

# NCEP Synergy Meeting Highlights: June 27, 2016

*This meeting was led by Mark Klein (WPC) and attended by Steven Earle (NCO); Glenn White (EMC); Eric Rodgers (MMB); Israel Jirak and Andy Dean (SPC); Hugh Cobb (NHC); Dave Myrick (MDL); Andy Edman (WR); Curtis Alexander (ESRL); John Kelley (NOS); and Brian Cosgrove (NWC).*

## 1. NOTES FROM NCO (Steven Earle)

RTMA/URMA v2.4.1 - 30-day evaluation expected to start at the end of this week

RAPv3/HRRRv2 - 30-day evaluation expected to start at the end of this week

NAM-MOS and GFS-MOS - 30-day evaluation expected to start at the end of this week

HYSPLIT Implementation Decision Briefing scheduled for June 29. Implementation tentatively scheduled for July 6th.

HWRF - Implementation scheduled for July 12, 2016

<http://www.nws.noaa.gov/os/notification/tin16-18hwrfaaa.htm>

GFDL - Implementation scheduled for July 12, 2016

<http://www.nws.noaa.gov/os/notification/tin16-17gfdl.htm>

National Water Model - 30-day clock is currently on hold due to technical issues. Scientific evaluation is ongoing

Geospace (SWMF) - 30-day stability test is ongoing. Implementation scheduled for late-July

National Blend of Models and EKDMOS - Evaluation scheduled for end of July through August... Implementation on target for September.

Global RTOFS - Currently delayed due to a delay with the Navy upgrade. Implementation is TBD.

## 2. NOTES FROM EMC

### **2a. Global Climate and Weather Modeling Branch (GCWMB) (Glenn White):**

*The global branch is working to put together the 2017 Q3F17 GFS. We are considering including 1/8<sup>th</sup> degree files in this implementation in response for the field's interest in receiving full model resolution output. What fields should be prioritized for higher*

resolution? We look forward to the field actively participating again in the next implementation and submitting case studies to the global branch.

**Scope:**

- 1) Transition GDAS/GFS to NEMS infrastructure on Cray
  - 2) Produce 1/8<sup>th</sup> degree grib2 output
  - 3) Scale- & aerosol-aware deep & shallow convection schemes with convective cloudiness enhancement
  - 4) High resolution (1km) IGBP vegetation and STASGO soil type data; MODIS snow and snow free albedo; GLDAS forced by observed precipitation used to spin up soil moisture; new USGS GMTED2010 terrain data
  - 5) Decoupling prevention to address the rapid temperature drop during sunset
  - 6) GDAS upgrades to include Near Surface Sea Temperature (NSST)
  - 7) Use SEVIRI IR; VIIRS; GOES clear air water vapor winds; additional GPSRO data; RARS and DBNET data
  - 8) Readiness for CrIS; JPSS and GOES-R
- Improvements to stratospheric ozone and water vapor modeling?  
Testing and evaluation complete Jan. 31, 2017  
How much testing? Less of a scientific upgrade than last two  
Implementation May 10, 2017

*The GFS implemented in May substantially reduced a near surface summertime warm dry bias in the Great Plains and as a result increased the high bias for light amounts of precipitation and a wet bias in the northern Great Plains and Midwest in late spring and early summer. As a result, high dewpoints have been seen over the Midwest and excessive values of CAPE over the Great Plains and spurious light precipitation has also been seen in GFS forecasts. In addition, spurious maxima of precipitation have been seen over the Great Lakes near the shore. Fanglin Yang is running a test of a modified convection parameterization developed by Jongil Han that makes it more difficult to trigger convection may reduce the spurious light precipitation and spurious Great Lakes precipitation. These problems have been discussed at the Model Evaluation Group; the presentations are online. A possible problem in terms of a large positive bias was found in CAPE values calculated within AWIPS rather than CAPE values from the models.*

*The MEG is spinning up a visitors' program between EMC and the field. Initial visits from EMC to forecast offices should begin in the next few months.*

*EMC has a website that displays fields from the GEFS and ECMWF ensembles.*

*<http://www.emc.ncep.noaa.gov/gmb/tpm/emchpc/ens/index.html>*

*Tim Marchok modified the .htaccess file requirements to be in line with the modified ECMWF exchange agreement and also in line with his TC genesis page (which also displays ECMWF data). The new access should allow anyone who is coming in from a ".noaa.gov" IP address to have access. However, 3 of 6 EMCers still could not access it. (We will investigate further.) The site is NOT an operational site and may not be maintained on a timely basis. The idea of moving the site and having it run and maintained by EMC has been suggested. **REMINDEVERYONE that ECMWF plots are NOT to be shared with anyone outside NOAA***

## **2b. Mesoscale Modeling Branch (MMB) (Eric Rodgers)**

*NAM V4 upgrade (Implementation date moved to 2017Q1 to allow for a robust solution for the CONUS nest failures with Hurricane Joaquin; recent changes/testing in boldface)*

**June 2016 update : Changes to address Joaquin failures in place and being tested. Final microphysics changes will be tested during June/July, codes will be frozen by the end of July and code delivery to NCO is targeted for the end of August. The hourly NAMRR 18-h forecast component of the NAM V4 will not be included in the operational implementation of this upgrade.**

- Increase resolution of CONUS nest from 4 km to 3 km; CONUS nest output grid will be the same as that from the HRRR. 3 km nest has improved QPF bias over 4 km CONUS nest at higher thresholds.
- Increase resolution of Alaska nest from 6 km to 3 km
- Increase frequency in calls to model physics for all domains; for the 12 km parent, call the radiation scheme every 20 min instead of once an hour
- Physics changes (now being tested or under development; subject to change)
  - Convection changes → higher (i.e., closer to one) 12 km NAM QPF bias, improved 12 km NAM equitable threat score during cool season .
  - Currently testing running shallow convection in 3 km parallel CONUS nest to reduce low level dry bias, decrease high QPF bias in nests, and remove unrealistic persistent light precipitation over the eastern Pacific.
  - Land surface model changed to increase canopy resistance, reduce plant transpiration, and reduce direct evaporation from frozen soil, targeting low 2m Td bias during cool season.
  - PBL changes to address maritime shallow cloudiness.
  - Radiation/microphysics changes to address 2m T warm bias during warm season.
  - Use of radar-derived temperature tendencies in model's diabatic digital filter initialization; call digital filter at start of NAM forecast (now only done at start of 3h NDAS forecasts).
  - Replace 3h NDAS (which only runs on the 12 km domain) with 6-h hourly assimilation "catch-up" cycle with hourly analysis updates for 12km parent/3 km CONUS and 3 km Alaska nest
  - Tentative: make 18h forecast of 12 km parent and 3 km CONUS/Alaska nest every hour (NAMRR); first step towards future convection allowing ensemble (ARW members (i.e., 3 km HRRR) + NMMB members (3 km NAM nests))
  - Now running 6h NAMRR "catchup" cycle with a 6h, hourly cycle of the 12 km parent, 3 km CONUS nest, and 3 km Alaska nest in real time, followed by full 60h forecasts of the CONUS/Alaska nests and 84h forecast of the 12 km NAM. Links to web pages can be found at <http://www.emc.ncep.noaa.gov/mmb/mmbpll/eric.html#TAB2>
  - Hourly forecasts from NAMRR are now being run in real-time. These

forecasts are associated with all domains having a distinct data assimilation cycle, i.e. the 12 km parent, 3 km AK nest, and 3 km CONUS nest.

- New observations assimilated :
  - i. New satellite winds:
    1. MTSAT2 IMAGER WVct AMVs (JMA)
    2. 254 54 M7 IMAGER WVct AMVs
    3. M10 IMAGER WVct AMVs
    4. NOAA 15 AVHRR IR AMVs
    5. NOAA 18 AVHRR IR AMVs
    6. NOAA 19 AVHRR IR AMVs
    7. METOPA AVHRR IR AMVs
    8. METOPB AVHRR IR AMVs
  - ii. New GPS Radio Occultation Data
    1. METOPB 3 (subtype)
  - iii. New Satellite radiance data
    1. M10 Seviri
    2. metopb hirs4, amsua, mhs, iasi
    3. npp atms, cris
    4. f17 ssmis
  - iv. Resume use of AFWA snow depth product using envelope adjustment
  - v. For CONUS/Alaska/Fire Weather nest: Land-sea mask changed to add all lakes resolved by the new fresh water lake (FLAKE) climatology. Water temperatures at "FLAKE" lake points are a blend using a Cressman analysis of the FLAKE climatology and temperatures at nearby water points resolved by the RTG\_SST\_HR analysis.
  - vi. Use NESDIS burned area data in the NAM fire weather nest. Two "accumulation" burned area files are used: 2-day and 30-day. The greenness fraction and albedo is adjusted according to the 30 day data and the top layer soil moisture according to the 2-day data

RAPv3 / HRRRv2 Upgrade: Problems with RAP analysis job occasionally hanging on the system have delayed the start of the 30-day evaluation. Expect to have a solution very soon. Targeting implementation in mid-August.

### ***2c. Marine Modeling and Analysis Branch (MMAB):***

### 3. EARTH SYSTEM RESEARCH LAB (*Curtis Alexander*)

#### RAPv3/HRRRv2

13-km RAP will have expanded computational domain (matches the 12-km NAM)

- Provide coverage for Hawaii
- Facilitate future plans for ensemble systems and to (eventually) improve the initialization of SREF

Forecast length extensions

- RAP output will be extended from 18 to 21 hours for all cycles
- HRRR output will be extended from 15 to 18 hours for all cycles

Output changes

- All grib1 RAP output is being discontinued
- The RAP output for cloud base height will actually represent the true cloud base height, and the old computation is now properly labeled as cloud ceiling
- Two new winter precipitation fields are added to the RAP and HRRR - accumulated snow depth that includes variable density hydrometeor accumulation and snow melt effects and accumulated graupel both available in 1-hour and run total amounts

Data Assimilation/Initialization Changes

- Refinements are made to improve the assimilation of surface observations, soil moisture adjustment, and three-dimensional cloud and precipitation hydrometeors
- HRRR will start using the ensemble/hybrid data assimilation
- RAP will increase ensemble portion of hybrid data assimilation from 0.50 to 0.75 weighting
- Land surface hourly cycling introduced into the HRRR
- Select mesonet surface data assimilation added to the RAP and HRRR
- Radar radial velocity data assimilation added to the RAP

Physics Changes

- WRF-ARW core upgraded to version 3.6.1
- Convective scheme in the RAP is changed from the Grell 3-D scheme to the scale-aware Grell-Freitas scheme
- MYNN planetary boundary layer scheme is updated to include the effects of subgrid-scale clouds for increased shortwave attenuation
- RUC land-surface model is updated to add a mosaic approach for fractional snow cover, improve the fluxes from snow cover, and modify the wilting point for cropland use
- Thompson microphysics scheme is updated to be aerosol-aware with use of an ice-friendly and water-friendly aerosol field that support more explicit cloud production
- Shortwave and longwave radiation have been changed to use the RRTMG (RRTM global) scheme that includes the effects of aerosols and boundary layer subgrid-scale clouds
- WRF-ARW diagnostics for 2-meter temperature and dew point are

improved

Many of these changes to the data assimilation, land-surface model, boundary layer scheme, microphysics, radiation, and (in the RAP only) convective scheme are designed to mitigate the low-level warm, dry bias (and associated high bias in high-based convective initiation/development) in the RAP and HRRR, most notable during afternoons in the warm season. Significant reduction of these biases has been evident in extensive testing.

#### **4. NATIONAL OCEAN SERVICE (*John Kelley*):**

No Report

### **5. FEEDBACK FROM MDL/OPERATIONAL CENTERS/REGIONS**

#### **5a. MDL**

- NCO is currently working GFS-MOS, GMOS, NAM-MOS, EKDMOS and NBM V2.0 with 30-day evaluations coming this summer (see notes above).
- Next MDL code handoff will be ECMWF-MOS (code delivery 8/9/2016), upgrade includes:
  - Generate first generation ECMWF MOS station-based snowfall guidance for the CONUS and Alaska
  - Generate METAR station-based 10-m wind gust guidance
  - Update ECMWF MOS METAR station-based 2-m temperature, 2-m dewpoint, MaxT, MinT

#### **5b. NCEP Centers**

- Weather Prediction Center (WPC)
  - 4th annual Flash Flood and Intense Rainfall Experiment started on June 20th and will continue through July 22 with a break the week of July 4.
  
- Storm Prediction Center (SPC):
  - No Report
  
- National Hurricane Center (NHC):

- No Report

- Ocean Prediction Center (OPC):
- Aviation Weather Center (AWC):
- Climate Prediction Center (CPC):
- Space Weather Prediction Center (SWPC):

#### **5c. NWS Regions**

- Pacific Region (PR):
- Alaska Region (AR):
- Western Region (WR)
- Southern Region (Jack Settelmaier - SR):
  - As a follow-on to the Jun 13-15 Ensemble Users Workshop, and as a potential a way to build upon MEG-like discussions, I started a VLab community called "Forecast Performance Blog." I have invited a scientist from the ECMWF to share good/bad cases of model performance to share and discuss. All are invited to contribute case reviews.
- Central Region (CR):

- I see that the HRRR/RAP will be extended to 18/21 hours around June 20, 2016, which is great. At the same time, OAR is now running the HRRREXP out 18 hours every hour, and then out 36 hours every 3 hours. Just wondering what the plans for the next upgrade of the HRRR/RAP and HREF are as a first stab. Jeff Craven
- Eastern Region (ER):

## 6. National Water Center

- The National Water Model stopped its 30-day test on June 23rd. A fix is being tested and a restart of the 30-day is likely for later this week.

## 7. NESDIS (*Jason Taylor*)

**Operational Commencement for GPM L1C-R BUFR Product:** On June 30, 2016, the Global Precipitation Mission (GPM) Level-1 Common Calibrated Brightness Temperatures (L1C-R) in Binary-Universal-Form for the Representation of Meteorological Data (BUFR) format will be implemented into operation. The product has been generated and evaluated routinely in the test mode. This implementation will meet the National Weather Service user request for the GPM Level-1 Common Calibrated Brightness Temperatures and accelerate the use of the GPM data in the Numerical Weather Prediction model, which has proven positive impacts (Limin Zhao, SPB, E/SP05, 301-683-3240)

**Arctic Composite Satellite Imagery Products are Operational:** GOES/POES Arctic Composite Satellite Imagery Products went into operations on June 9, 2016. The Arctic product processing software operationally runs in ESPC GEOPROD4 Operational Production System to generate 4-km hourly imagery products at 5 bands (VIR, WV, IR, SW, and LW) covering regions from 50°N to 90°N. The satellite data used in the Arctic products include visible, infrared and water vapor imagery from GOES-13, GOES-15, Meteosat-7, Meteosat -10, Himawari-8, NOAA-18, NOAA-19, Metop-A, Metop-B, Aqua and Terra. The products are distributed to the DDS (netcdf and gif) and the GEO ADDE (McIDAS) servers. The quality of the products is monitored in the web-based QA monitoring tool (<http://www.ospo.noaa.gov/Products/imagery/composite.html> or <http://www.ospo.noaa.gov/Products/imagery/arctic/>). The products will be used to improve operational forecasting for the North Pacific and North Atlantic for maritime and aviation operations (Weather and Water, Local Forecast and Warning, Commerce and Transportation). Also aid in understanding weather patterns and phenomena, and ultimately improving forecasts. The NOAA operational users include Ocean Prediction Center, Weather Prediction Center, NWS Alaska, Geographic Information Network of Alaska (supporting NWS Alaska), National Ice Center, and NOAA Aircraft Operations



Center (AKA NOAA Hurricane Hunters). (Banghua Yan, 301-683-3230; Antonio Irving, 301-683-3239).

**Hourly CONUS GHE GRIB2 Product Activation in AWIPS:** Following full deployment of AWIPS-II (Advanced Weather Interactive Processing System) in December 2015 and an installation of a NWS (National Weather Service) software update in May 2016, NESDIS/SPSD successfully activated the Hourly CONUS (Continental United States) Global Hydro-Estimator (GHE) GRIB2 (Gridded Binary) product in AWIPS. The product replaced the older formatted GHE GRIB1 product. Generated from NSOF/ESPC the product is being routinely transmitted through the Satellite Broadcast Network to support numerous NWS sites in monitoring and forecasting heavy precipitation events that lead to flooding. (John Paquette, 301-683-3237)

**Algorithm Readiness Review (ARR) for the Gridded Cloud Products (GCP) for National Weather Prediction (NWP):** On May 19, 2016, ARR for the GCP was conducted by the Satellite Applications and Research (STAR) in conjunction with Satellite Products Branch personal. In attendance were the OSPO Product Area Leads for Sounding, OSPO contactor programmer, University of Wisconsin algorithm developers, STAR algorithm integrators, Office of Satellite Ground Services (OSGS) manager, Environmental Modelling Center (EMC), and National Centers for Environmental Prediction (NCEP) users. The cloud algorithm updates in the GCP application will be same as the cloud algorithms used by the Clouds from the AVHRR Extended System (CLAVR-X) and GOES Cloud Insulation Product (GCIP). The cloud information included for this updates is for Cloud Mask, Cloud Phase, Cloud Top Height, Cloud Liquid Water Path, Cloud Ice Water Path, and Cloud Optical Properties. The presentation was given to cover the user requirements, algorithm updates, software architecture and interfaces, content of the algorithm package, and required action for operational implementation. The cloud updates for GCIP are implemented as a part of "Gridded Cloud Products for NWP Verification" project that will be required for the ESPC operational implementation. NCEP has requested the gridded cloud products for their model verification and the user request was endorsed in the Satellite Products and Services Review Board (SPSRB) database as #1107-0011. The Blended Gridded Cloud Product will be generated using the CLAVR-x and GCIP Cloud Products which will serve the NCEP and National Weather Service (NWS) requirements for composite cloud analysis. This proposal builds on the existing service of NESDIS cloud products to NCEP's for NWP verification. (Dr. Awdhesh Sharma, 301-683-3229)

**NESDIS/NWS Coordination for Global Forecast Systems (GFS) Upgrade on May**

**11 2016:** EMC and NCO announced the successful implementation of the GFS version 13 upgrade at 12Z on May 11<sup>th</sup> 2016. NESDIS programmers worked with NCEP to ensure that all applications were properly validated and tested and compatible with the new GFS and GDAS data streams. Preparation for the transition included establishing parallel data streams from NCEP to support real time testing. Several applications required emergency fixes and these code changes were completed before the changeover was implemented. The transition to GFS upgrade on May 11 went smoothly and successfully. (Antonio Irving and Zhaohui Cheng, 301-683-3239)

**Jason-3 Near Real-Time Verification Workshop:** The first Jason-3 Near Real-Time (NRT) Verification Workshop was successfully held June 21 at the NOAA Center for Weather & Climate Prediction (NCWCP) in College Park, MD. The purpose of this workshop was to assess the overall quality of the NRT Operational Geophysical Data Records (OGDRs) and to recommend their public release. The timeline for release of the Interim Geophysical Data Records (IGDRs) was also discussed. As was already foreseen in the preliminary “calval” meeting held in mid-April of this year, the quality of these products was confirmed at a very good level, and the operational users are ready to integrate them into their systems. The Workshop has therefore recommended allowing the public release of both OGDR and IGDR Jason-3 products. Public release is to occur on or around July 1st. A workshop conclusion was also to make Jason-3 the primary reference mission and to stay on schedule for moving Jason-2 to an interleaved orbit around mid-September 2016. In parallel, science teams will start working on Geophysical Data Record (GDR) products until the next workshop that will be held during the La Rochelle Ocean Surface Topography Science Team (OSTST) meeting in early November 2016. (David Donahue, 301-683-3236)

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## **8. Offline Discussions**

**Topic:**

**Lead:**

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**The next Synergy Meeting is scheduled for July 25 at 2:30 pm EDT in NCWCP conference room 2890, with remote teleconferencing capability.**

Telecon: **1-866-763-1213**

Passcode: **524234#**