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Technical Implementation Notice 14-29
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From: Timothy McClung
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Office of Science and Technology

Subject: Corrected: Changes to the North American Mesoscale (NAM) Analysis and Forecast System: Effective August 12, 2014

Corrected wording of changes to NAM snow/SST fields

Effective August 12, 2014, beginning with the 1200 Coordinated Universal Time (UTC) run, the National Centers for Environmental Prediction (NCEP) will make the following modifications to the NAM Analysis and Forecast System:

1) Changes to the NEMS-NMMB forecast model in the NAM Data Assimilation System (NDAS) and the NAM:

- Replace the legacy GFDL radiation scheme with the NCEP Rapid Radiation Transfer Scheme (RRTM)
- Extensive modify the gravity wave drag/mountain blocking scheme by making it more responsive to subgrid-scale terrain variability, leading to improved large-scale synoptic performance without degrading 10-m winds
- Add a new version of the Betts-Miller-Janjic (BMJ) convective parameterization scheme, with moister convective profiles and less convective triggering, which improves the QPF bias on the 12-km NAM parent domain during the warm season
- Replace the Ferrier microphysics with the new, retuned Ferrier-Aligo microphysics, with changes targeting improved convective-storm structures in the NAM 4 km CONUS and 1.33 km fire weather nests
- Reduce the roughness length for 5 vegetation types, with the target of improving the 10-m wind bias in the eastern CONUS:
  - Evergreen Needleleaf Forest
  - Deciduous Broadleaf Forest
  - Mixed Forests
  - Croplands
  - Cropland/natural vegetation mosaic

All NMMB model changes will be simultaneously implemented into the Downscaled GFS by NAM Extension (DGEX) system

2) Changes specific to the NAM nested domains

- Run all nests except the 6 km Alaska domain with explicit convection instead of reduced convective triggering in the BMJ scheme
- Improve severe storm signatures
  -- Ferrier-Aligo microphysics
  -- Reduce 2nd order diffusion
  -- Separate microphysics species advection for all nests except the 6 km Alaska nest

3) Analysis/NDAS changes

- Use the hybrid variational ensemble GSI analysis with the NCEP Global Ensemble Kalman Filter (EnKF)
- Add new satellite bias correction scheme
- Add Variational Quality Control
- Enhance Rawinsonde level
- Use the mesonet wind observation reject list from the NCEP Real-Time Mesoscale Analysis (RTMA)
- Use GFS ozone analysis in the satellite radiance assimilation
- Add diabatic digital filter initialization (NDAS analyses only)
- Use new observation types:
  -- Replace the use of refractivity with GPS radio occultation bending angle observations
  -- Add Meteosat-10 winds subtypes with different data thinning
  -- Add GOES-15 radiances
  -- Add new VAD winds with higher vertical resolution and temporal resolution
- Resume the calculation of the NDAS long-term precipitation budget adjustment (used to bias-correct the Stage II/IV precipitation analyses that are used as input to the NDAS forecast land-surface model) using the NCEP Climatologically-Calibrated Precipitation Analysis

4) Other changes

- Discontinue the use of the Air Force Weather Agency (AFWA) 23 km snow depth product in lieu of higher resolution snow depth that will be continuously cycled in the NDAS. Once per day (at the start of the 0600 UTC NDAS cycle) snow will be removed at any NAM grid point that is snow-free in the NOAA Interactive Snow and Ice Mapping System (IMS product); snow will be added at any NDAS snow-free point that is snow covered in the IMS product.
- For Great Lakes water temperatures, switch from using values provided by the Great Lakes Environmental Research Laboratory (GLERL) to using the the high-resolution (1/12th degree lat/lon) NCEP Real-Time Global High Resolution Sea Surface Temperature

(RTG_SST_HR) analysis (the SST analysis used over the rest of the NAM domain)
- Add the following stations to the 12 km NAM hourly BUFR station list:

First Column: Numerical Station ID
Second/Third Column: Station Latitude/Longitude
Fourth Column: Station Identifier
Fifth Column: Station Name

000345 42.80N 109.81W KPNA PINEDALE, WY
000346 39.15N 122.15W WLM WILLIAM, CA
000347 40.88N 121.66W BNY BURNEY, CA
000348 37.99N 120.38W SON SONORA, CA
000349 37.74N 118.59W YSV YOSEMITE VALLEY, CA
000350 36.20N 119.10W LSY LINDSAY, CA
000351 35.97N 118.54W JHN JOHNSONDALE, CA
000352 34.83N 118.95W FZP FRAZIER PARK, CA
000353 36.14N 120.35W COA COALINGA, CA
000354 36.65N 118.48W TBM TABLE MOUNTAIN, CA
000355 42.47N 73.29W KPSF PITTSFIELD, MA
000356 39.21N 82.23W KUNI ATHENS/ALBANY, OH
000357 40.48N 111.43W K36U HEBER VALLEY MUN APT, UT
000358 33.02N 114.24W B40 YUMA, AZ
000359 31.49N 110.30W B41 FT HUACHUCA, AZ
000360 32.02N 107.87W B42 DEMING, NM
000361 30.43N 104.33W B43 MARFA, TX
000362 28.39N 110.29W B44 EAGLE PASS, TX
000363 26.57N 98.82W B45 RIO GRANDE CITY, TX
000364 28.71N 95.96W B46 MATGORDA, TX
000365 29.81N 91.66W B47 MORGAN CITY, LA
000366 24.70N 80.51W B48 CUDJOE KEY, FL
000367 17.98N 67.08W B49 LAJAS, PR
723066 35.33N 77.97W KGSB SEYMOUR-JOHNSON_AFB, NC
724397 40.48N 88.92W KBMI BLOOMINGTON/NORMAL, IL
725490 42.55N 94.20W KFOD FORT DODGE, IA
725635 42.05N 102.80W KAIA ALLIANCE, NE
726710 42.58N 110.11W KBPI BIG PINEY, WY

These stations have been replaced by nearby locations:

Old: 000037 42.00N 95.00W CRL NR. CARROLL, IA
New: 000037 42.04N 94.79W CRL CARROLL, IA
Old: 000050 40.90N 92.80W AIA NR. ALBIA, IA
New: 000050 42.11N 92.92W MAR MARSHALLTOWN, IA
Old: 000080 40.69N 94.47W RDD REDDING, IA
New: 000080 41.02N 94.36W CSQ CRESTON, IA
Old: 724754 37.08N 113.60W KSGU SAINT_GEORGE_(AWOS), UT
New: 724754 37.04N 113.50W KSGU SAINT_GEORGE_(AWOS), UT

5) Changes to the NAM gridded output:

- Added 0-6 km wind shear to these output grids from the NAM 12 km parent (file name on the NCEP ftp server given in quotes):

-- #212 (40 km Lambert Conformal over the CONUS "awip3d")
-- #216 (45 km Polar Stereographic over Alaska "awipak")
-- #218 (12 km Lambert Conformal over the CONUS "awphys")
-- #242 (11.25 km Polar Stereographic over Alaska "awak3d")
- Added cloud bottom height and 2-m specific humidity to the 12 km Lambert Conformal grid #218 ("awphys")
- Added 0-6 km wind shear to the output grids for all NAM nests
- Added Radar-derived vertically integrated liquid (VIL) to the NAM 4 km CONUS nest and the NAM 1.33 km fire weather nest
- For all NAM output grids with snow water equivalent: increased the GRIB precision so that it is output in tenths of kg/m**2 (e.g., 358.3 instead of 358)

Since convective parameterization will be turned off in the CONUS, Hawaii, Puerto Rico, and Fire Weather nests, the following fields that are derived from the convective parameterization will no longer be output from these nested runs:

- Total convective precipitation
- Convective precipitation rate
- Convective cloud efficiency
- Total convective cloud fraction
- Total convective cloud top and bottom pressure
- Deep convective cloud top and bottom pressure
- Shallow convective cloud top and bottom pressure
- Derived radar reflectivity from parameterized convection (was only output previously in the Fire weather nest)

The NAM DNG (smartinit) code was changed by including a diagnostic wind adjustment scheme to better adjust 10-m winds over high resolution topography

6) Added the following fields to the 12KM gridded output from the DGEX:

- Ventilation Rate
- Haines Index
- 1-h Minimum Shelter Relative Humidity
- Transport Wind
- PBL Height
- PBL Height computed from Richardson number

7) Added new DGEX gridded datasets

- Added 6KM NDFD Alaska gridded dataset, files are named: dgex.tCCz.smartakHHH.tm00.grib2
- Added 5KM NDFD CONUS gridded dataset, files are named: dgex.tCCz.smartconusHHH.tm00.grib2

Based on the most recent timing tests of the NAM change package, we anticipate the NAM product delivery times to be several minutes later than the current operational NAM.

For more information on this NAM/DGEX upgrade, see

http://www.emc.ncep.noaa.gov/mmb/mmbpll/misc/NAM_2014Q3_19mar2014.pptx

A consistent parallel feed of data will be available on the NCEP server by late June via the following URLs:

http://www.ftp.ncep.noaa.gov/data/nccf/com/nam/para

ftp://ftp.ncep.noaa.gov/pub/data/nccf/com/nam/para

NCEP urges all users to ensure their decoders can handle changes in content order, changes in the scaling factor component within the product definition section (PDS) of the GRIB files, and volume changes. These elements may change with future NCEP model implementations. NCEP will make every attempt to alert users to these changes before implementation.

For questions regarding these changes, please contact:

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NWS National Technical Implementation Notices are online at:

http://www.nws.noaa.gov/os/notif.htm

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