V2.7 RTMA/URMA/RTMA-RU
EMC Change Control Board Meeting

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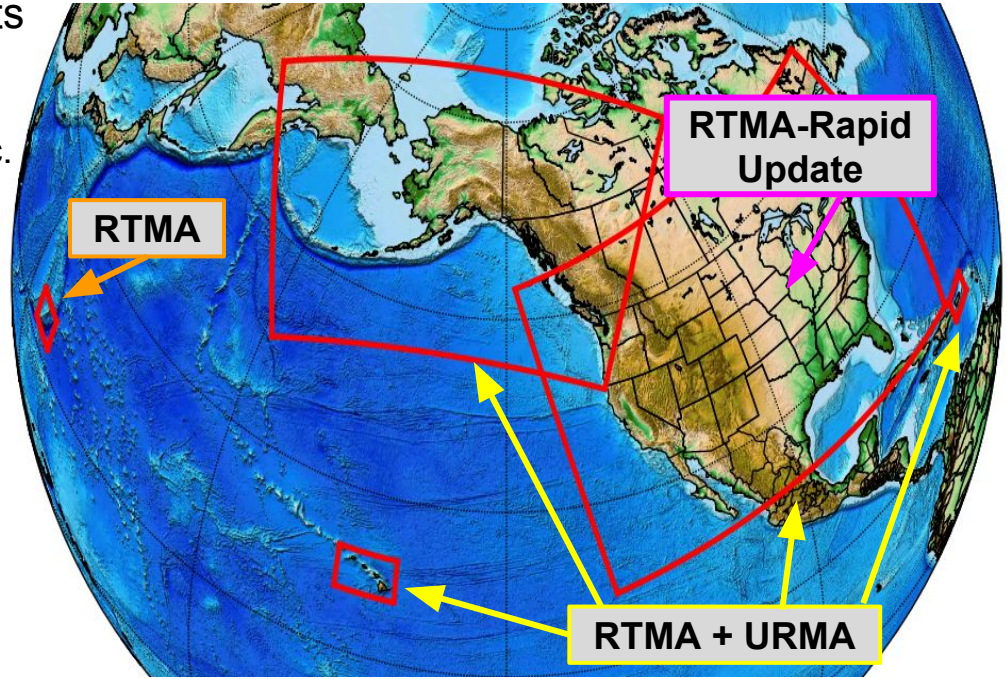
And many other excellent folks from ESRL/GSD, NWS WFOs and Regions, MDL + the NBM team, and NCEP Centers

[1]NCEP/EMC/Modeling and Data Assimilation Branch
[2]IM Systems Group
[3]Systems Research Group

RTMA/URMA/RTMA-RU

- 2D, *2.5km** analysis of sensible wx elements
  - 2DVar system
  - 2m T and moisture, 10m wind and gust, ceiling, visibility, sky cover, wave height, etc.
- **R**eal **T**ime **M**esoscale **A**nalysis (RTMA)
  - Hourly
  - Real time system for nowcasting and situational awareness
- **U**n**R**estricted **M**esoscale **A**nalysis (URMA)
  - Runs 6 hours after RTMA to capture late arriving obs
  - Verification, calibration, analysis of record
  - Calibration in National Blend of Models
- RTMA-**R**apid **U**pdate
  - 15-min updates, low-latency
  - Nowcasting, aviation, + situational awareness



*AK domains are currently at 3 km

SOO-DOH Group Helps Drive Development

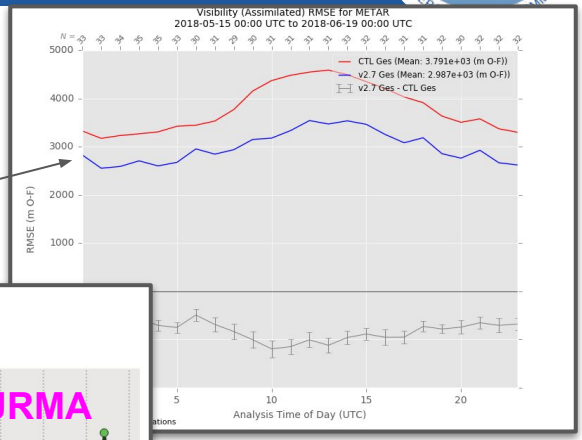
- SOO-DOH RTMA Group formed in 2016, released set of recommended improvements to make the RTMA 'good enough' for field use in November
  - Premise: RTMA is not good enough. These recommendations will make it good enough.
  - Breakout session at 2016 NPSR was dedicated to this, followed up at NPSR 2017
- We released set of plans on what we could accomplish in spring 2017
  - Concurrent with v2.5 upgrade
  - Delicate balance of improving existing capabilities vs. adding new fields
- Many improvements with this upgrade were motivated by issues identified by this group
  - Document has been updated as upgrades have taken place
  - Most other recommendations require re-engineering of GSI and/or obs processing system or major scientific work

v2.7 RTMA/URMA Upgrade: Highlights

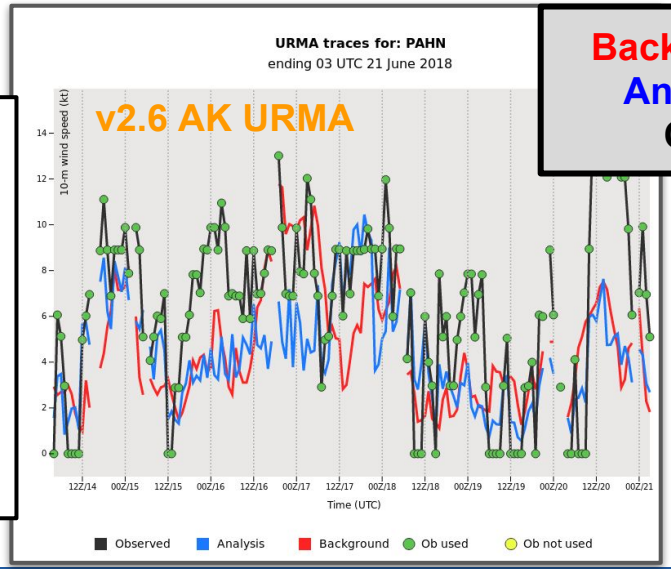
- Use of HRRR-AK in background [AK Region]
- Sky cover and ceiling analysis expanded for all domains [NBM, all regions]
- Improved C&V analysis via algorithm enhancement [FAA, AWC, NBM, all regions]
- Waves for OCONUS URMA [NBM, AK Region, Southern Region (PR), Pacific Region]
- Hourly system for Guam [NBM, Pacific Region]
- Better fit to observations ['Good Enough' item 3 and 4, all stakeholders]
- Winds QC → Ongoing process ['Good enough item 2, all stakeholders]
- Fill in data coverage gaps in Precipitation URMA with MRMS/cmorph [NBM, Western Region, WPC, AWC]
- RTMA-RU → Improved latency (within 15min) and C&V [FAA, AWC]

HRRR-Alaska for AKRTMA and AKURMA

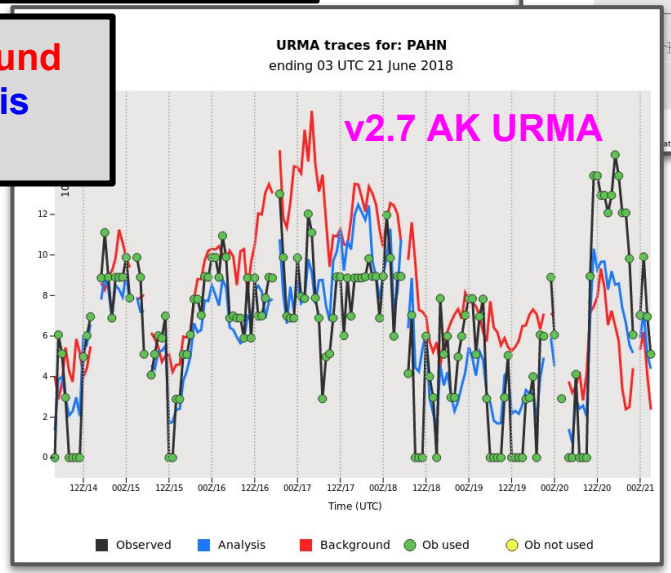
- 3 km HRRR-AK now used in background
- Finer grid spacing, better resolved terrain induced features
- Better background → better analysis [e.g. visibility]



10m Wind Speed (kts)

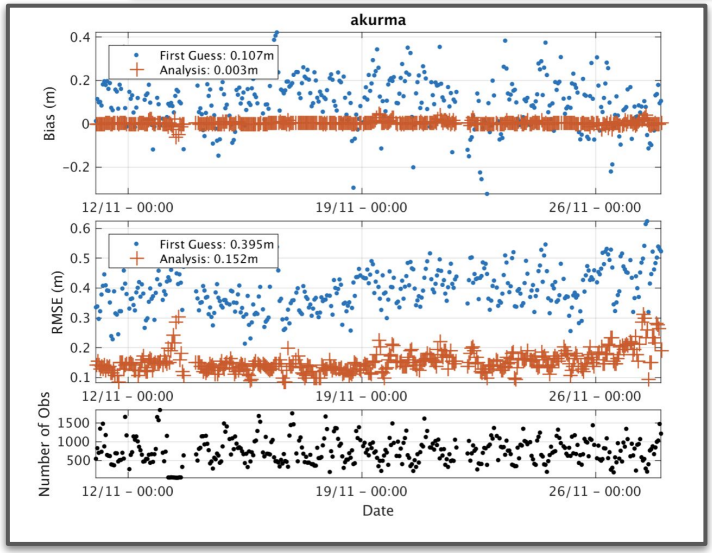


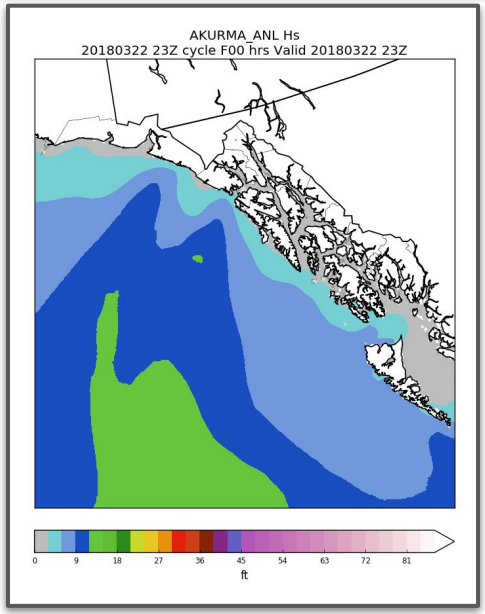
Background
Analysis
Obs

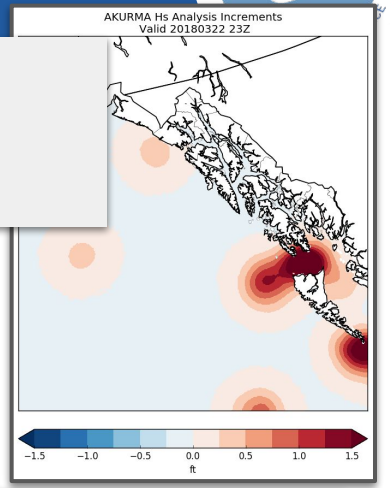


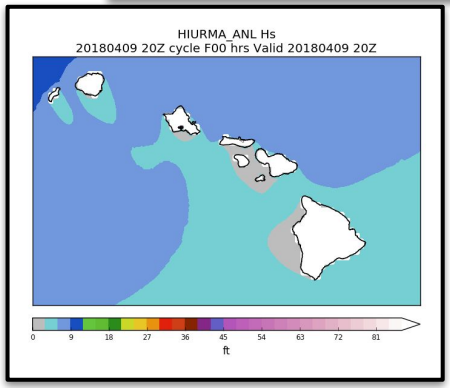
New Variable: OCONUS Waves

- Expanding URMA wave analysis to OCONUS
  - Assimilates buoys and satellite altimeter data
  - Background from Global WW3







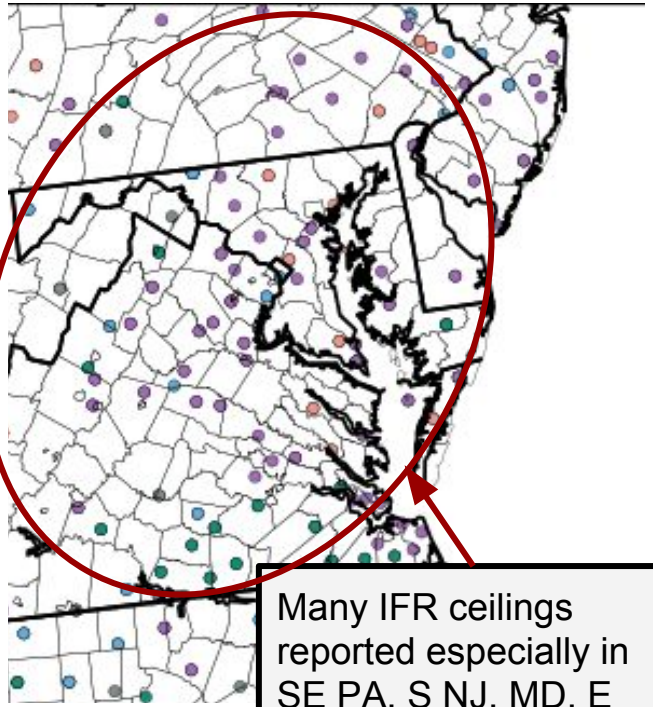


Modifications to the C&V Analysis Algorithm

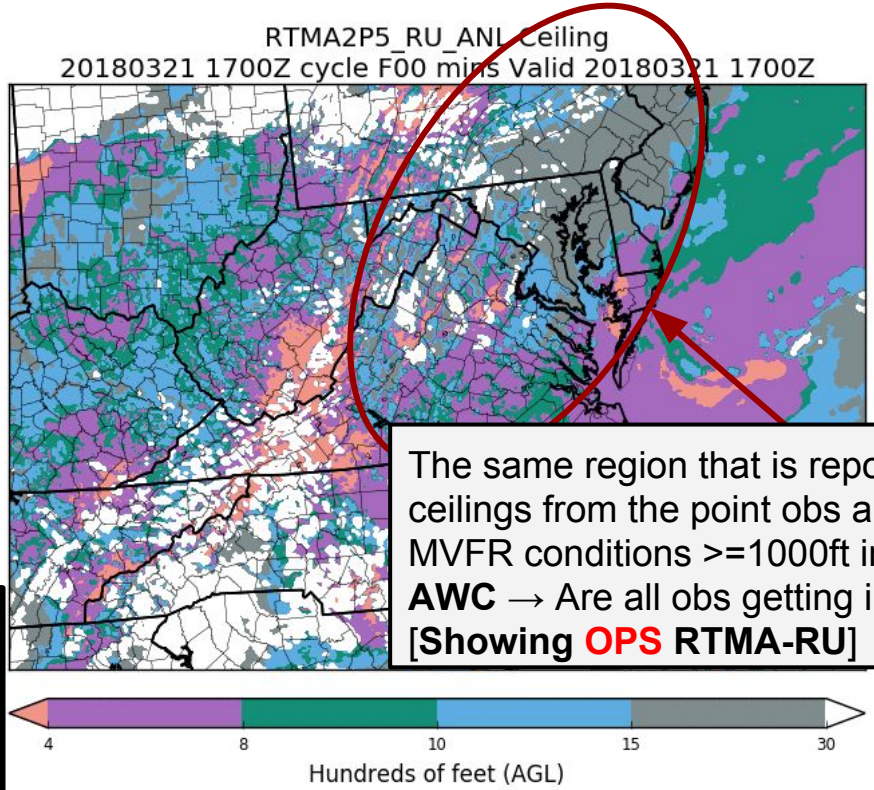
- Analyzing fields that are not continuous and have non-Gaussian error statistics is a major challenge
- We currently transform C&V into logarithmic space within the variational minimization to help address
  - Assumption that O-Fs are not very large - *unfortunately not the case with C&V*
- Large O-Fs lead to errors in the linear transformation of the analysis perturbation

- Solution? Perform every step of the analysis in a log-like space.
- No transform of variable to another inside algorithm
- No negative vis and ceiling

21 March 2018, 17Z Ops Ceiling Analysis



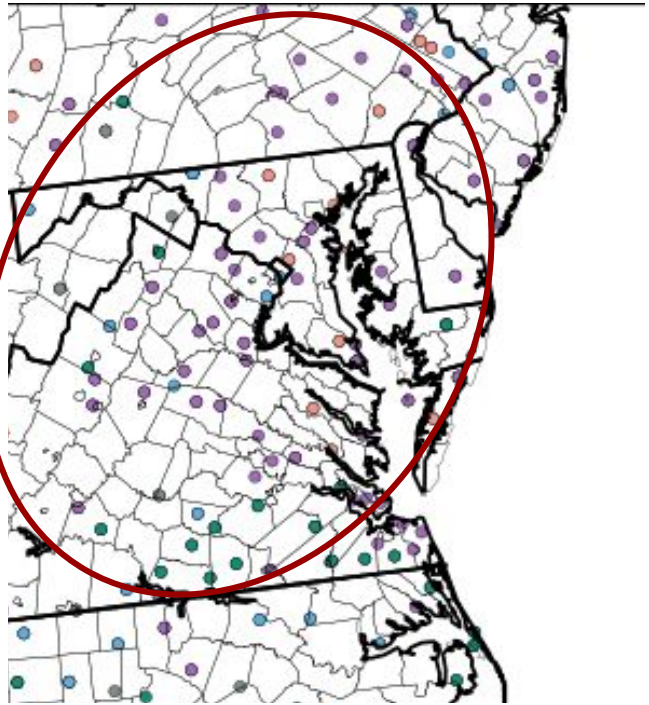
Many IFR ceilings reported especially in SE PA, S NJ, MD, E VA, DE and Long Island, <1000ft many around 300-700ft

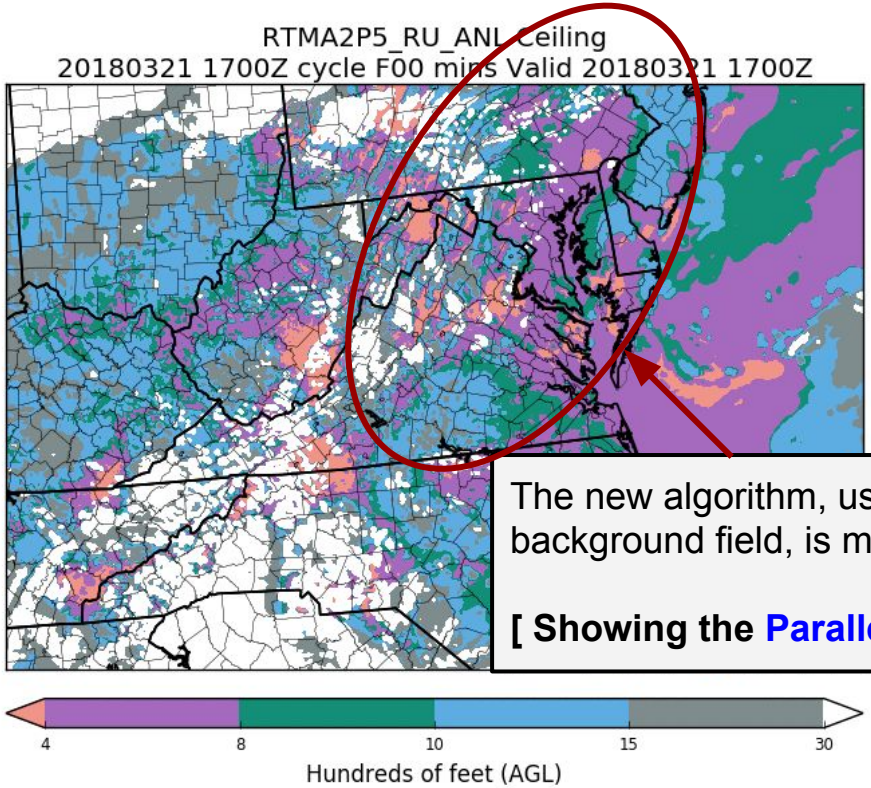


The same region that is reporting IFR to LIFR ceilings from the point obs are only showing MVFR conditions >=1000ft in RTMA

AWC → Are all obs getting into system? [**Showing OPS RTMA-RU**]

21 March 2018, 17Z RTMA Ceiling Analysis [from AWC]

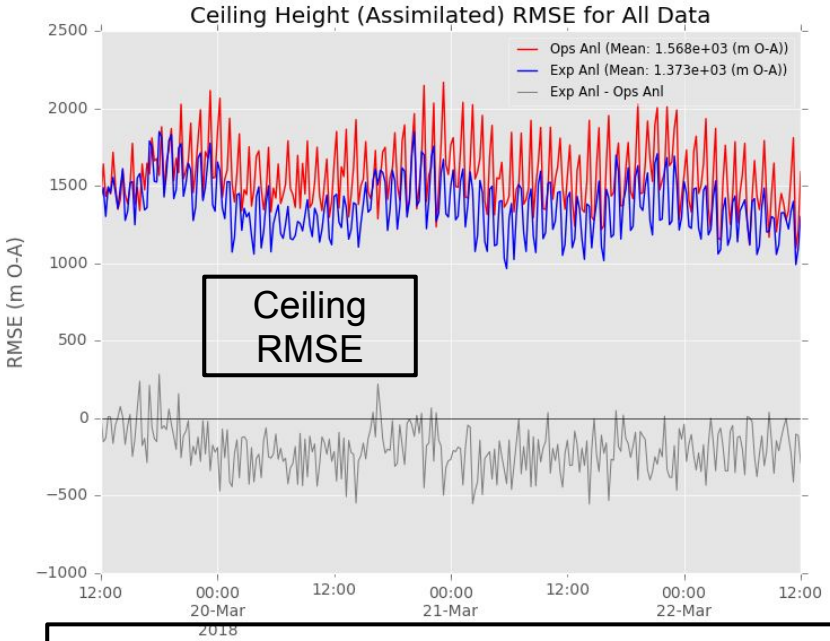


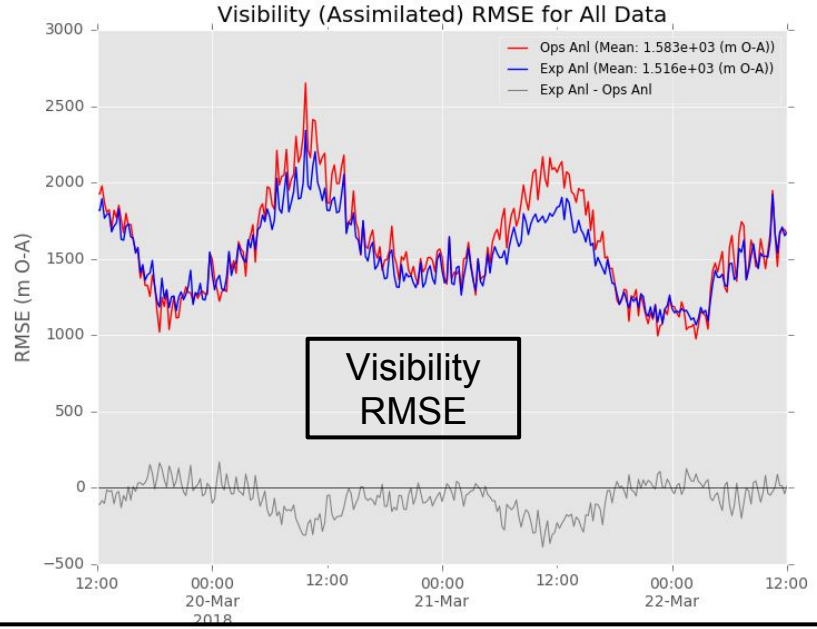


The new algorithm, using the *same* background field, is much improved.

[Showing the Parallel RTMA-RU]

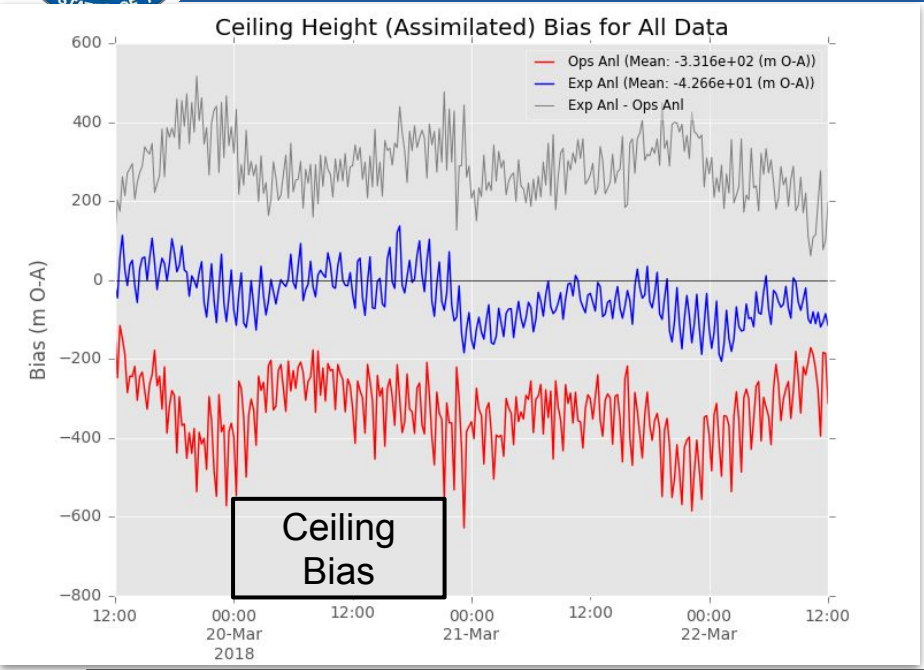
C&V Stats: RMSE [CONUS]

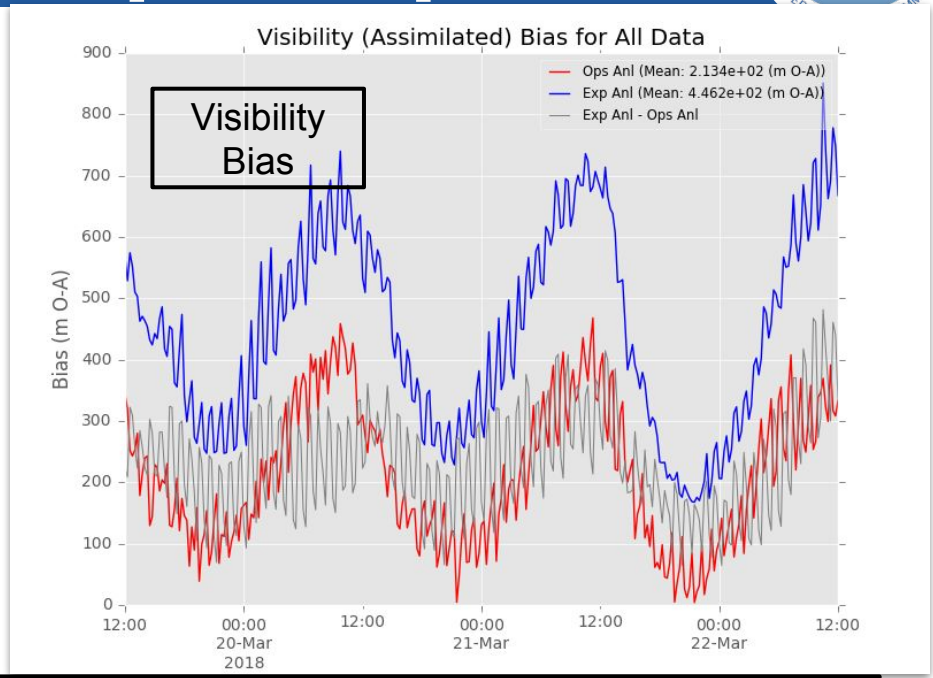




Parallel v2.7 RTMA-RU (blue) fits ceiling and visibility data more closely than v2.6 RTMA-RU (red)

C&V Stats: Bias [CONUS]

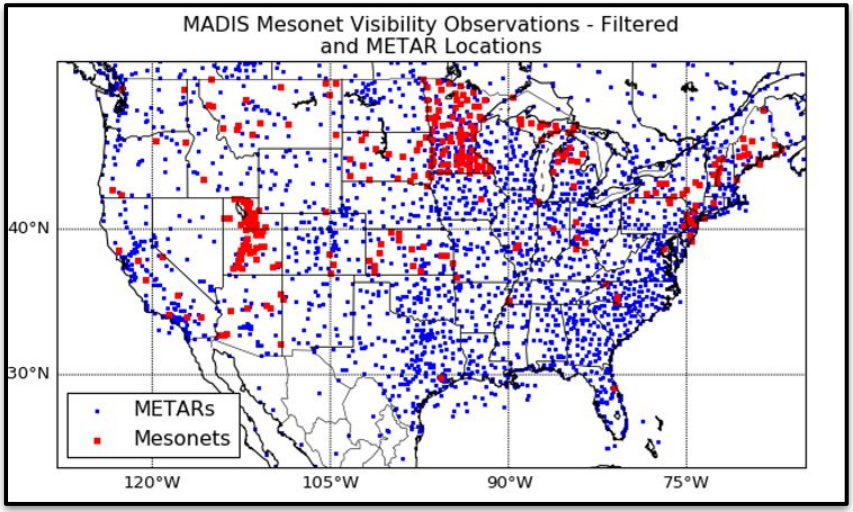




- Parallel v2.7 RTMA-RU (blue) shows a much improved ceiling bias than v2.6 RTMA-RU (red).
- Visibility bias is degraded but in the direction of caution, i.e. toward even lower visibilities
  - Stats are O-A, so >0 values imply an analysis that is too low

Additional Obs: Mesonet Visibility

- Mesonet visibility use-list generated by NOAA ESRL Collaborators* via FAA AWRP
  - Many mesonets have low (< 2.5 km) maximum visibility value which is tough to account for
  - Collaborators ran mesonet vis QC filter on all mesonet stations that reported a visibility during the month of January 2018
- 345 stations out of 1,162 passed the filter (see red locations below → ***new obs!***)

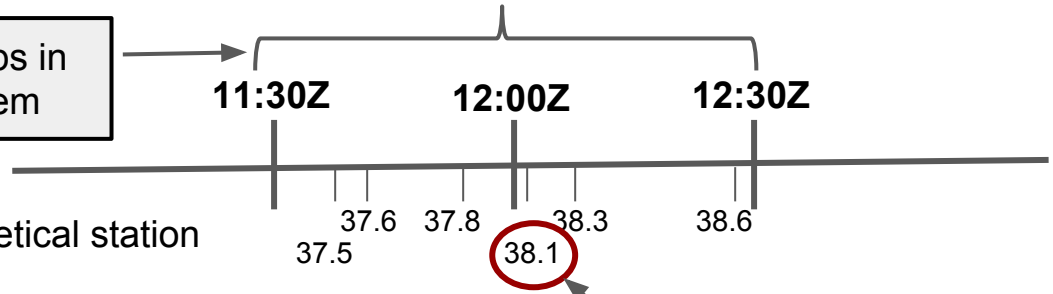


*Thanks to Ken Fenton of ESRL for this work!

Updated Observation Selection Algorithm

- Assimilate only the observation reported closest to the analysis time at each site
- This adjustment allows for a closer fit to observations in each analysis as well as the improved use of special (SPECI) reports (ceiling and visibility).
  - The modified algorithm ensures the SPECIs always get the strongest weight in the analysis.

12Z Ops RTMA/URMA considers all obs in the window and interpolates among them



12Z v2.7 RTMA/URMA
Only considers report closest to analysis time

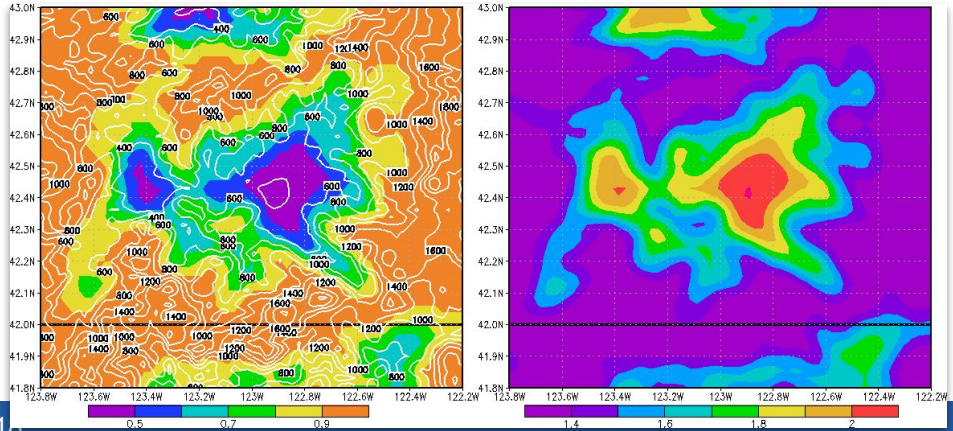
Largest impacts:
- Situations where the element in question may change rapidly
- Frontal passages, valley drainage, etc.
- Closer fit to observations

Revised 2m T Background Error Covariance

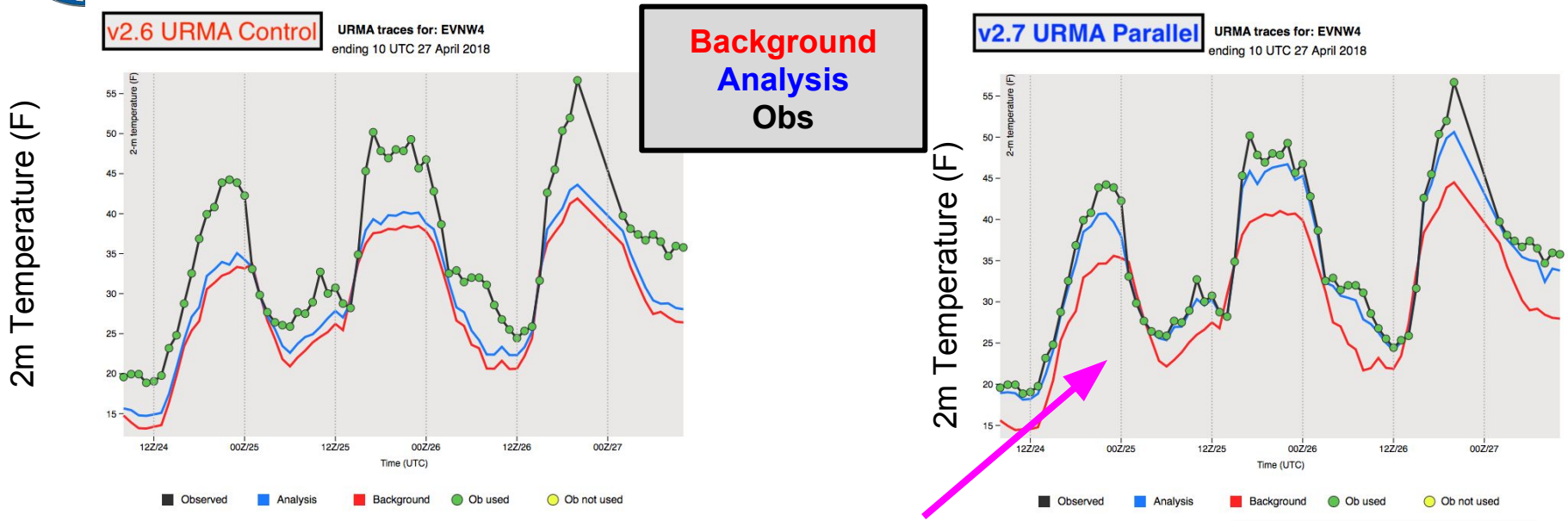
- Analysis is a statistical combination of the observations and background, weighted by their respective errors
- The background 2m T field can struggle in/around complex terrain (i.e. *an error in the background*)
- Incorporate a valley map into the background error to inflate the errors in complex terrain
  - Fit observations more closely where the RTMA/URMA background struggles - valley cold pools

Valley-map and Terrain (m)

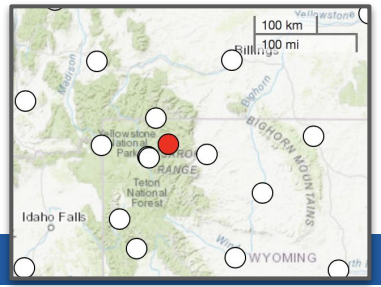
Temperature Background Error Stdev (K)



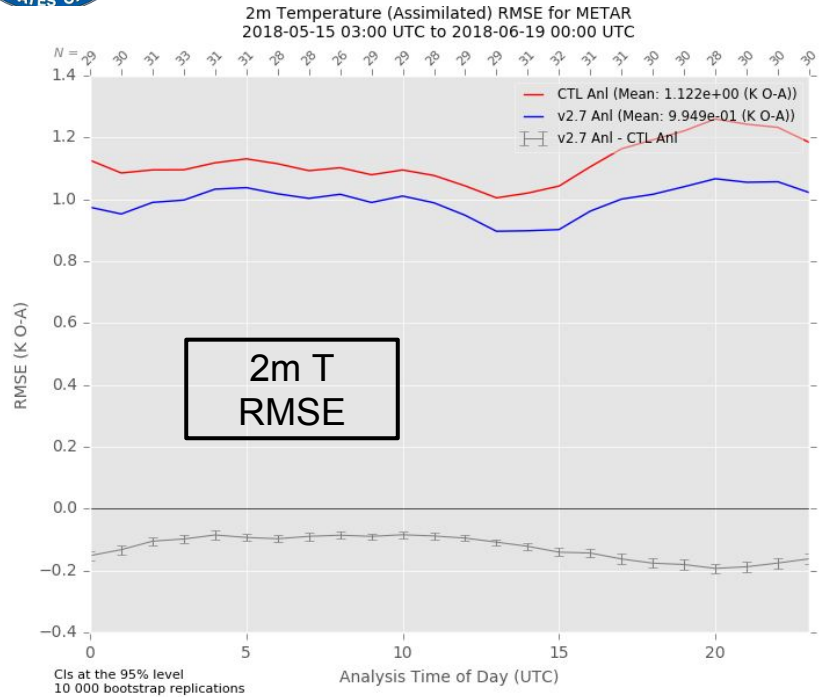
Temperature Analysis Improvements

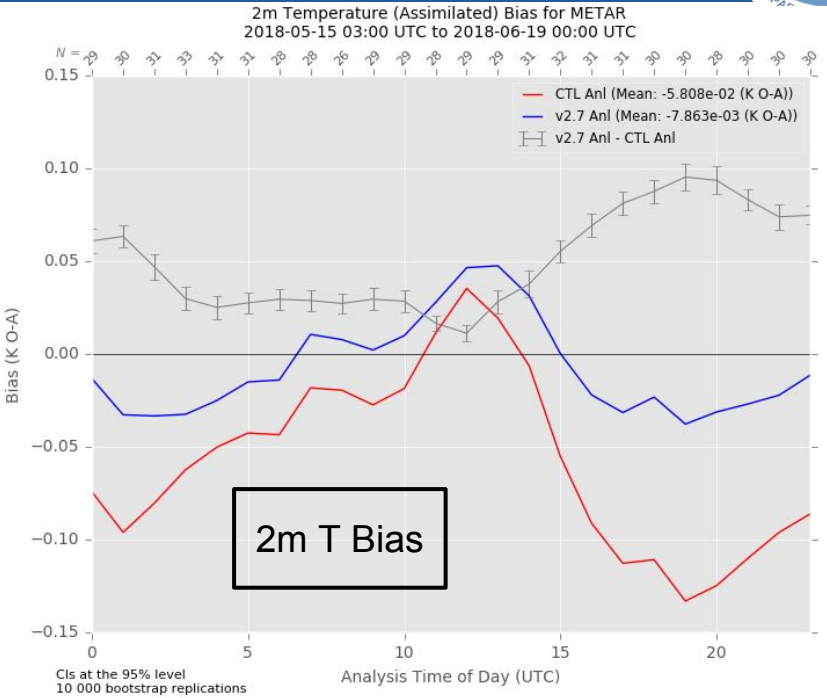


- Apply new background error approach - closer fit to obs
- Updated observation selection algorithm → Use of closest ob to analysis time
- Further relaxed QC in valleys to allow better analysis of valley cold pools



2m T Stats: CONUS





Parallel v2.7 URMA fits 2m T at METARs more closely with an improved bias relative to Ops v2.6 URMA

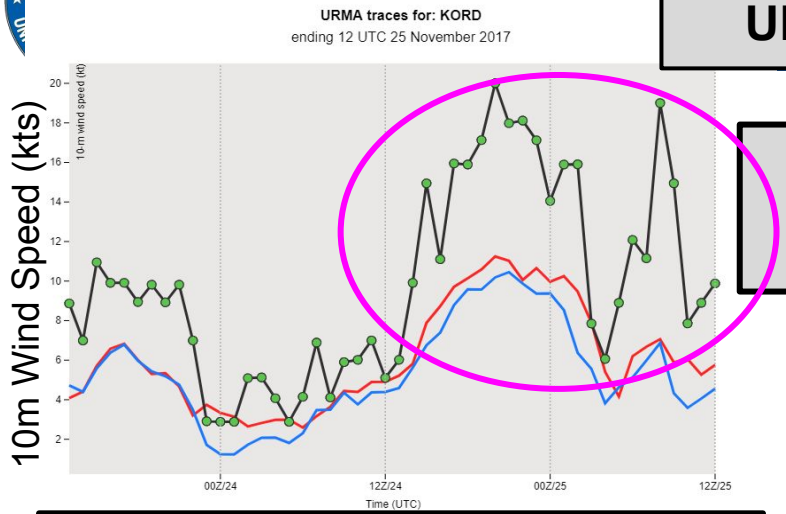
Wind Analysis Challenges

- List of sensor heights for most providers from MesoWest
  - Stations accepted when sensor heights are known, even if <10 m.
  - ‘default setting’ assumes all wind obs are at 10 m
  - Any station can be flagged via if needed (stop-gap measure)
- Metadata gathering effort for CWOP, AWX, WxBug
  - Need for this has been presented to PMO, Nat’l Mesonet project
  - ***Proper metadata is crucial to using these valuable data correctly!***
- Representativeness
  - People live where these stations are, not at airports (but airports are important)
- Goal is to account for **ALL** mesonet stations in analysis.

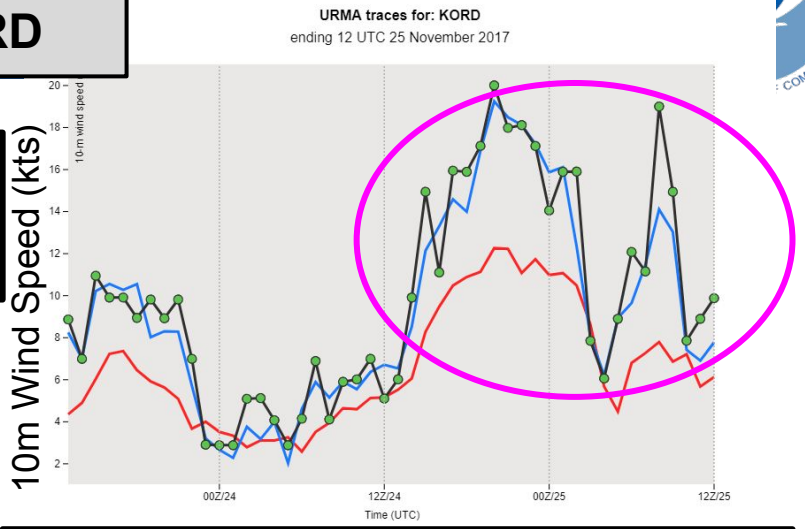
CWOP station photo from http://weather.gladstonefamily.net

may be okay if the chimney isn’t used!

URMA at KORD



Background
Analysis
Obs



Assimilate Winds as in Operations

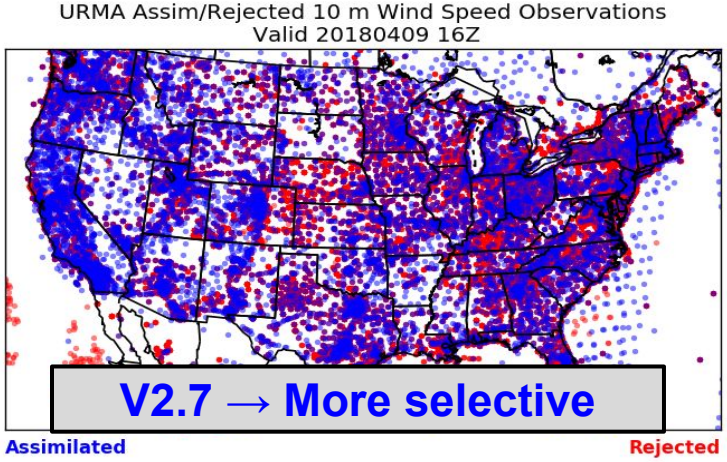
No Assimilation of *any* Mesonet Winds

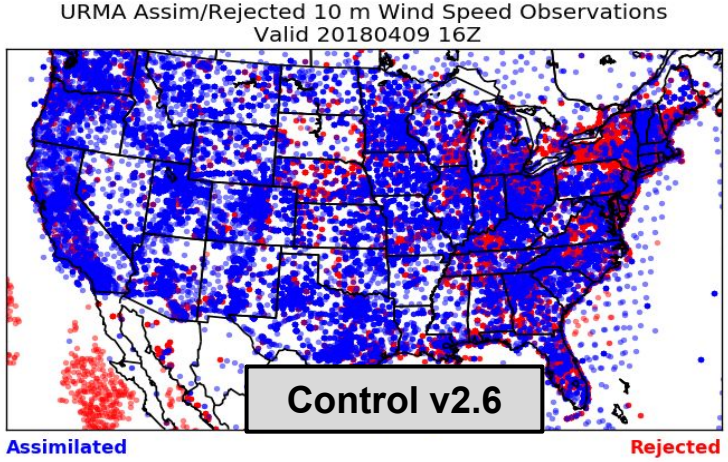
Next Steps for Winds?

- Develop comprehensive metadata database for mesonets → in progress w/ MesoWest, stakeholders, and collaborators
- Update provider use lists → in progress for **CONUS**
- Better metadata allows us to leverage DA algorithm to handle wind obs at heights other than 10 m
- Representativeness - METARs are often at airports. Fine for aviation but what about nearby urban areas where most mesonets reside?
  - Statistical analysis based on urban area mapping GIS data

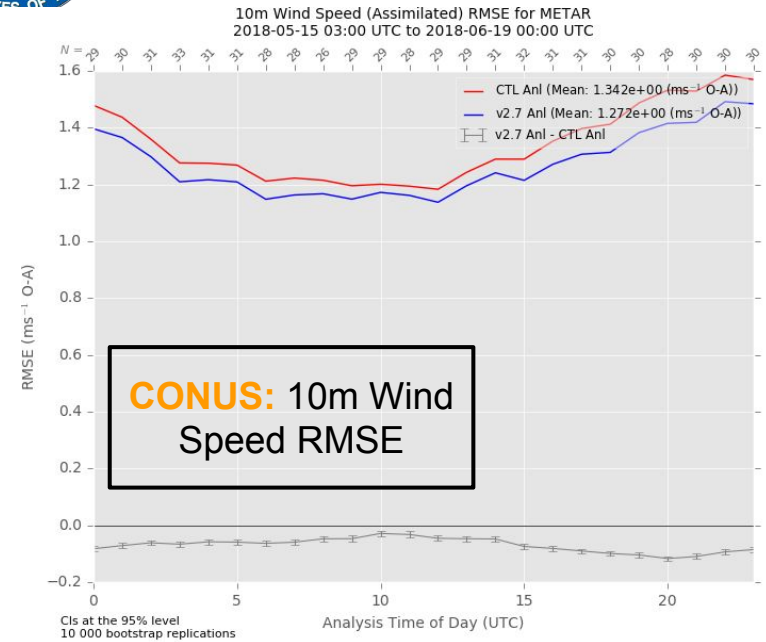
Update Trusted Provider List for Winds

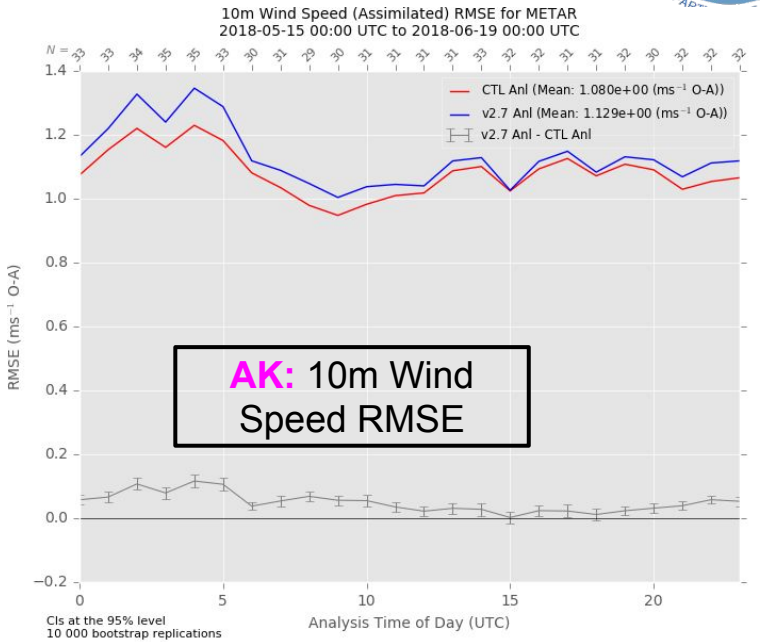
- **CONUS:** Only allow providers with winds having the following characteristics
  - Known anemometer height to be 10m AGL (consistent with analysis algorithm)
  - From a trusted/high-impact network, e.g. RAWS
  - Collaboration with MesoWest, regions, and several SOOs continue to be helpful in this process
- **OCONUS:** All wind data will be considered in OCONUS
  - Domains have fewer observations overall
  - Manage known poor stations via real time reject list





10m Wind Stats

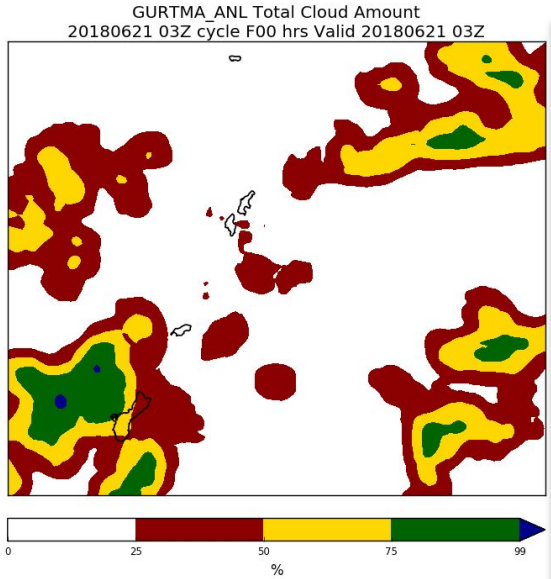


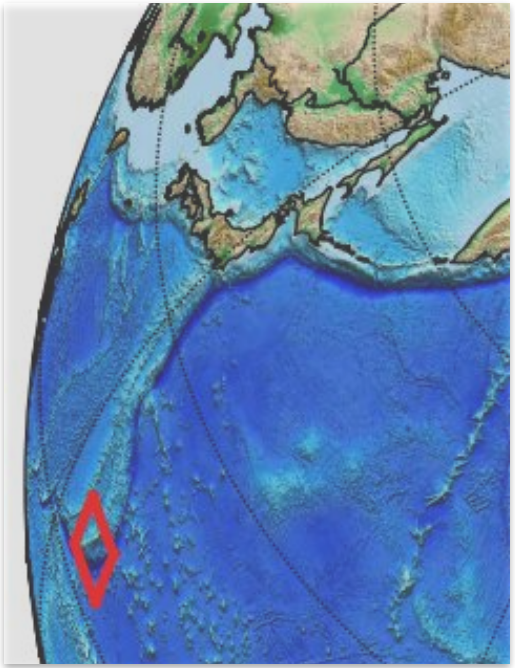


- **CONUS:** v2.7 URMA 10m wind RMSE is *slightly better (~0.07 m/s)*
- **OCONUS**: v2.7 URMA 10m wind RMSE is *slightly worse (~0.05 m/s for AK, ~0.1 to ~0.2 for HI and PR)*
  - Not a surprise! Removal of the wind use list in OCONUS will have this effect - engage stakeholders for real-time QCing of bad stations

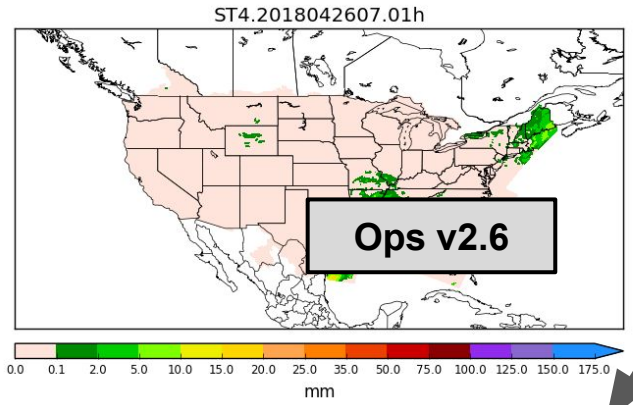
Guam RTMA → Now Hourly

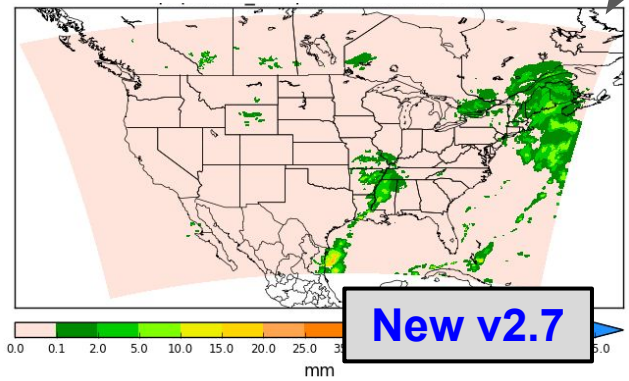
- Ops Guam RTMA
  - 3 hourly, 13 km GFS downscaled background to 2.5 km
  - Cannot be used for NBM, also lacks ceiling and sky cover
- V2.7 Guam RTMA
  - **Hourly**
  - **New background from ~3 km HiRes Window**
  - **Features ceiling and sky cover**
  - **NBM compatible!**
  - **Hourly is consistent with all other domains**





Precip URMA Changes





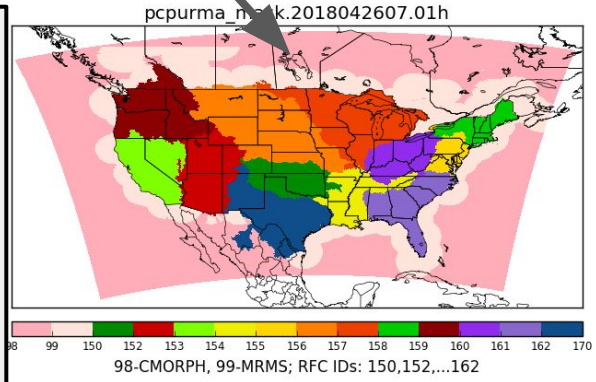
Fill in offshore coverage in Stage IV using gauge QC'd MRMS (if RQI ≥ 0.1) and CMORPH (in that order).

V2.7: Providing data mask shows source of data

- RFC domains fixed; MRMS/CMORPH coverage may vary.

Filling of the offshore coverage is done for both hourly and 6 hourly analyses **starting at 24h past validation time**

→ CMORPH has a ~19h lag
→ gauge QC'd MRMS has a ~60min lag
→ full CONUS coverage from RFCs has up to 26h lag



Evaluations

- Western Region: Approves
  - Continue efforts toward expanding/improving assimilation of mesonet winds.
  - Accelerate progress of METAR station location precision.
- Southern Region: Approves
  - OCONUS wave height, ceiling, and sky cover is beneficial for Puerto Rico.
- Alaska Region: Approves
  - v2.7 is an improvement with better gap winds and temperatures are a bit better. Though the unique terrain, few available observations, and extreme weather still present challenges in AK.
- Eastern Region: Approves
  - The RTMA/URMA system continues to show improvements in v2.7.
  - An overall improvement in ceiling and visibility with less broad coverage over minor visibility/ceiling changes along with fewer unsupported major reductions. However, some bullseye features exist (also noted by MDL) that remain a big issue.
  - Expanded QPE is beneficial for RFCs and WFOs who border Canada.

Evaluations

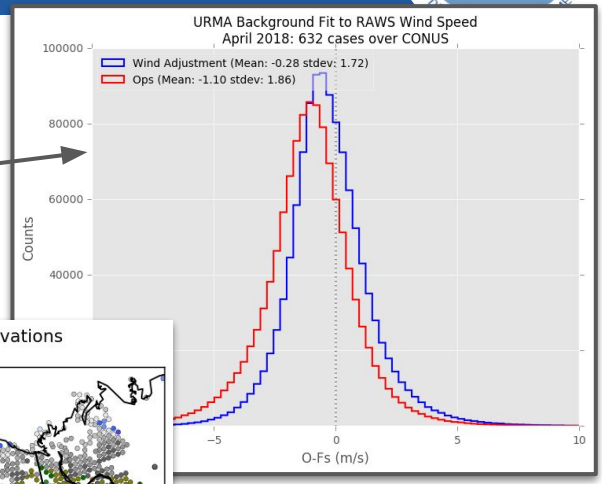
- Aviation Weather Center: Approves
  - Improved C&V analysis which compares better with METARS.
  - RTMA-RU shows correct short term changes in C&V as observed in METARS.
  - Great benefit to aviation ops (more accurate arrival and departure rates) at major airports.
  - Link to pdf of AWC's evaluation slides.
- Weather Prediction Center: Approves
  - v2.7 had an improved 2m T/Td analysis in almost all cases checked.
  - Benefit of the expanded QPE is fairly limited for WPC, except for qualitative comparisons to NWP/WPC QPF. The expansion may be particularly helpful for examination of observed offshore precipitation from tropical systems in order to gauge potential inland impacts.

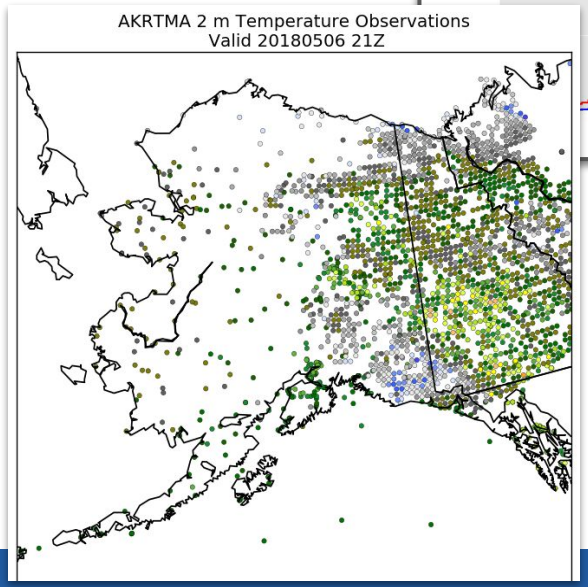
Evaluations

- MDL: Approves
  - New visibility analysis is better, ceiling looks similar to operations. Both C&V, on occasion, exhibit bullseyes in the analysis that are undesirable.
  - Hourly Guam and unification of analysis fields across OCONUS improves support provided by NBM to OCONUS.
  - 2m T analysis is very good and with the addition of the obs blacklist option, stakeholders are able to assure that unrepresentative observations are removed.
  - Offhsore QPE allows NBM to apply calibration uniformly across the domain instead of truncating at the coast.

What's Next - Some highlights for v2.8

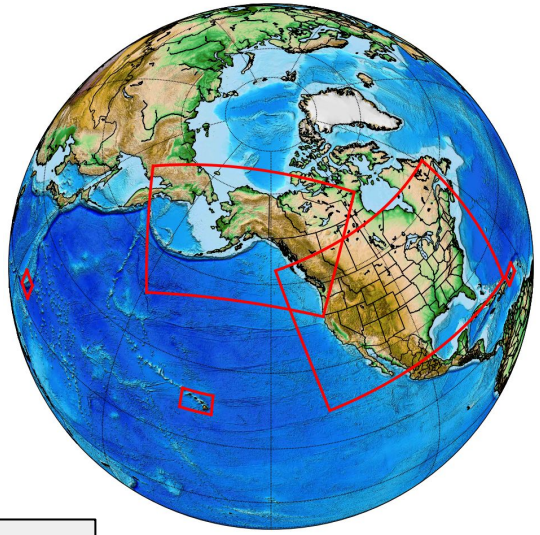
- Improve engagement with OCONUS partners
- Improve observation operators for wind
  - Incorporate similarity theory-based adjustment
  - Continue pursuit of enhanced station metadata with partners
- Continue improvement of QC
- Incorporate elevation adjustment in temperature assimilation
- Assimilation of VIIRS LSTs
  - Project with AK Region
- Update/enhance downscaling
- Snowfall analysis





RTMA/URMA

- Many improvements to going into the next bundle, v2.7 (Fall 2018)
  - Updated 2m T background error covariance → better fits to obs, esp. in complex terrain
  - 3 km HRRR-AK background for AK
  - Improved wind QC
  - Improved CONUS offshore precip coverage
  - Hourly Guam with HiResW background
  - Sky cover, better C&V, waves in URMA
  - Improved latency and C&V in RTMA-RU
- Ongoing field interaction with VLab:
  - Community: https://vlab.ncep.noaa.gov/group/715073/home
  - Forum/email: rtma.feedback.vlab@noaa.gov



Disclaimer: This research is in response to requirements and funding by the Federal Aviation Administration (FAA). The views expressed are those of the authors and do not necessarily represent the official policy or position of the FAA.

Resources

Upstream Dependency Changes

- Hi-Res Window ARW being used for hourly Guam RTMA system
- Obsproc upgrade
  - Unify obs used in RTMA and URMA
  - Mesonet visibility obs
  - New URMA dumps: satmar (reading from tanks in current prod)
  - Re-threading RTMA-RU dumping to reduce walltime
- Rely on RAPv4/HRRRv3 (including AK-HRRR)
  - We are running off NCO parallel now
- SmartInit Changes for RAP, HRRR, NAM

Output Additions

- Guam: 3 hourly RTMA → Hourly
  - Note: there is no Guam URMA and there are no plans for one
- New variables [all added to current output files]
  - CONUS: pcpurma analysis and accompanying data mask files on “wexp” grid (nomads and com), add ~15mb/day nomads space, ~100mb/day com space (including mrms/cmorph files on com)
  - Alaska (add ~500 mb/day com space) - Sky cover and waves
  - Hawaii (add ~100 mb/day com space) - sky cover, waves, and ceiling
  - Puerto Rico (add ~100 mb/day com space) - sky cover, waves, and ceiling
  - Guam [All are RTMA] (add ~50 mb/day com space) - sky cover and ceiling, now hourly

No changes for SBN/AWIPS.

REQUEST: Keep 10 days worth of files alerted for RTMA/URMA for all runs on NOMADS/ftp (currently 2-3 days based on run). Each day is about 16 GB total (including RTMA-RU)

Output Subtractions

- 5 km CONUS RTMA files
- 6 km Alaska files
- 5 km NESDIS RTMA sky cover
  - Update name of sky cover file following removal of the obsolete 5-km NESDIS sky cover product
    - Rename file **ds.tcdc.bin** to **ds.sky.bin**
- Alert ONLY *wexp grib2 files for RTMA/URMA‡
  - Remove generation of smaller (ndfd, ext) grids from post?
    - With the exception of pcprtma2.yyyymmddhh.grb2, which is on g184 (no offshore coverage for pcprtma available)

Resource Changes

- Expect no overall change in disk usage
- Node use is effectively unchanged, with the exception of the addition Guam RTMA
  - Guam jobs are very, very small in comparison to CONUS.
  - Current ops runtimes not expected to change
    - Guess: serial job, runs in < 10s
    - Analysis: 16 cpus, runs in ~3 minutes
    - Post: 16 cpus, runs in ~ 10s
  - Current file sizes:
    - ~1.5 MB in grib2 for analysis, guess, and analysis error files per cycle [12 MB per day]
    - Adding~24 MB more per day for Guam in grib2 output for total of 36 MB per day

Bugzillas

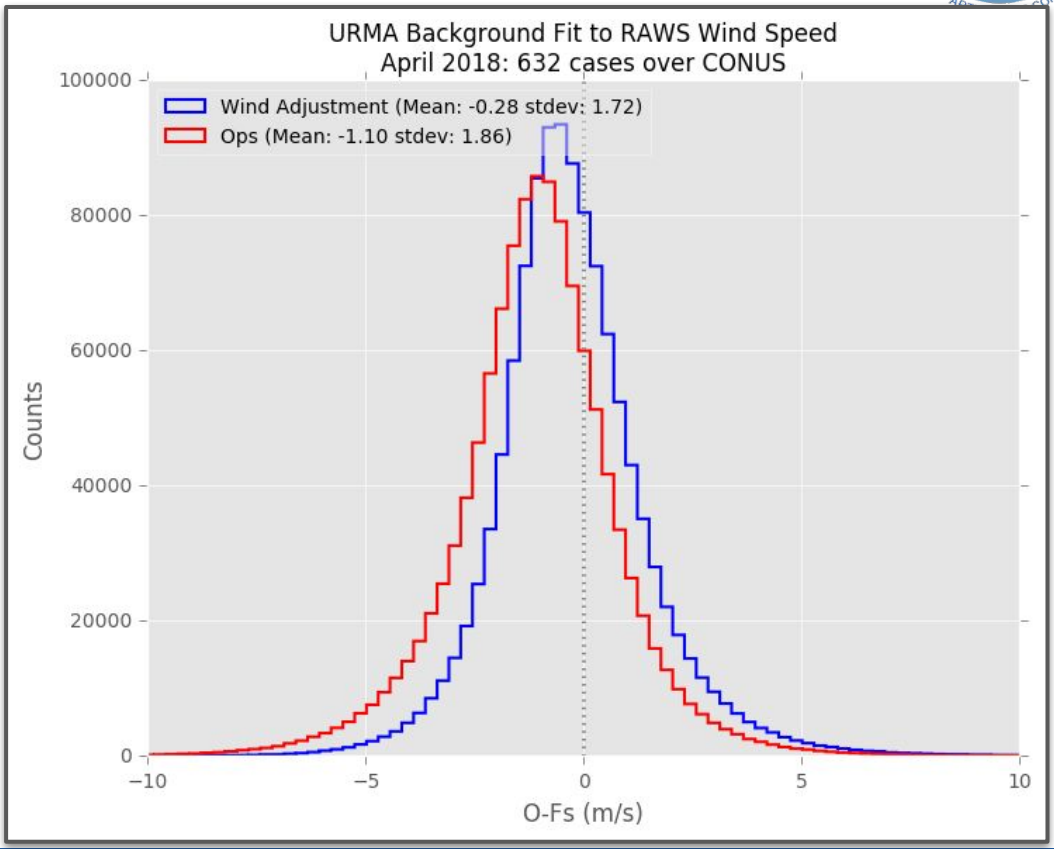
Bug ID	Product	Component	Status	Resolution	Summary
681	URMA	getguess	RESOLVED	FIXED	Array subscript out of bounds in exec/*firstguess (URMA)
683	URMA	gsianal	NEW	---	Array subscript out of bounds in exec/*gsianl (URMA)
688	URMA	post	RESOLVED	FIXED	URMA executable names do not match their top level source directory names
691	URMA	gsianal	RESOLVED	FIXED	Shared working directory used by URMA gsianl and post jobs
551	PCPANL	stage2	RESOLVED	FIXED	Verify required tar_bias files are copied before attempting to process
552	PCPANL	stage4	RESOLVED	FIXED	Only add successfully generated analysis files to toplot4 file
689	PCPANL	stage2	RESOLVED	FIXED	pcpanl executables do not redirect stdout and stderr to files
692	PCPANL	stage4	RESOLVED	FIXED	Memory leaks in exec/st4_mrms_hrlywgts
696	URMA	pcpn	RESOLVED	FIXED	Confusing error messages when the urma_pcp_pcpn job aborts because of missing ST4 files
243	URMA	gempak	RESOLVED	FIXED	Generate the URMA Gempak files using grib2 files
368	URMA	gsianal	NEW	---	Reduce GOTO statements from URMA Fortran source codes
682	RTMA	gsianal	NEW	---	Array subscript out of bounds in exec/*gsianl (RTMA)
697	RTMA	pcpn	RESOLVED	FIXED	Lack of warning when no ST2 and ST4 files pcpanl files are present. Solution: when both data sources are missing, in NCO mode send email alert to SPA/SOS desks and developer that no RTMA would be produced for the hour; in dev mode the alert is posted in job output..
680	RTMA	getguess	RESOLVED	FIXED	Array subscript out of bounds in exec/*firstguess
695	RTMA	getguess	NEW	---	Unclear error messages in RTMA and URMA getguess jobs
649	RTMA	gempak	RESOLVED	FIXED	Remove Guam GEMPAK production
694	RTMA	getguess	RESOLVED	FIXED	Send a warning message when FGAT is turned off in RU-RTMA
553	RTMA	gsianal	RESOLVED	FIXED	general_sub2grid_mod compilation warnings
693	RTMA	gsianal	NEW	---	Memory leaks in RTMA and URMA gsianl jobs
690	RTMA	gsianal	RESOLVED	FIXED	Shared working directory used by RTMA gsianl and post jobs
241	RTMA	gempak	RESOLVED	FIXED	Generate the RTMA Gempak files using grib2 files
367	RTMA	gsianal	NEW	---	Reduce GOTO statements from RTMA Fortran source codes (mainly gsi code)

KEY
FIXED
IN PROGRESS
IMPROVED
NOT FIXED

Supplemental Slides

v2.8: *Better Metadata, Better Wind Analysis*

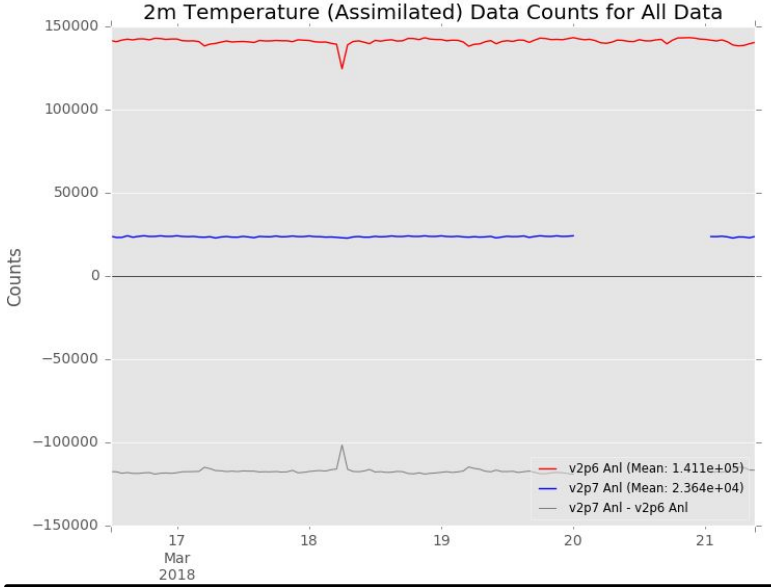
- Test very simple adjustment for 6m AGL winds from RAWS
  - Neutral stability, uniform roughness length for all sites
- Improved bias with fits to the background
- Challenge? Most mesonet networks have little to no metadata
- Those that have metadata are well-sited anyway
- More outreach is needed to gather and collect metadata before we can use

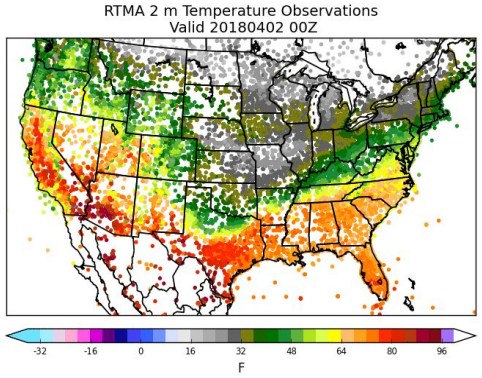


Updated Observation Selection Algorithm

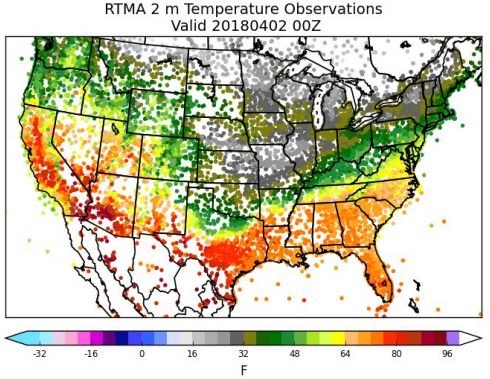
Using closest report → factor of ~6 reduction in total 2m T *reports* used

Still use the ***same*** number of *stations*





Ops RTMA
Assimilated 2mT obs

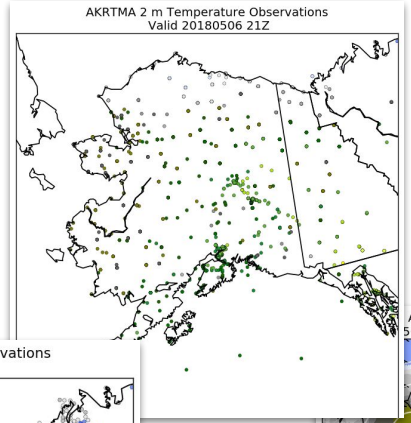


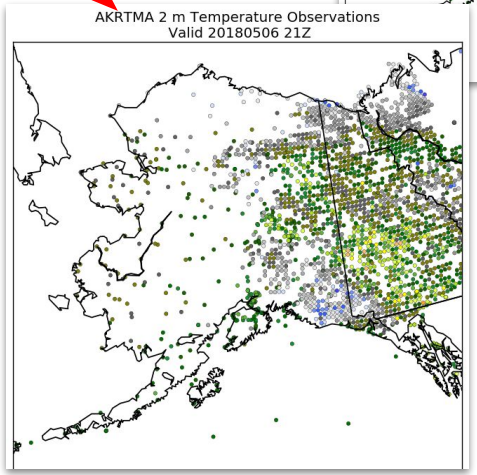
v2.7 RTMA
Assimilated 2mT obs

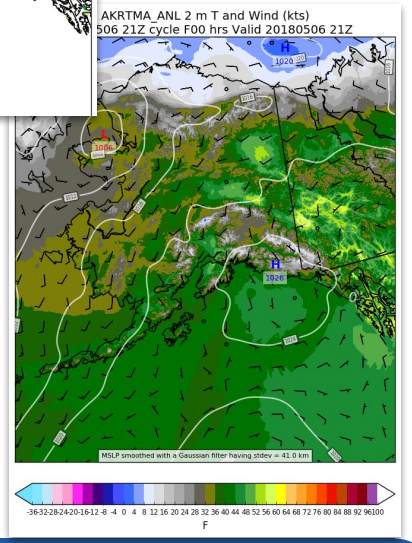
Use of closest report → a sharper analysis more representative of the conditions at analysis time
A closer fit to the observations - removes implicit temporal smoothing

v2.8/v2.9: Assimilating VIIRS LST's in RTMA

- Observing network in AK is sparse
- Satellite data can fill in many of these gaps
- 2DVar framework of RTMA is not amenable to direct assimilation of satellite radiances
  - Need a 3D atmospheric component
  - Possible in future 3DRTMA
- Assimilation of satellite retrieval products is a viable alternative
  - Compensate for the lack of in-situ observations in AK
- Method can be extended to other domains as well!

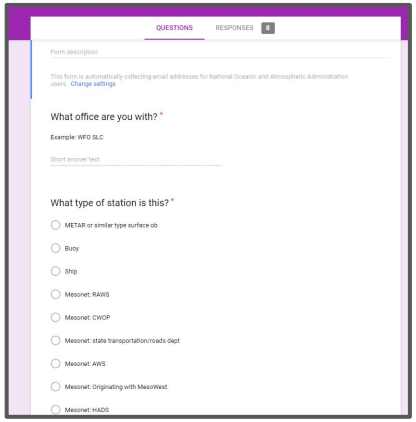


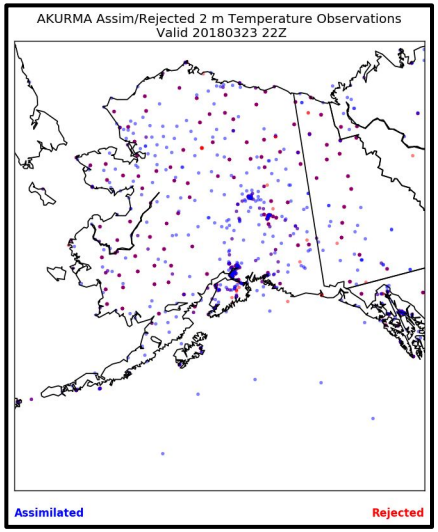


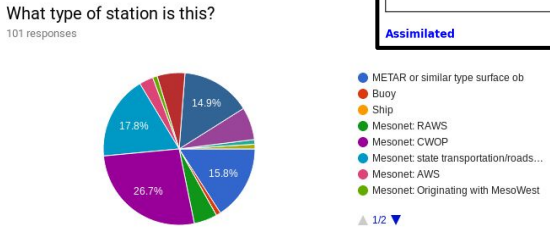


Near Real Time Station Blacklisting

- v2.6: Leverage WFO local expertise to inform NCEP/EMC about bad stations
- Use NOAA's RTMA VLab site to report bad stations
  - Requests can be tracked/logged/mined for future QC development
  - Over 100 requests so far
- Submissions via WFO SOOs and regions
- Elements from offending stations are blacklisted after appropriate review by NCEP/EMC
  - No waiting for an implementation!
  - Stations can be flagged just for temperature, moisture, etc.

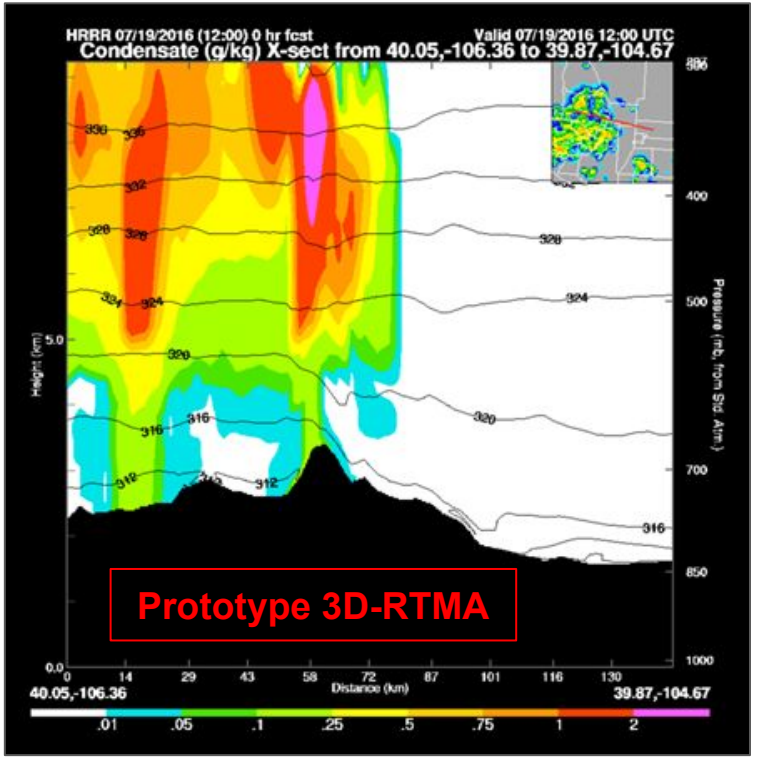






The Move to Three Dimensions

- 3 Year Plan to Develop 3D-RTMA/URMA
  - With sub-hourly updates
  - CONUS + Alaska
- JTTI + FAA funded joint development effort between EMC + ESRL/GSD
- Real time, rapid updated analysis of 3D atmospheric fields
  - Severe and aviation weather parameters
  - Analysis of hydrometeor and cloud fields
  - Assimilation of radar observations
  - Heavy rainfall, etc.



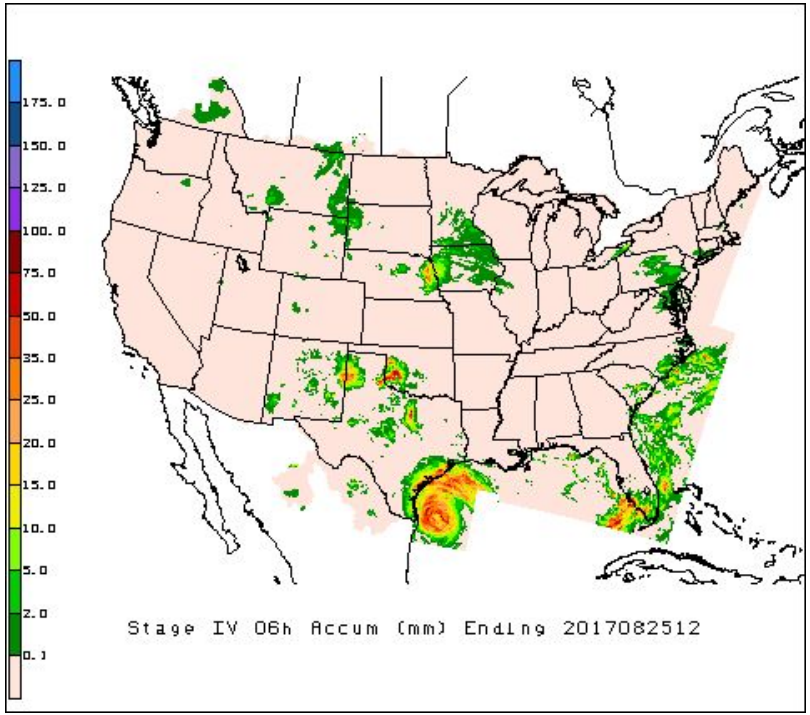
Thanks to ESRL/GSD for this figure

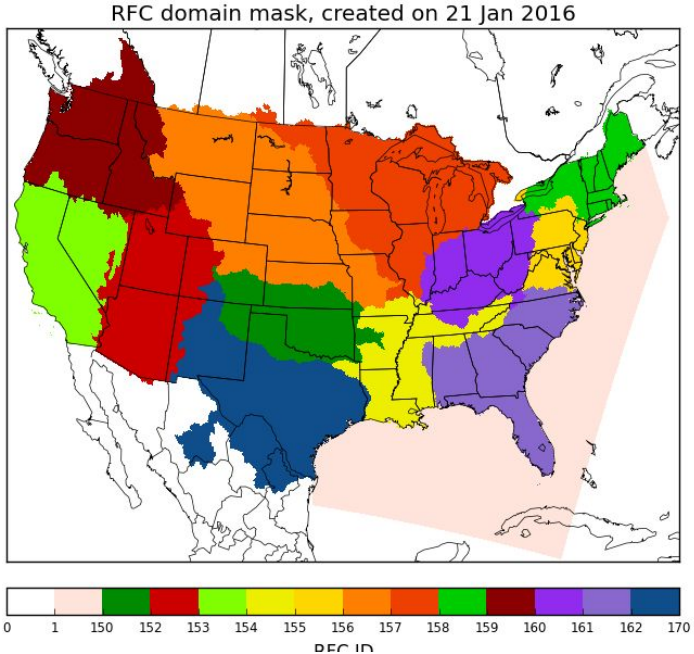
Ongoing Challenge: Point Obs vs Grids

- We analyze (and forecast) on a grid, but people care about obs at points
- RTMA is largely being compared to MatchObsAll or other obs grids
  - Forecasters are used to a near or exact match to trusted obs, even if conditions within grid box vary
- Trusted obs are usually METAR sites, but RTMA uses many others
  - People don't live at the airport, and conditions vary by environment (RWIS, railroad, rec site, industrial site, residential subdivision)
- Varying levels of support/acceptance of this
  - Sometimes matching obs can lead to non-meteorological features getting into a grid

Extra PCPURMA Information

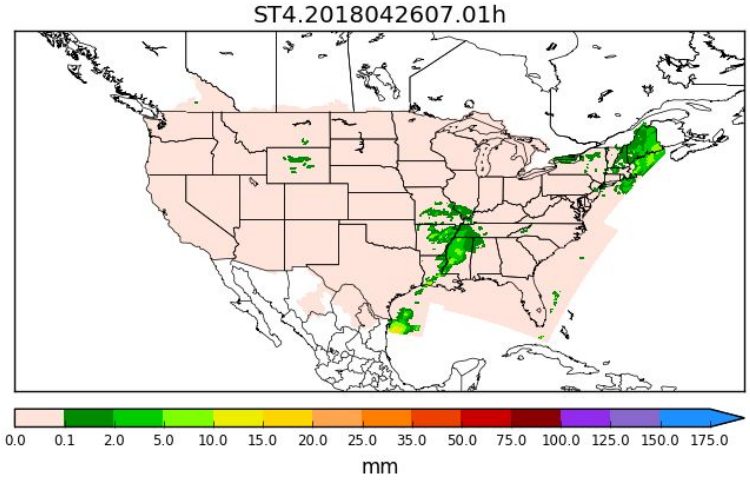
Expand the ConUS Precip URMA Coverage

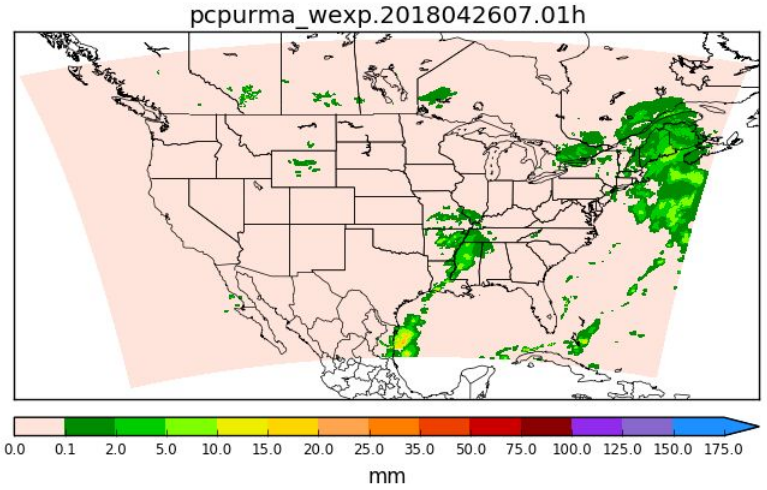


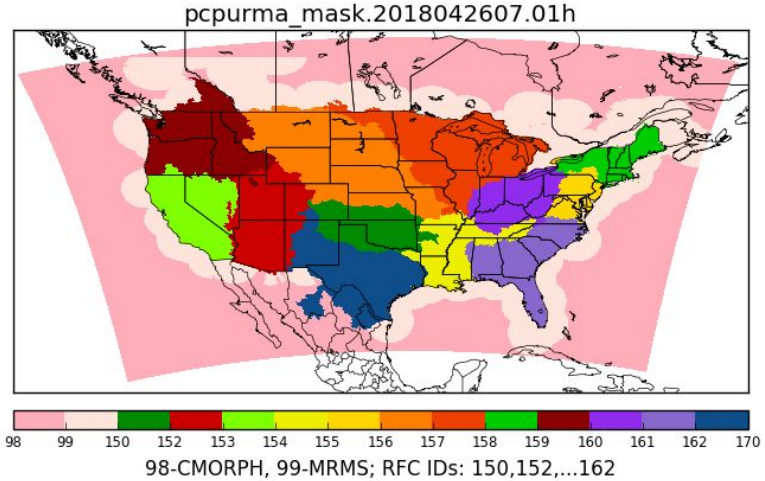


Stage IV (and current opnl precip URMA) has no offshore coverage off the west coast (Western RFCs' QPEs are gauge-based and land-only). The incidental QPE coverage in the Gulf of Mexico and off the East Coast is retained in the ConUS mosaic mainly for visual interest - RFCs do not QC coverage outside of their domains proper.

Filling Stage IV with MRMS and CMORPH

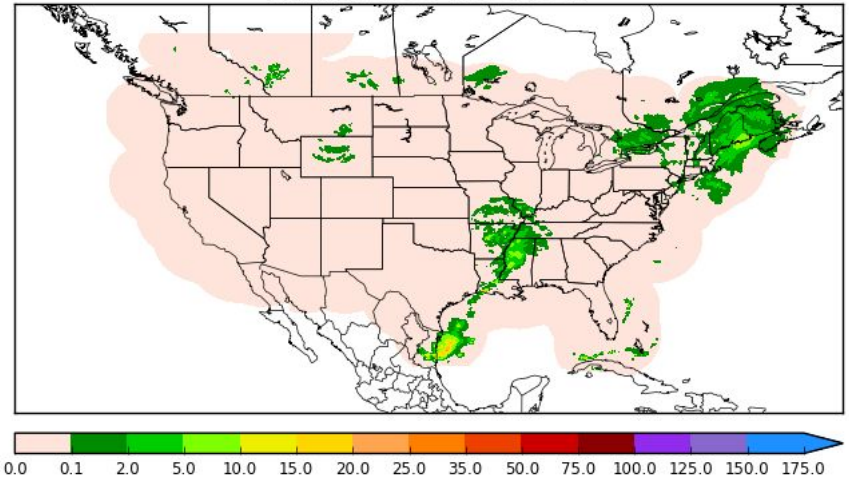






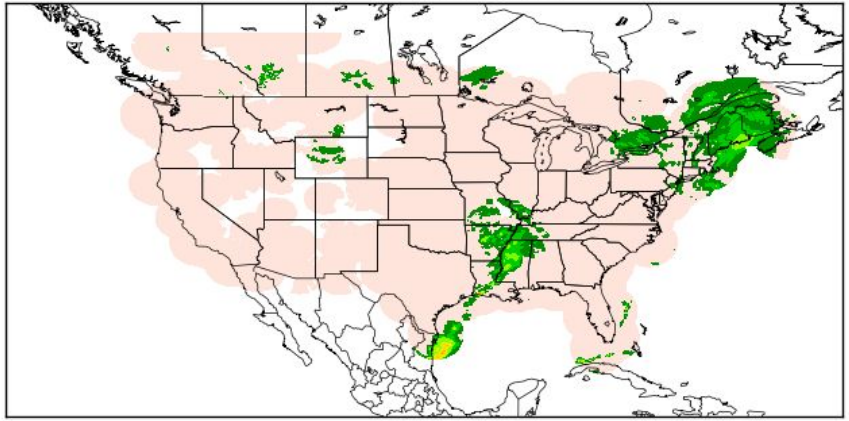
Use 1) gauge QC'd MRMS (where Radar Quality Index ≥ 0.1) and 2) CMORPH to fill offshore coverage in the Stage IV.

mrms.2018042607.01h



0.0 0.1 2.0 5.0 10.0 15.0 20.0 25.0 35.0 50.0 75.0 100.0 125.0 150.0 175.0

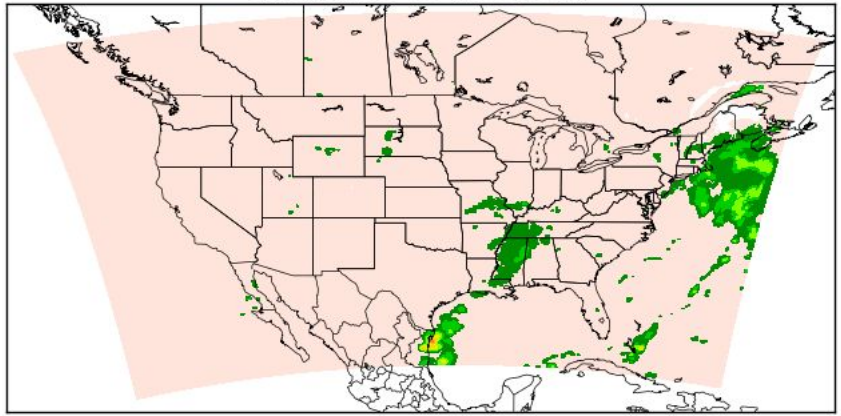
mrms.2018042607.01h, RQI $\geq$ 0.1



0.0 0.1 2.0 5.0 10.0 15.0 20.0 25.0 35.0 50.0 75.0 100.0 125.0 150.0 175.0

mm

cmorph.2018042607.01h



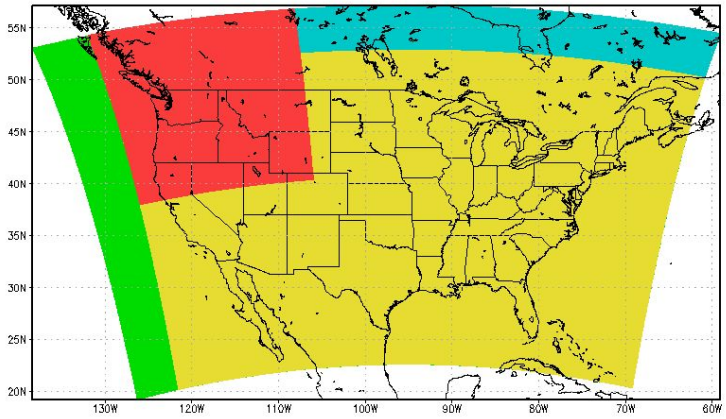
0.0 0.1 2.0 5.0 10.0 15.0 20.0 25.0 35.0 50.0 75.0 100.0 125.0 150.0 175.0

mm

V2.7: Adjusting Stage IV/pcpurma run times

- ConUS Stage IV 6h/24h, pcpurma 6h reruns: 1/2/3/5/7-day reruns after the ending 12Z, for a 12Z-12Z 24h period.
  - 2-day rerun added at the request of AHPS for water.weather.gov/precip.
- Stage IV/pcpurma **hourly**: 1/2/3/5/7-day reruns.
  - Also added reruns for $daym1 13Z-14Z at 15Z on $day (*i.e.* 25 and 26h after valid time). These additional reruns are to provide earlier hourly coverage in NWRFC/CNRFC areas.
- Filling of the offshore coverage is done for analyses (1h/6h) starting at 24h past validation time
  - CMORPH has a ~19h lag, gauge QC'd MRMS has a 90-95min lag; full hourly ConUS coverage has an up to 25-26h lag

Domain for ConUS PCPURMA Expanded to WEXP



Until v2.6 (current operational), ConUS PCPURMA has been on 1) the ConUS Grid 184 (yellow) and 2) the NW Grid 188 (red) for both NOMADS and AWIPS.

Starting in v2.7, ConUS PCPURMA will be produced on the wexp ("westward expanded grid", yellow+red+blue+green). The pcpurma_wexp.* files will be available on NOMADS. The g184 and g188 grids will continue to be distributed through AWIPS.

Each pcpurma_wexp.* file has a companion pcpurma_mask* file showing the source of the precipitation data on each grid (one of the RFCs, MRMS or CMORPH). The mask will be available on NOMADS.

v2.7 Improve MRMS QPE availability for Stage IV/URMA

- MRMS QPE files are occasionally missing, and the system is not currently set up to make re-runs when there is a glitch in one hour.
  - This affects the availability of hourly Stage IV/URMA coverage in the NWRFC/CNRFC area (for log of missing western hourly coverage since RTMA/URMA v2.6 implementation, see http://www.emc.ncep.noaa.gov/mmb/ylin/pcpanl/stage4/problems.log)
- IDP* recently began to ameliorate this issue:
  - Checks for the MRMS file on both the production and backup servers and performs a synchronization of a file is present on one and not the other to ensure availability to the Stage IV/pcpurma.
  - This often provides improved western coverage in hourly Stage IV/URMA when MRMS runs into difficulties (*e.g.* 3-6 Apr 2018).

*Thanks to Viktor Zubko of IDP

End of Extra PCPURMA Information