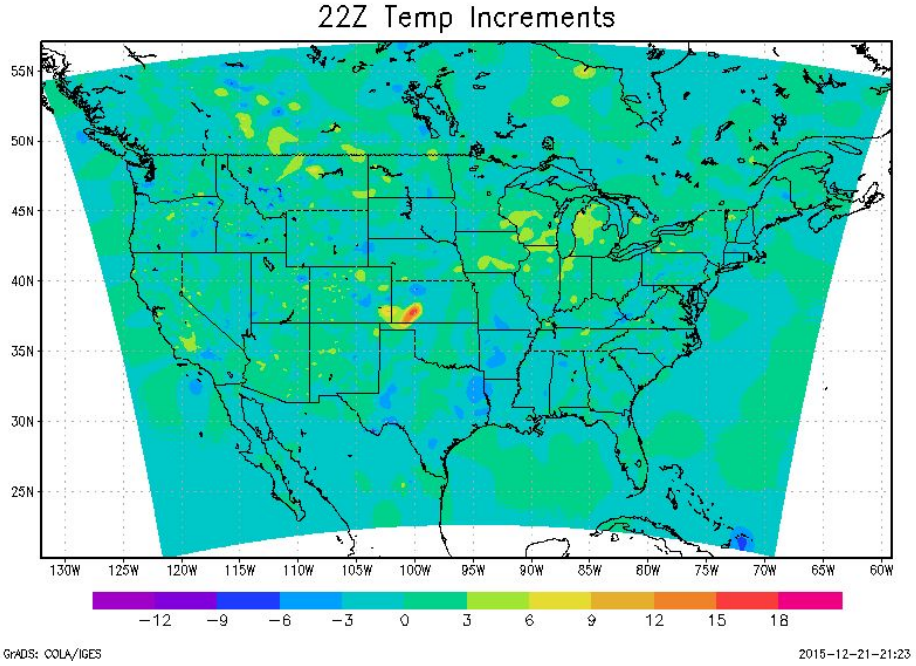


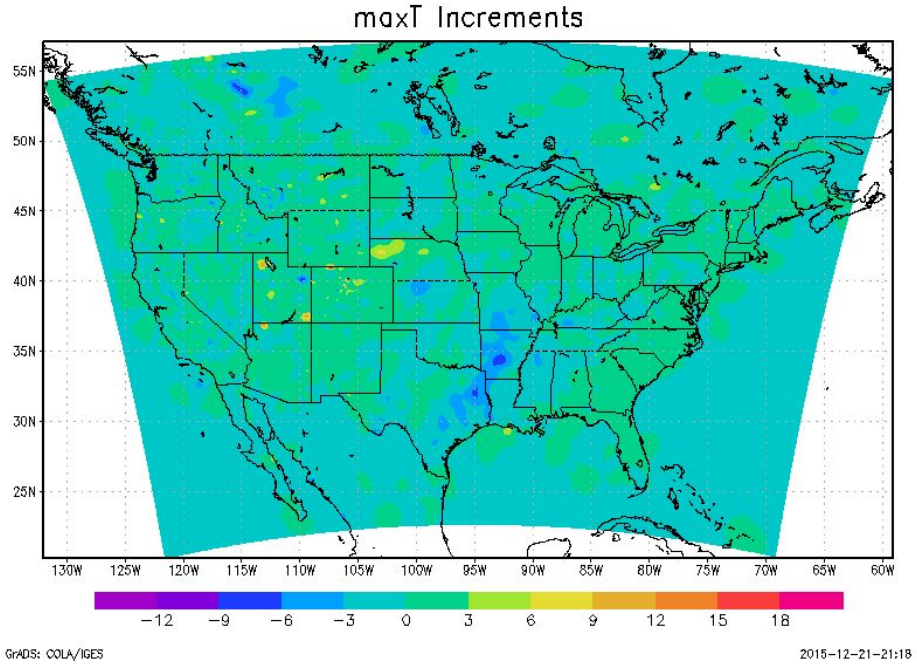
MaxT Analysis Field





MaxT Increments



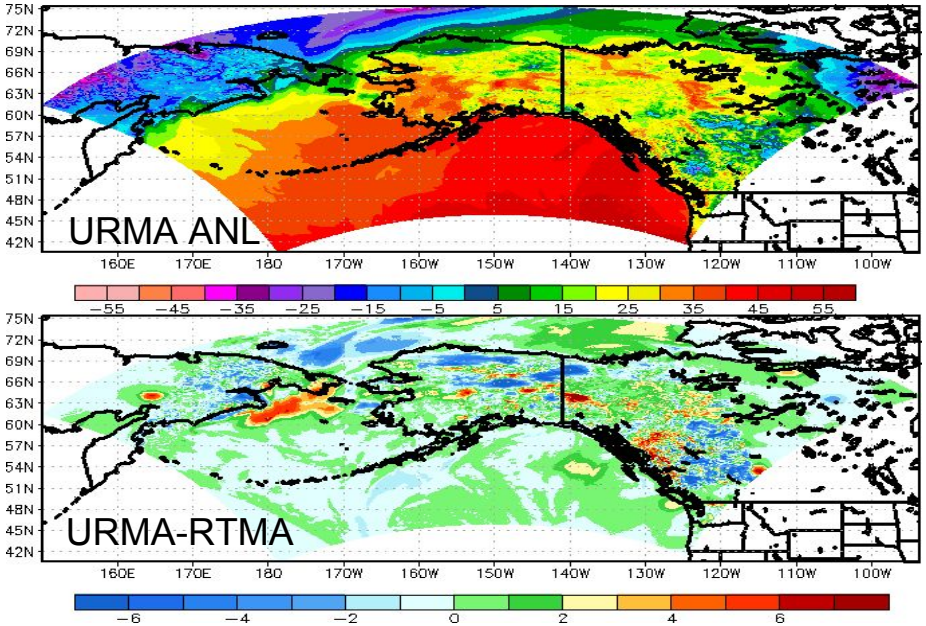


URMA-ALASKA

(Mainly to support NBM by Proving min/maxT analysis)

Similar to RTMA-Alaska, except run 6-h later to use late arriving observations

URMA Temperature Analysis (F) and URMA-RTMA (F)
Valid 09 Jan 03 2015



Number of T-stations:
URMA: 2018
RTMA: 1632

Significant differences (URMA-RTMA)

URMA using 23.6% more stations in this case

In general # of stations increases from 6 to 25% for any one variable (T, Q, PS, W)

When and how can the new varqc help?

- (a) If there are a few isolated bad observations among good data, which happens often, new varqc assigns less weights to the bad observations during the analysis process; therefore, mitigates the effect of the bad observations .
- (b) If the observed data are of good quality, but the first guess is not, those data can be used in analysis process, and therefore pull analysis solution close to the true status. Without VarQC, such good obs were often rejected

In short, with new varqc, we can relax the gross error criterion to let more data get into the analysis without degrading the results.

Comparison: upgrade URMA vs operational URMA

Four cases:

- 2/19/2015 03z: an erroneous low temperature data
- 5/27/2015 13z: an erroneous low dew-point temperature data
- 5/29/2015 03z: an erroneous low temperature data (backup slide)
- 6/12/2015 00z: erroneous low Td analysis, but no observation supporting (backup slide)

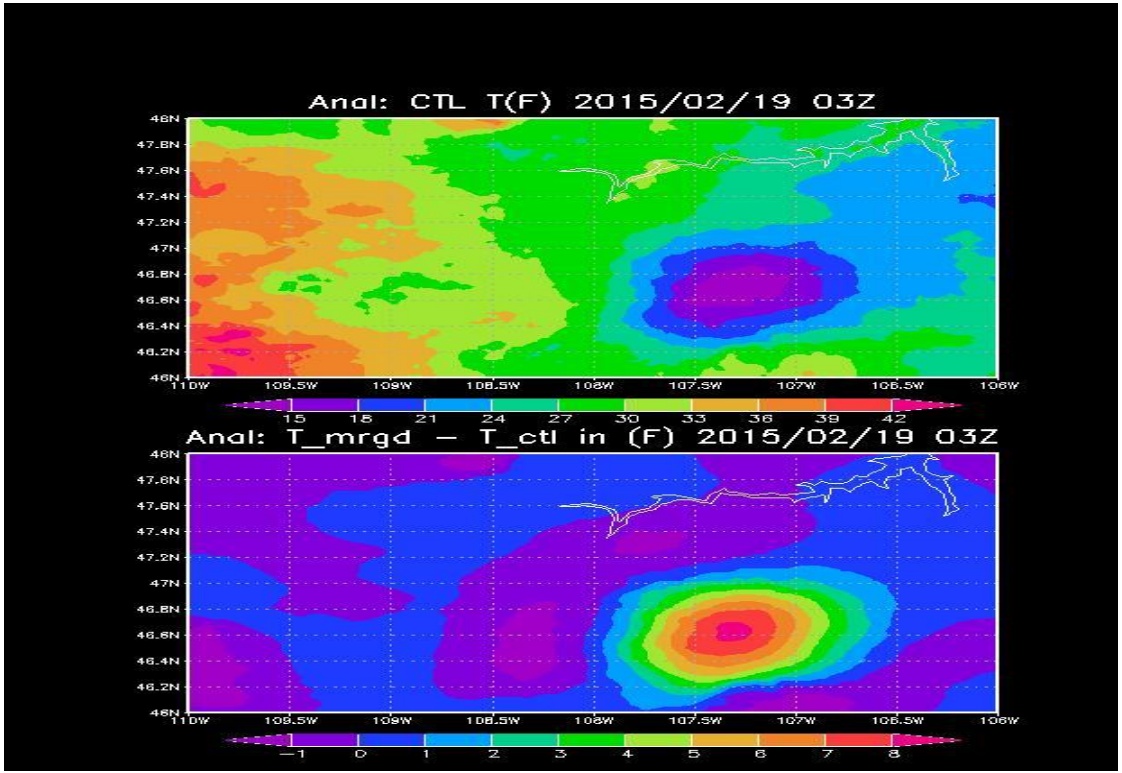
Case one: erroneous low temperature data over Montana 03z 02/19/2015

Top*:* *OPS* Temperature analysis

The bullseye reflects an erroneous low temperature observation

Bottom: *Upgrade–OPS*

The bullseye intensity is reduced by about 8 F



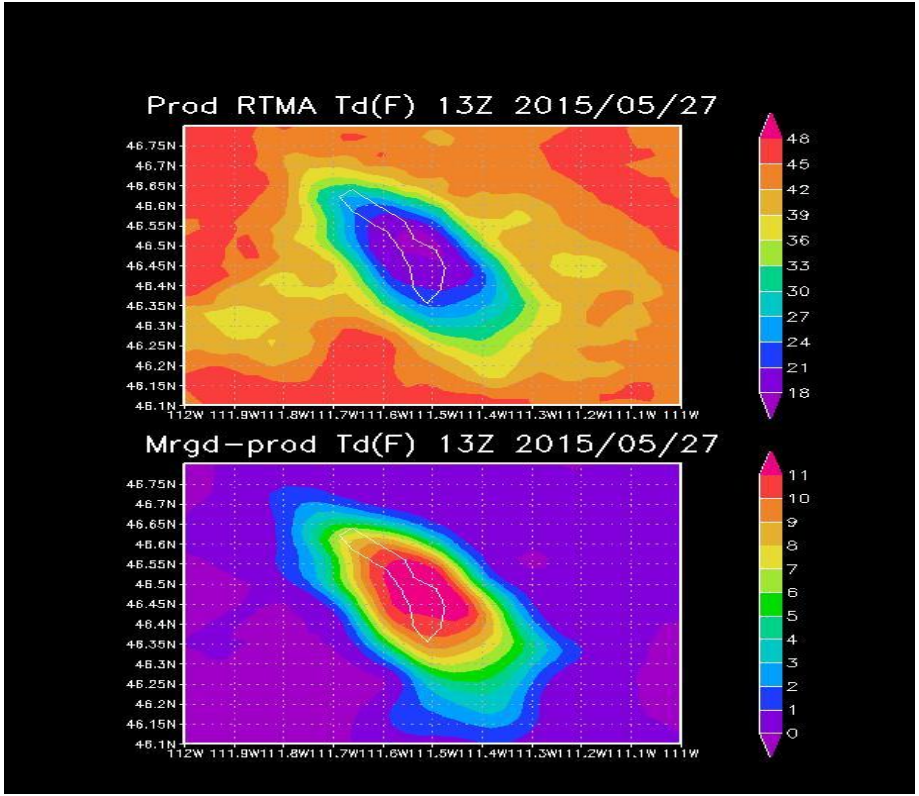
Case two: an erroneous low Td data over Montana 13Z 5/27/2015

Top: *OPS* dew point analysis

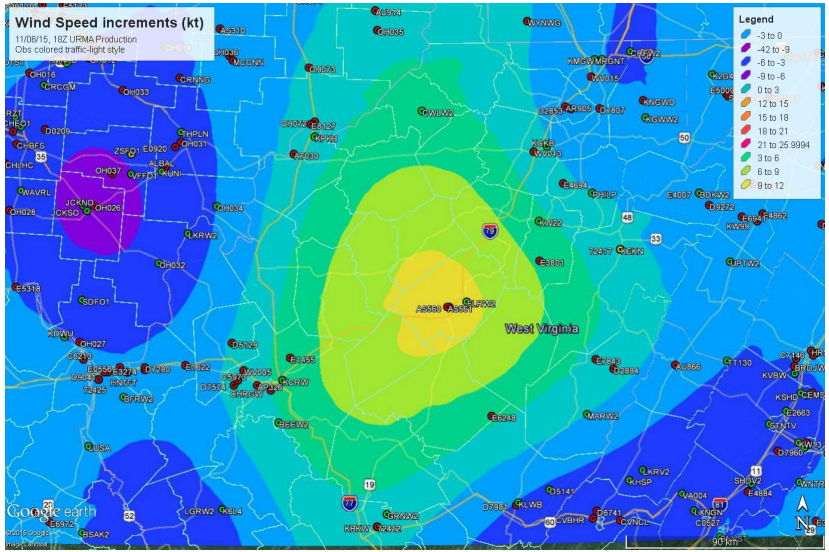
The bullseye reflects an erroneous low dew-point observation

Bottom: *Upgrade – OPS*

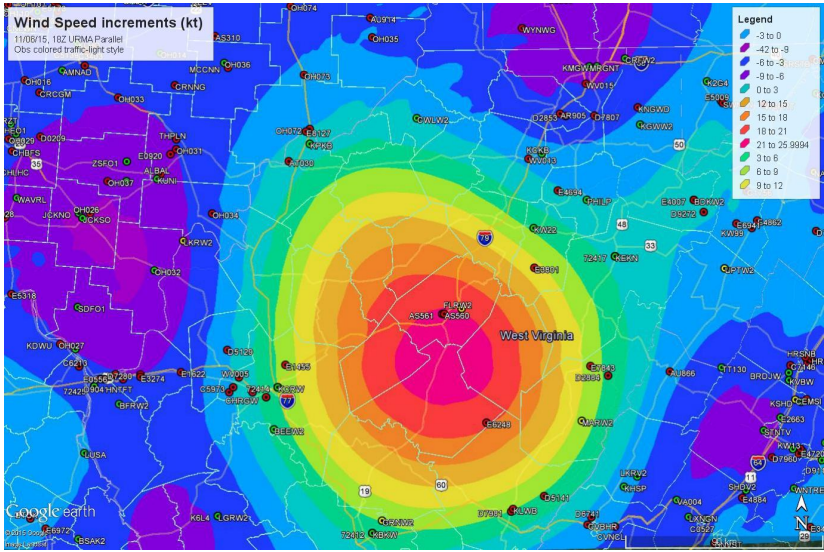
The bullseye intensity is reduced by about 11 F.



VarQC Issue and De-Scoping for Winds



Wind Speed Increments without VarQC

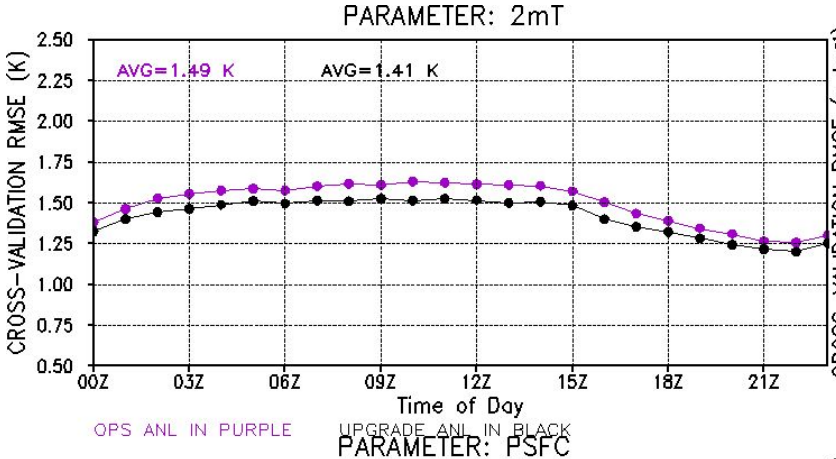


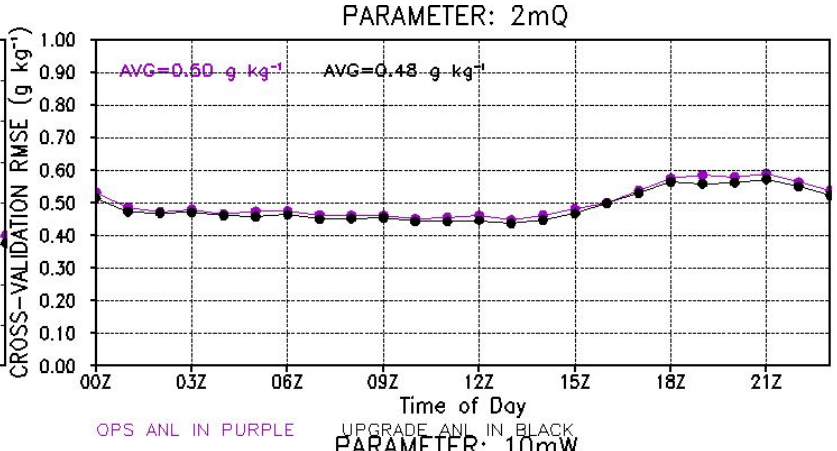
Wind Speed Increments with VarQC

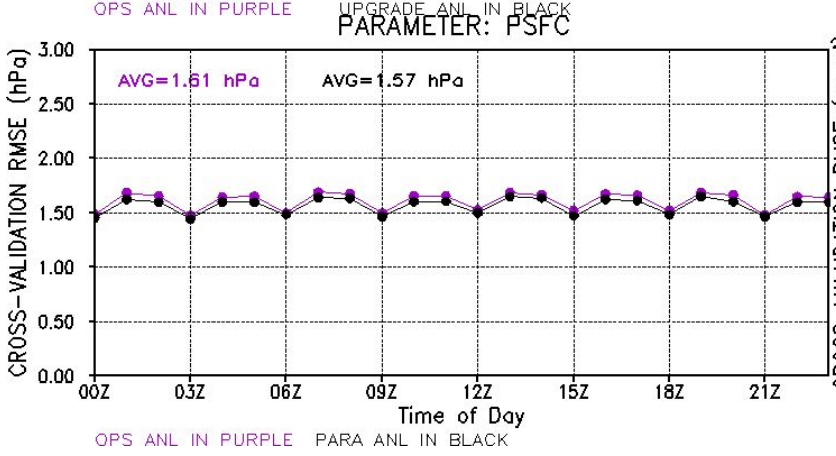
No obs justify any sort of wind speed increment in this area of West Virginia. Also, increment is much larger with VarQC than without (cause still being investigated).

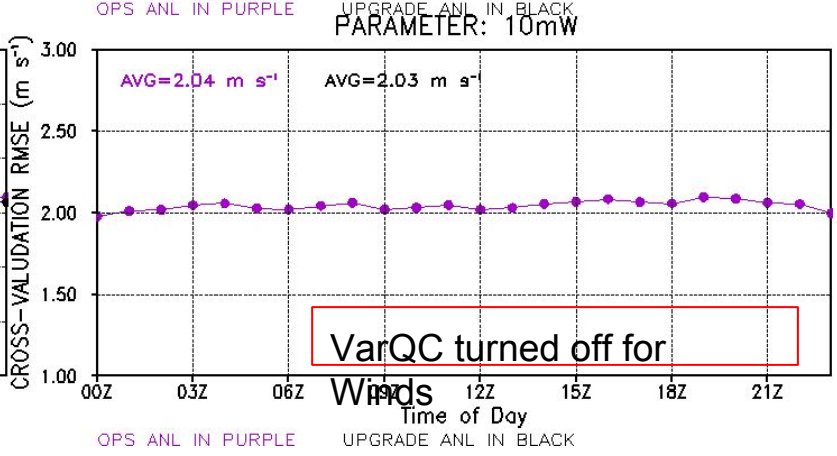
WFO Charleston and Eastern Region pointed this out, and varQC (for winds only) was removed for this implementation.

TIME-OF-DAY AVERAGED CROSS-VALIDATION RMSE (40 day-period: 00Z 19 Nov 2015 - 00Z 29 Dec 2015)









pcpanl.v2.2.0 upgrade for RTMA/URMA

1. Stage IV mosaicking/precip URMA
    - For grid points inside of an RFC's domain, if input from that RFC is late or missing, we will no longer use neighboring RFCs' data to fill in (RFCs do not QC data outside of their domains proper)
    - Coverage for Great Lakes now come from specific RFCs assigned to be responsible for them (at the request of GLERL); WGRFC domain now extends to part of Mexico
    - Areas in the Gulf of Mexico and off the Atlantic Coast are filled in with data from the RFCs, as before
    - For hourly Stage IV, NWRFC and CNRFC input are excluded (NWRFC does not provide hourly input; CNRFC hourly QPE too dry)
2. Precipitation RTMA: Stage IV hourly is used as primary input for RTMA, supplemented by Stage II hourly

Additional info/link to parallel data online: http://www.emc.ncep.noaa.gov/mmb/ylin/pcpanl/

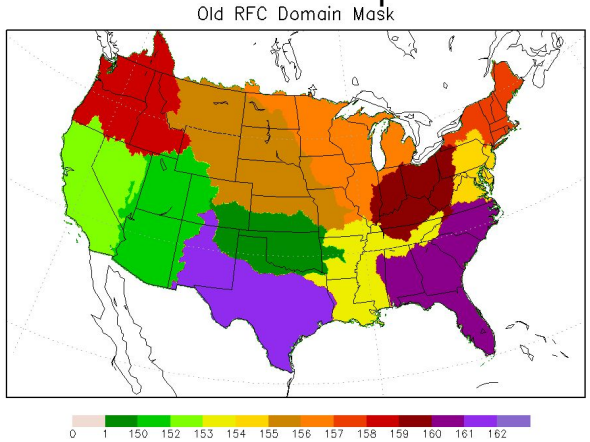
Stage IV/URMA: new domain map; 6h ending 12Z 30 Oct

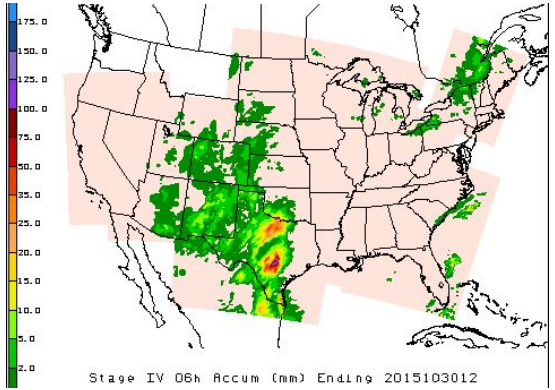
RFC domains map

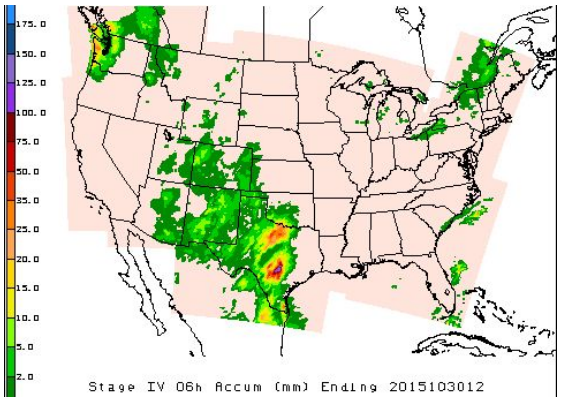
mosaic at 14:45Z

mosaic at 20:45Z

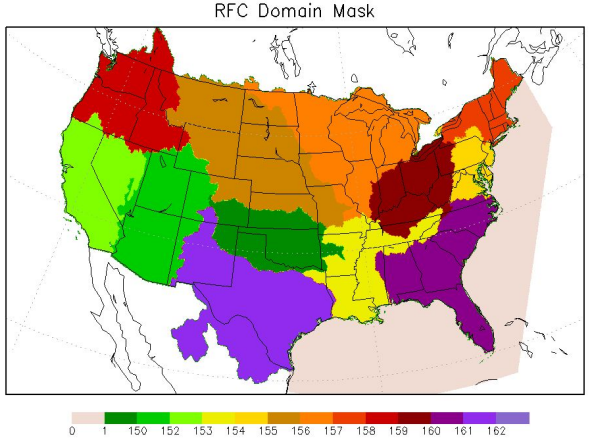
Old

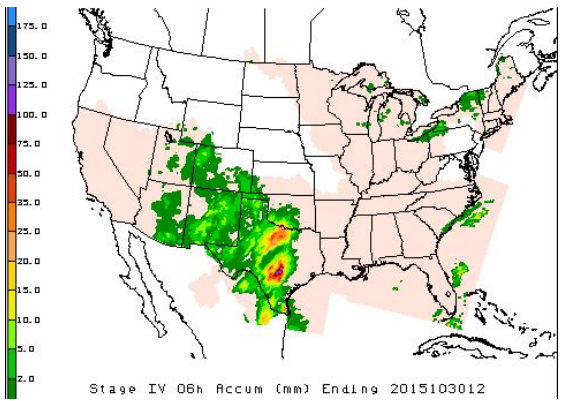


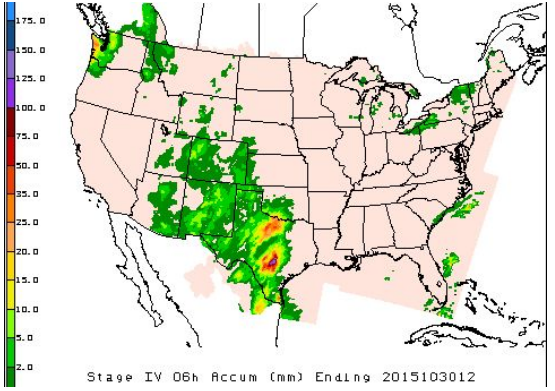




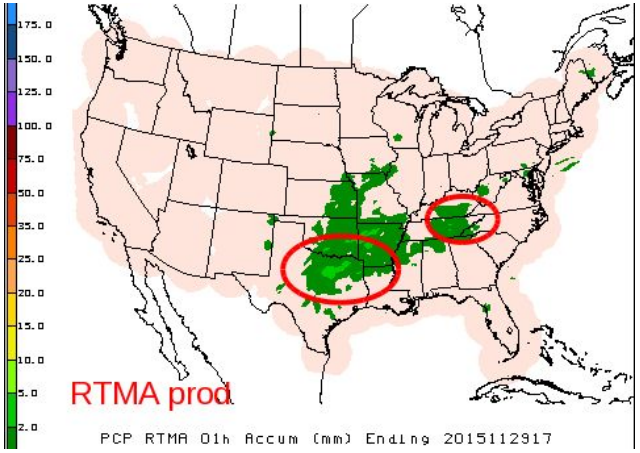
New



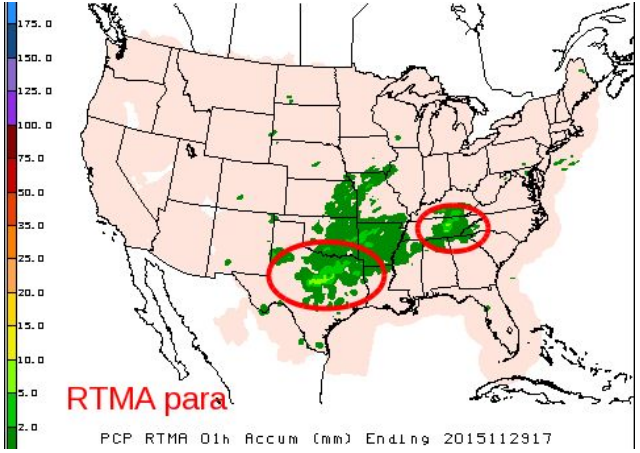


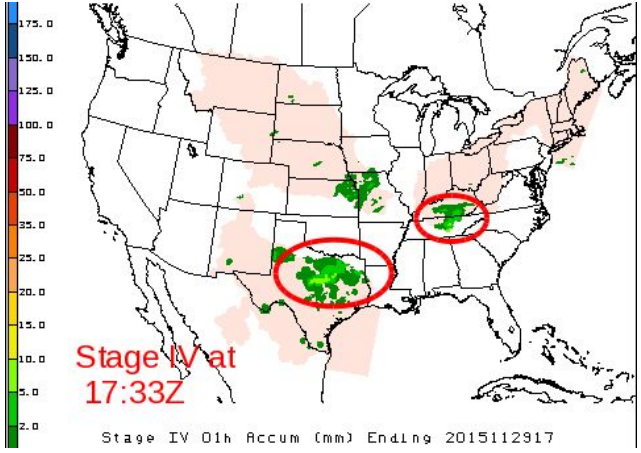


RTMA example: hourly accum ending 17Z 29 Nov

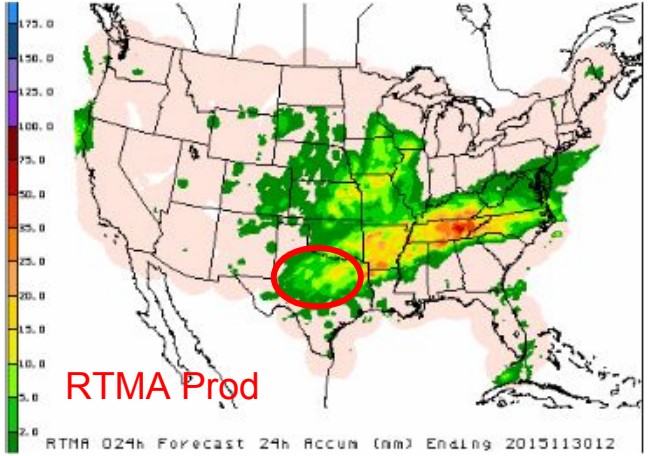


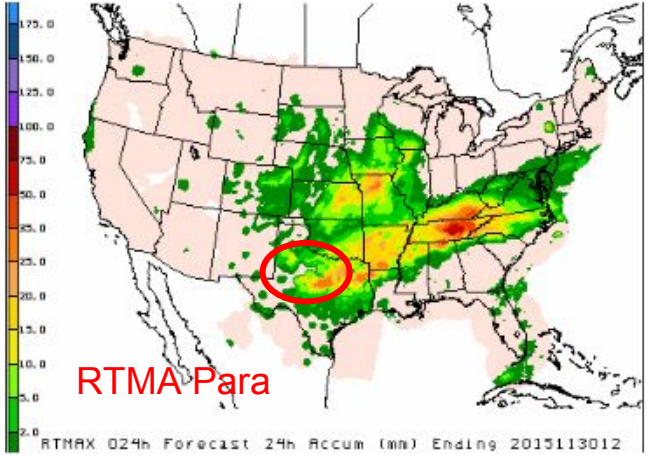
Current production RTMA: uses early Stage II (from radar and gauge data received at NCEP by 33min past the top of the hour).
Upcoming RTMA: uses Stage IV (from regional QPEs sent by RFCs by 33min past the top of the hour), supplemented by early Stage II.
This example: At 17:33Z 29 Nov, the first Stage IV mosaic for 17Z was run with input from MB/WG/OH/NE RFCs, and was used for the precip RTMA.

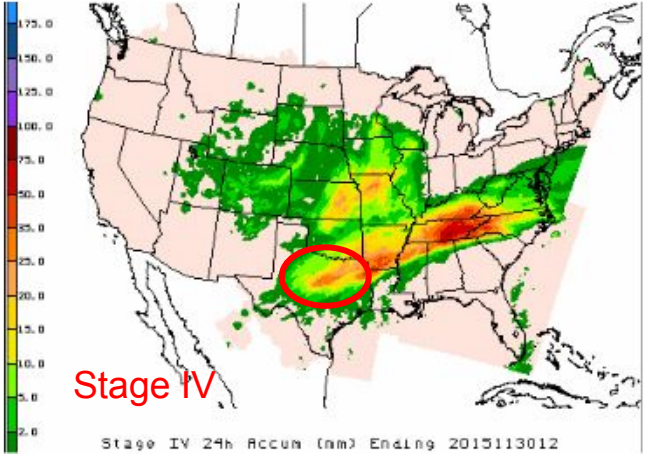


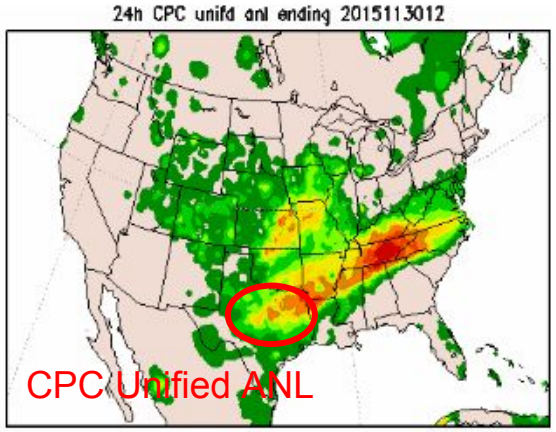


24h ending 2015113012

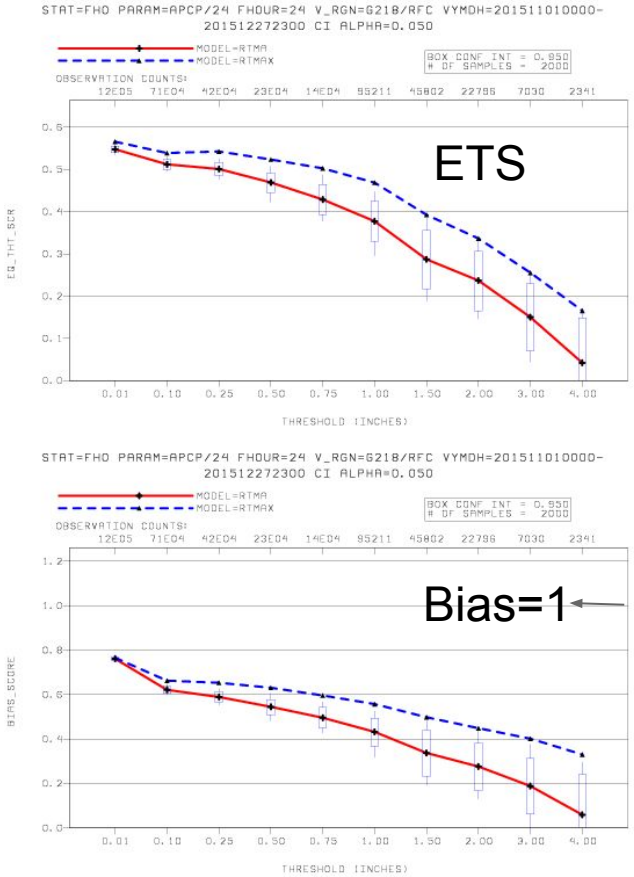


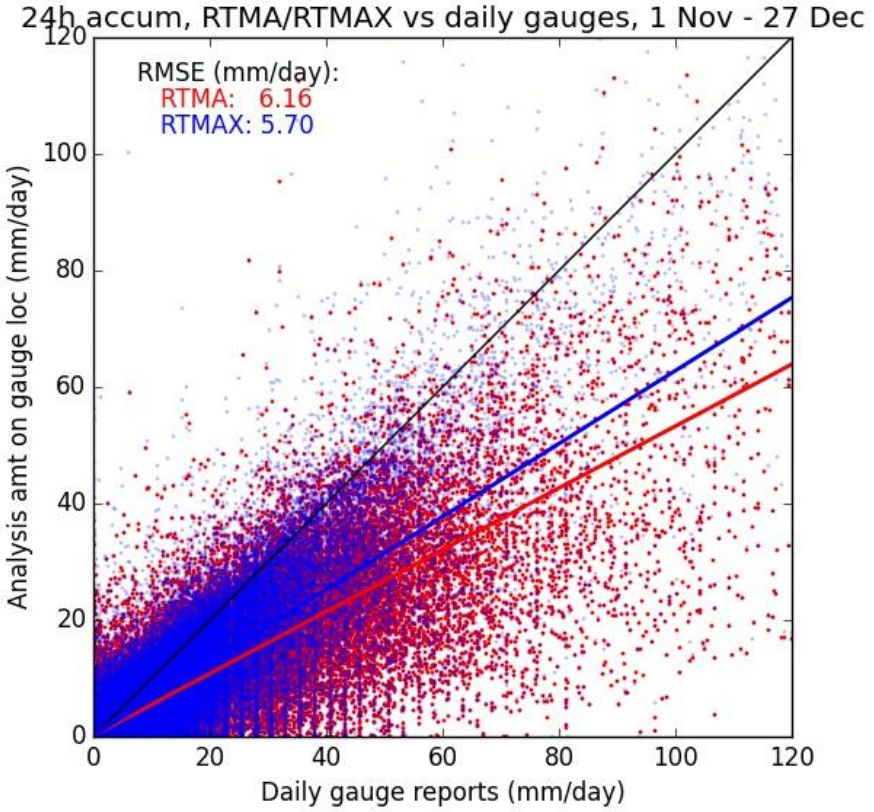






RTMA *vs.* RTMAX, 1 Nov - 27 Dec 2015





Working with the Field

- RTMA overview presented to SOO's via regional conference calls earlier this year
- Customers have had access to parallel via website and/or EMC FTP since 30 September
- Examples sent in via listserv (aor-rtma@infolist.nws.noaa.gov)
  - Also announcements about parallels, implementation progress, etc.
- NBM VLab page (includes message board)
- NBM 4-panel Google Map viewer
  - Compare RTMA, URMA, guess, par vs ops, NDFDnow, LAPS
  - Point/zoom, plot obs and QC marks
  - Overlay roads, counties, cities, landmarks, etc.
- Monthly conference calls

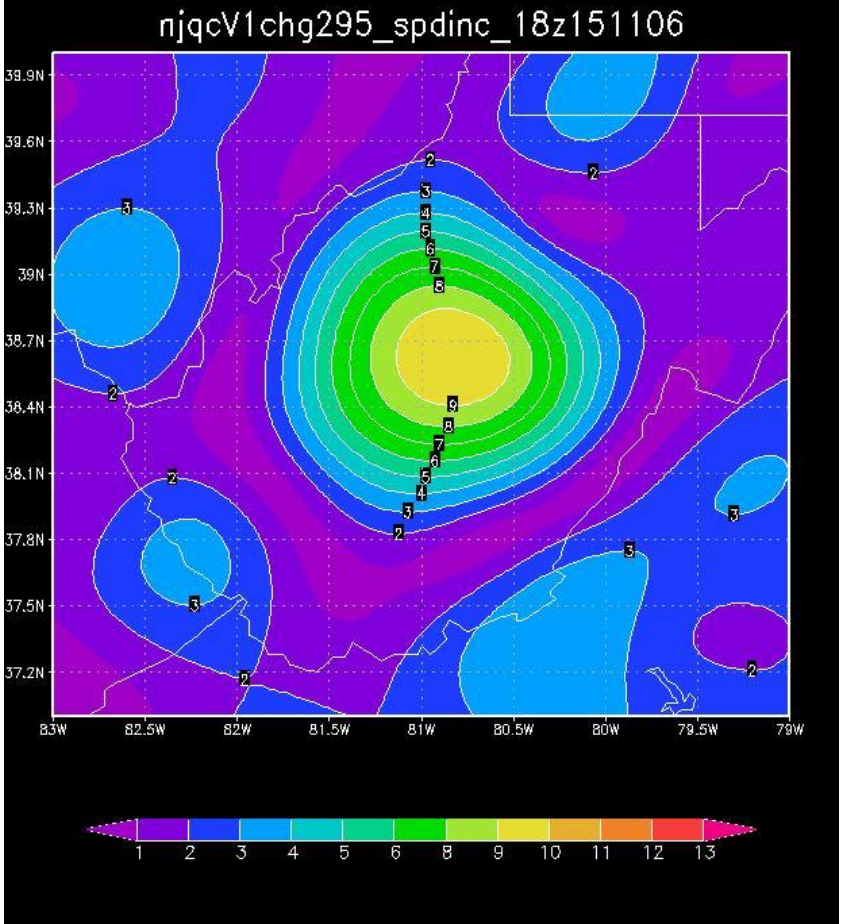
Observation Issues With Field

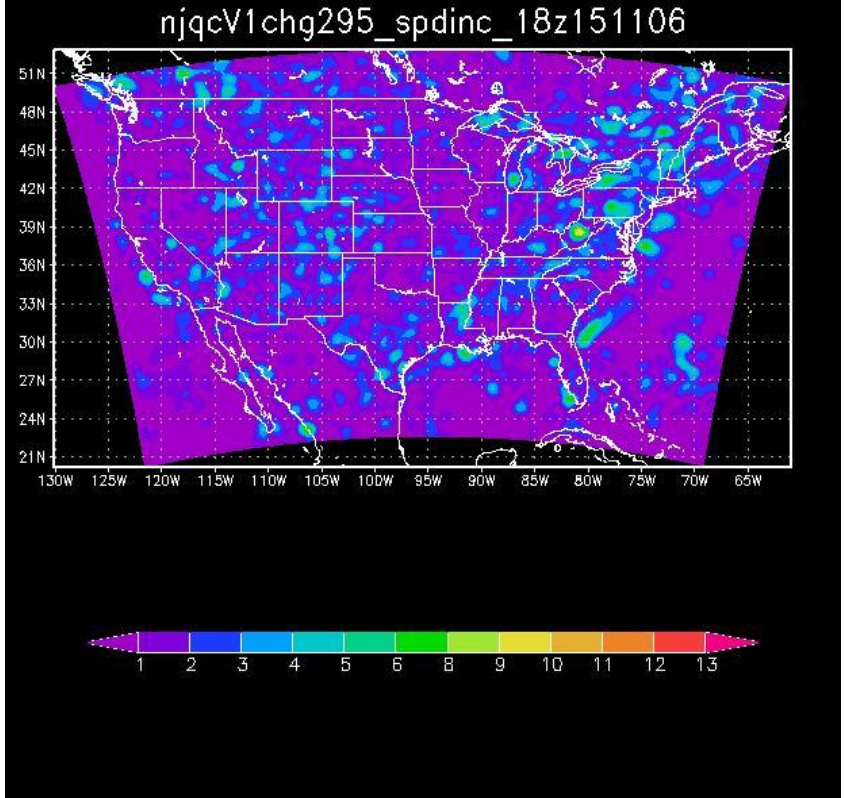
- Analysis will not match obs exactly (MatchObsAll)
- System will not resolve many meso-gamma scale features (narrow valleys, shallow cold pools, etc.)
- Ob selection (not all obs are created equal)
  - Forecaster's favorite ob is not our favorite ob
- Close-together obs will wash each other out
  - See presentation about this from NPSR here
- We use obs (mostly mesonets) field does not see or care to see
- WFO's sometimes see obs we don't
  - Mirror to CWOP to correct this
- Ob duplication issues
  - Same ob comes across multiple feeds and sometimes different types, difficult to find and weed out
- Influence of background in ob sparse areas

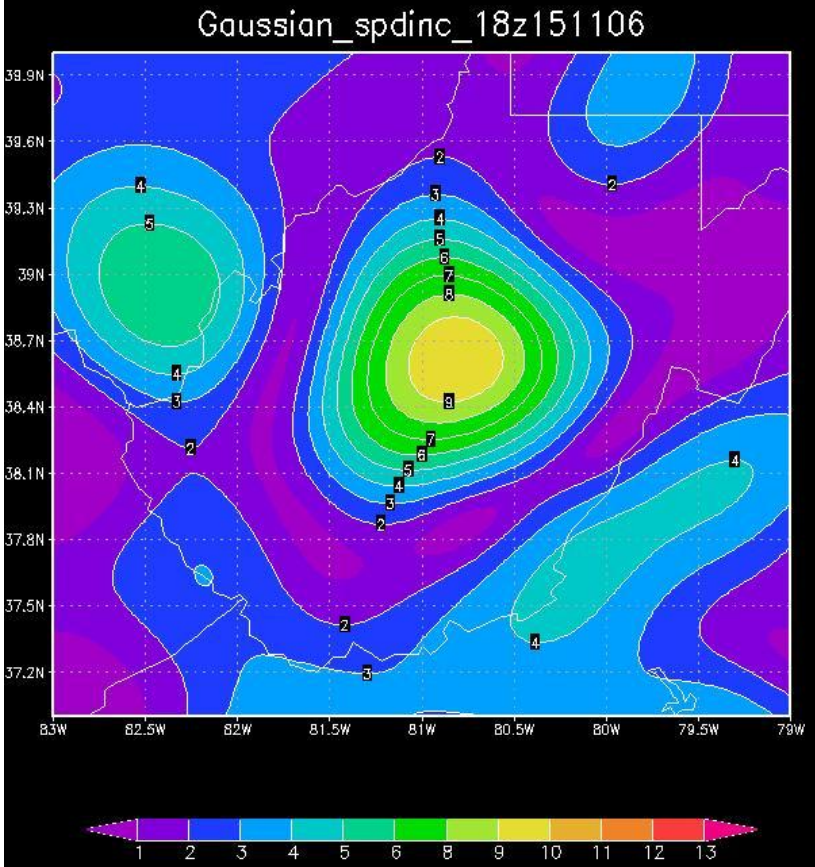
Next upgrade opportunity: Q3FY16 (concurrent with RAP/HRRR)

- Use new HRRRv2 for background over CONUS
- Add new variable: ceiling height (requested by FAA/NextGen)
- Implement new unified terrain (requested by MDL)
  - To be implemented across GMOS, RTMA, NBM and upstream models
- Add URMA (including min/maxT) for HI and PR

Backup Slides


njqcV1chg295_spdinc_18z151106
39.9N
39.6N
39.3N
39N
38.7N
38.4N
38.1N
37.8N
37.5N
37.2N
83W
82.5W
82W
81.5W
81W
80.5W
80W
79.5W
79W
1 2 3 4 5 6 8 9 10 11 12 13


njqcV1chg295_spdinc_18z151106
51N
48N
45N
42N
39N
36N
33N
30N
27N
24N
21N
130W
125W
120W
115W
110W
105W
100W
95W
90W
85W
80W
75W
70W
65W
1 2 3 4 5 6 8 9 10 11 12 13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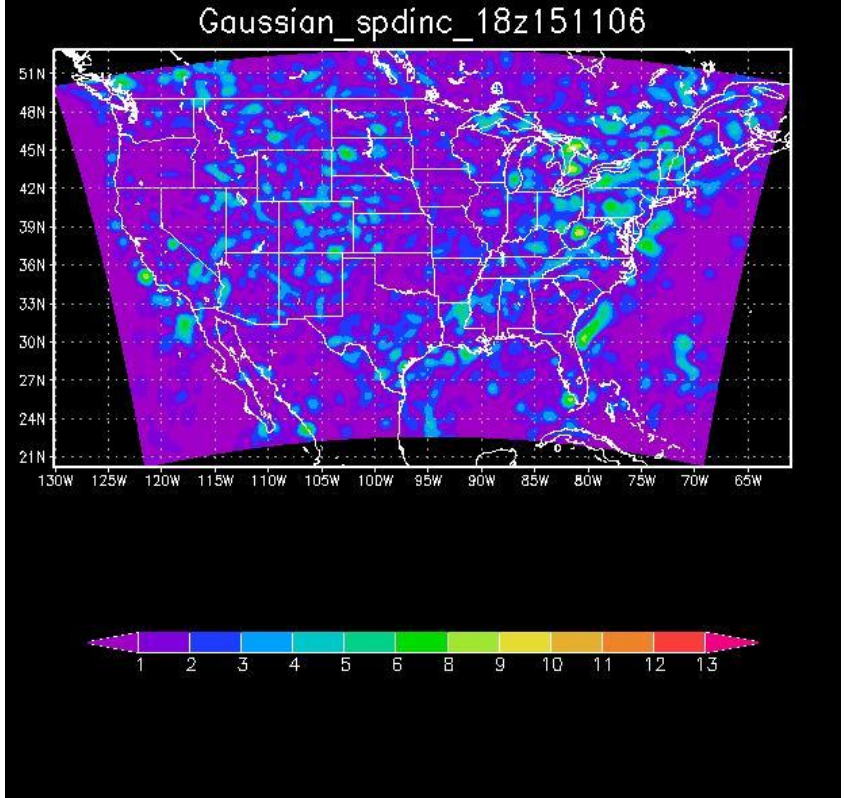
39.6N
38.3N
39N
38.7N
38.4N
38.1N
37.8N
37.5N
37.2N
83W
82.5W
82W
81.5W
81W
80.5W
80W
79.5W
79W
1 2 3 4 5 6 8 9 10 11 12 13


Gaussian_spdinc_18z151106
51N
48N
45N
42N
39N
36N
33N
30N
27N
24N
21N
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125W
120W
115W
110W
105W
100W
95W
90W
85W
80W
75W
70W
65W
1 2 3 4 5 6 8 9 10 11 12 13

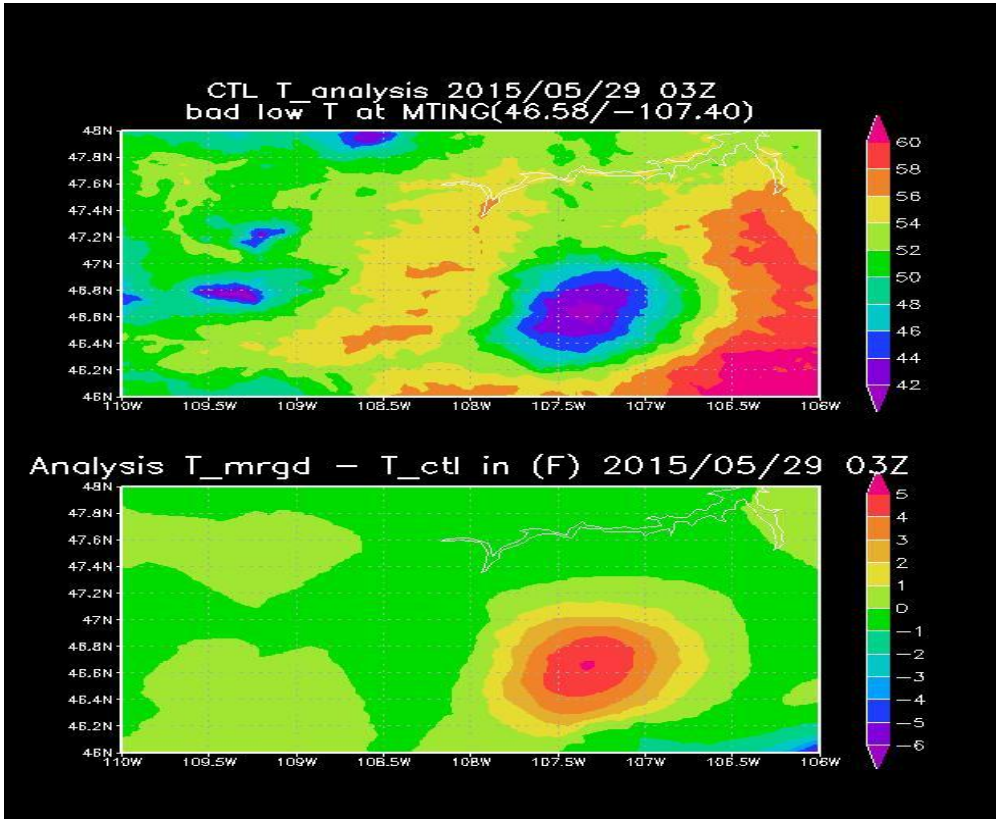
Case three: erroneous low temperature data over Montana 03z 5/29/2015

Top: *OPS* temperature analysis

The bull-eyes reflects a bad low temperature observation

Bottom: *Upgrade - OPS*

The bullseye intensity is reduced by about 5 F.



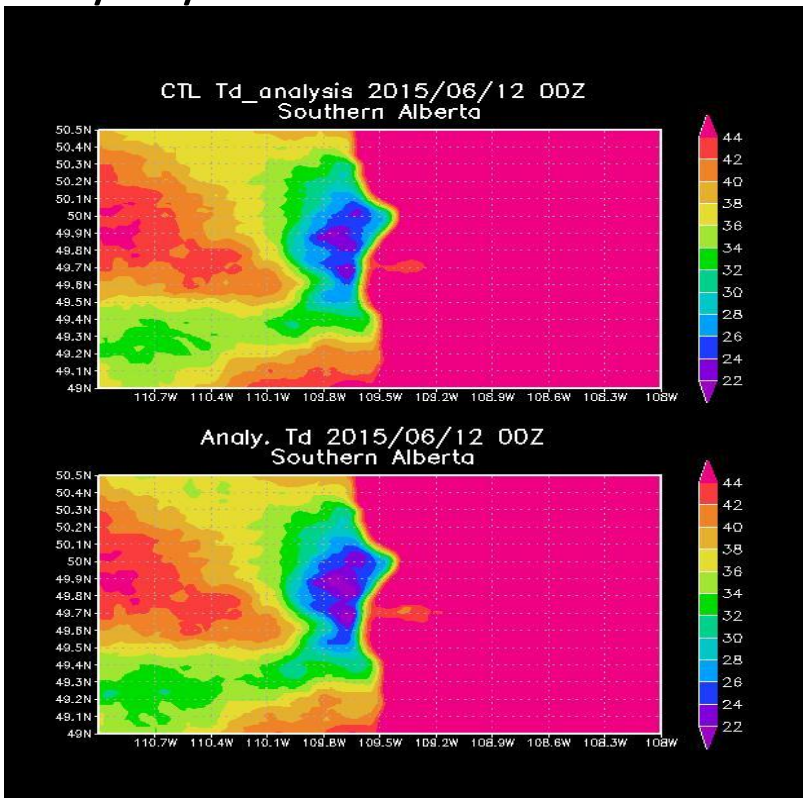
Case four: erroneous low *Td analysis*
00z 6/12/2015

Top: *OPS* Dew-point analysis.

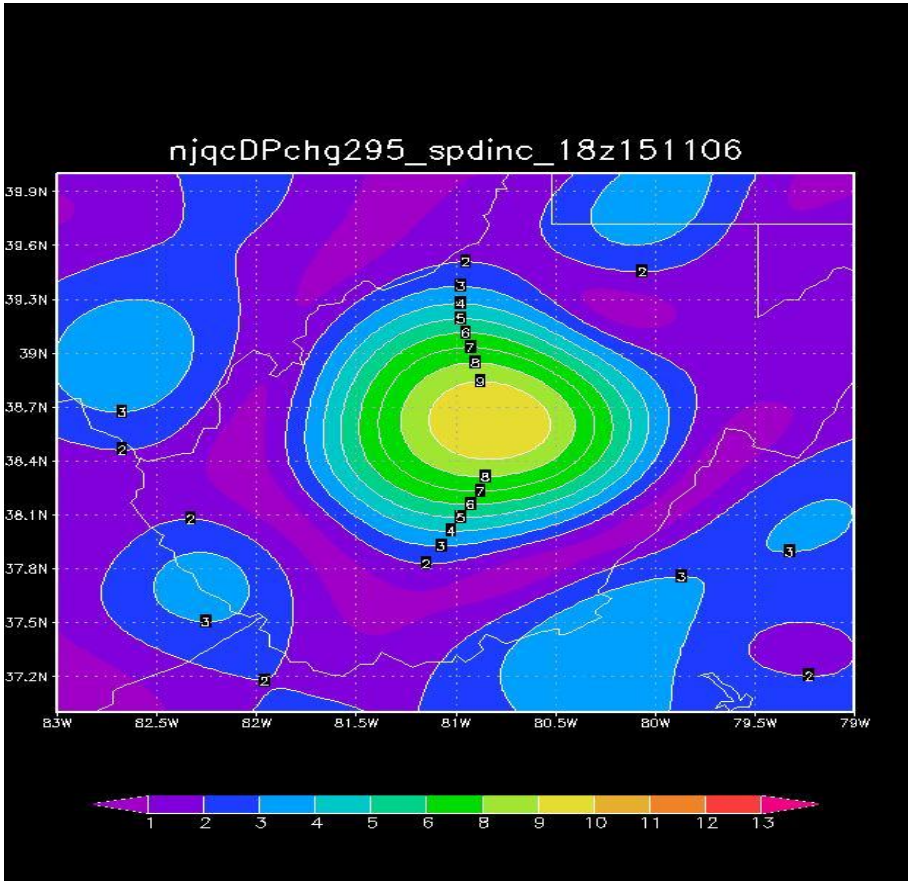
No observation supports the low Td values

Bottom: *Upgrade - OPS*

No improvement, since there are no obs in the area. Feature comes from first guess



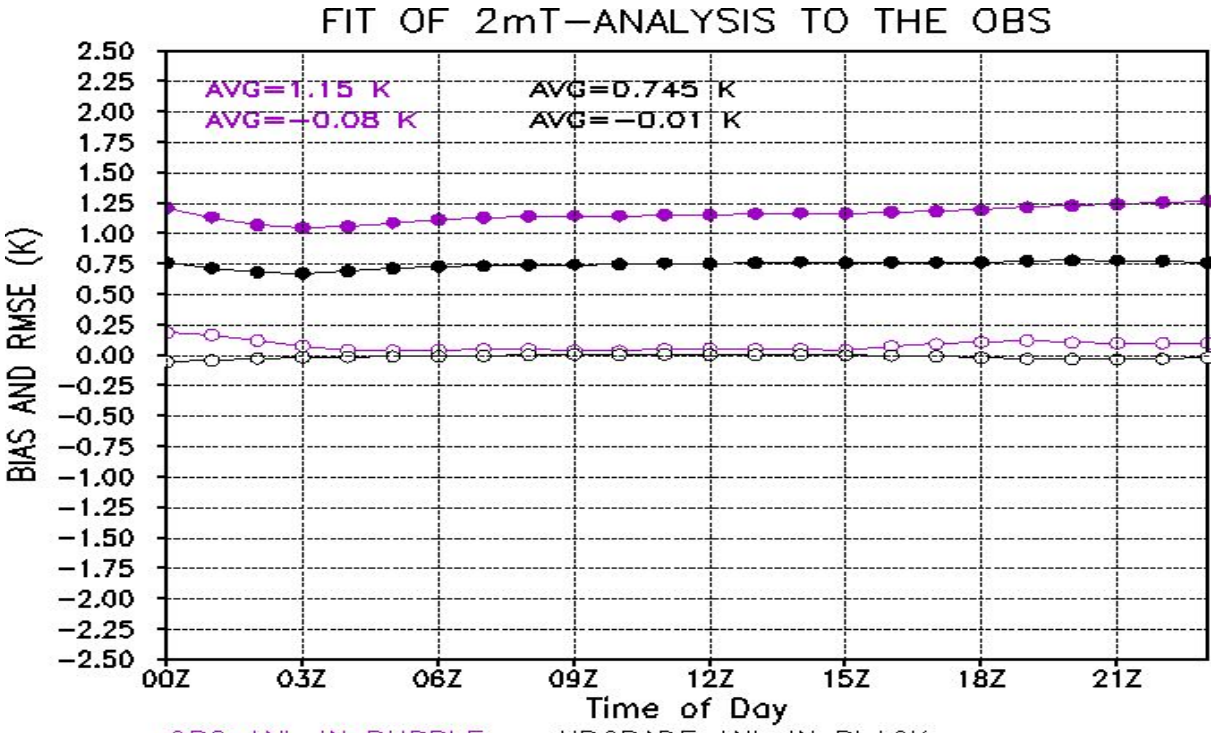
with revised new varqc code and tuned parameters



RTMA-HAWAII

Use separate control varaibles for land & water (T, Q and PS analyssis only). Blacklist 16 stations (out of some 120) that did not align properly with land/sea mask (in future either shift stations slightly or edit land/sea mask)

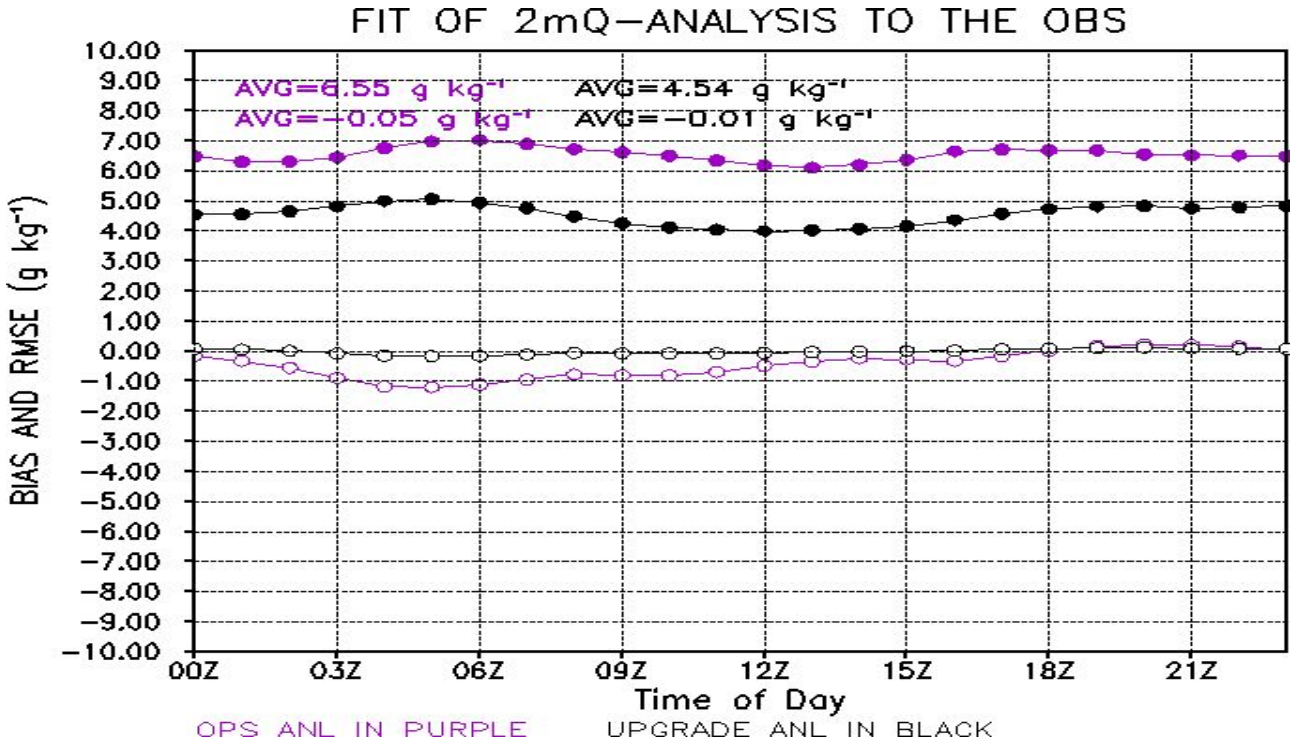
40-day average stats (Nov 11 2015 through Dec 21 2015)



Upgrade improves significanly the overall fit to the obs

RTMA-HAWAII

40-day average stats (Nov 11 2015 through Dec 21 2015)



Upgrade improves significanly the overall fit to the obs