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Technical Implementation Notice 12-22 Amended
National Weather Service Headquarters Washington DC
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From: Timothy McClung
 Chief, Science Plans Branch
 Office of Science and Technology

Subject: Amended: Global Forecast System (GFS) Upgrade: Effective May 22,
2012

Amended to correct information about availability of new pressure and specific humidity fields, specify the labeling of the layer Convective Available Potential Energy (CAPE) and Convective INhibition (CIN), and include a note about the Haines index field. All of these changes are included in the "GFS Output Product Changes" section of this Technical Implementation Notice (TIN).

Effective on or about Tuesday, May 22, 2012, beginning with the 1200 Coordinated Universal Time (UTC) run, the National Centers for Environmental Prediction (NCEP) will upgrade the GFS model and its associated data assimilation system (GDAS). The primary changes will be to the analysis system. There will be no major changes to the GFS model itself, but there will be a few modifications to the output products available from the GFS.

The primary change to the operational GFS and GDAS will be in the analysis system. The major component of the analysis change will be the incorporation of a hybrid variational/ensemble assimilation system. In this system, the background error used to project the information in the observations into the analysis is created by a combination of a static background error (as in the prior system) and a new background error produced from a lower resolution (T254) Ensemble Kalman Filter. The development of this system was done in collaboration with the Physical Sciences Division (PSD) at NOAA's Earth Systems Research Laboratory (ESRL). The inclusion of this change and the other smaller changes listed below produce significant positive impact on forecasts in both the northern and southern hemispheres and in the tropics. In almost all measures, a positive impact is noted; however, during the summer (convective precipitation) season, a small consistent degradation of the rain/no rain line and an increase in the bias was noted. This problem will be addressed through modifications to the convective parameterization in the next global implementation. Additional changes in this upgrade include:

Analysis Changes:

- Use Global Positioning System (GPS) radio occultation (RO) bending angle rather than refractivity.
- Include compressibility factors for atmosphere.
- Retune Solar Backscatter UltraViolet (SBUV) observation errors; fix bug at top.
- Update radiance usage flags.
- Prepare for monitoring National Polar-orbiting Partnership (NPP) and Meteorological Operational Satellite (Metop)-B satellite data.
- Add NPP Advanced Technology Microwave Sounder (ATMS) satellite data.
- Add Geostationary Orbiting Environmental Satellite (GOES)-13/15 radiance data.
- Add SEVERI CSBT radiance product.
- Include satellite monitoring statistics code in operations.
- Add new satellite wind data and quality control.
- Update to current version of analysis trunk for optimization and preparation for future updates.

GFS Model Changes:

The global spectral model is restructured, but there are no major physics or dynamics changes except for some bug fixes. The impact of these changes on the forecast is at the machine round off level.

GFS Output Product Changes:

- CAPE, CIN, and Lifted Index fields will now be calculated from virtual temperature.
- Users will see minor changes in simulated GOES products due to the use of the newer Community Radiative Transfer Model (CRTM) 2.0.2 library and coefficient files.
- The following fields will be added to the 0.5, 1 and 2.5 degree pressure gridded binary (GRIB) files:
Haines index Transport U and V Ventilation Rate.
Best 300mb CAPE and CIN and their source levels Temperature, U and V winds at 80 and 100m.
Specific humidity and pressure at 80m.
- The Haines index will be labeled with a GRIB parameter number of 3 at this time, but with an upcoming change, the GRIB parameter number will change to 2. A Technical Implementation Notice (TIN) will be issued announcing this change.
- The Best 300mb CAPE and CIN are encoded in GRIB as level 255 due to a limitation in GRIB encoding.
- 1km helicity will be removed from the 0.5, 1 and 2.5 degree pressure GRIB files. This field was added to these files by mistake during a previous implementation.

Data Availability:

The format and content of all current GFS data sets will remain unchanged, with the exception of the addition of the new fields. GFS data are currently available on NOAAport, the NWS FTP server, the NCEP

server and in the NOAA Operational Model Archive and Distribution System (NOMADS). The location of these data will remain unchanged. The additional new fields will be available only on the NWS and NCEP FTP servers.

Product delivery timing of the majority of GFS products is not expected to change as a result of this implementation. The GFS Downscaled Guidance (DNG) for Guam will be delayed for all forecast hours from hour 2 to 192. The delay will accumulate through the forecast hours and may be as much as 20 minutes by forecast hour 192.

More information regarding the GFS and associated products can be found at:

<http://www.emc.ncep.noaa.gov/GFS/doc.php>

A consistent parallel feed of data will become available on the NCEP server once the model is running in parallel on the NCEP Central Computing System by late-April. The parallel data are available via the following URLs:

<http://www.ftp.ncep.noaa.gov/data/nccf/com/gfs/para>
<ftp://ftp.ncep.noaa.gov/pub/data/nccf/com/gfs/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, changes to the GRIB Bit Map Section (BMS), 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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For questions regarding the dataflow aspects of these data sets, please contact:

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National Technical Implementation Notices are online at:

<https://www.weather.gov/notification/archive>

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