RELEASE NOTES - GSM v12.0.0

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v12.0.0 - released August 04, 2014

CODE CHANGES

- convert GFS GSM to vertical structure
- upgrade GSM for use in T1534 GFS package
- upgrade from current operational T574 Eulerian (~23km) to T1534 Semi-Lagrangian (~13km)
- Use high resolution daily RGT SST instead of weekly OI SST, and use daily sea ice analysis
- Extend high resolution forecast from 8 days to 10 days
- Use McICA radiation approximation
- Reduced drag coefficient at high wind speeds
- Hybrid EDMF PBL scheme and TKE dissipative heating
- Retuned ice and water cloud conversion rates, background diffusion of momentum and heat
- Retuned orographic gravity-wave forcing and mountain block, etc.
- Change from Lagrangian to Hermite interpolation in the vertical to reduce stratospheric temperature cold bias
- Restructured physics and dynamics restart fields and updated sigio library
- Consistent diagnosis of snow accumulation in post and model
- Compute and output frozen precipitation fraction
- Divergence damping in the stratosphere to reduce noise
- Added a tracer fixer for maintaining global column ozone mass
- Stationary convective gravity wave drag
- New blended snow analysis to reduce reliance on AFWA snow
- Changes to treatment of lake ice to remove unfrozen lake in winter
- Modified initialization to reduce a sharp decrease in cloud water in the first model time step
- Correct a bug in the condensation calculation after the digital filter is applied
- Accumulation bucket changed from 12 hour to 6 hour between day 8 and day 10
- Land Surface changes:
  - Replace Bucket soil moisture climatology by CFS/GLDAS
  - Add the vegetation dependence to the ratio of the thermal and momentum roughness
  - Fixed a momentum roughness issue

FORECAST JOB CHANGES

- JGDAS_FORECAST_HIGH, JGFS_FORECAST_HIGH, JGFS_FORECAST_LOW are updated
    - JGDAS_FORECAST_HIGH and JGFS_FORECAST_HIGH: updated to run T1534 semi-Lag GSM
    - JGFS_FORECAST_LOW: Updated to run T574 semi-Lag GSM.
        - Added an option "SPINUPLOW" to run with and without a 12-hour spin-up.
            - If SPINUPLOW=YES, the job will follow the current operational flow, i.e., start from high-res output at fh228, run chgres, run forecast for 12 hours with FHDFI=3, then restart fcst2 from sigr1/sigr2/sfcr at fh240 with FHDFI=0.
            - If SPINUPLOW=NO, fcst2 will start from high-res output at fh240, run chgres, and run forecast from SIGI and SFCI produced by chgres with FHDFI=3.
        - For this implementation, SPINUPLOW=NO.

JOB SCRIPT CHANGES

- scripts/exglobal_fcst.sh.ecf: updated for running semi-lag GSM. removed obsolete fixed fields.

USH SCRIPT CHANGES

- ush/global_chgres.sh and ush/global_cycle.sh are updated to prepare and process T1534 forecast files and initial/boundary conditions.

FIX and PARM FIELDS CHANGES

- fix directory is divided into subdirectories as fix_am, fix_om and fix_lm.
    - Additional fields for running T1534 and T574 semi-lag GSM were added. A new standard file name convention is used to name fixed fields for all model resolutions.
- parm directory is divided into parm_am, parm_lm, parm_om and parm_sib.
    - All files are updated for running T1534/T574 semi-lag GSM.

SOURCE CODE INFORMATION

- Five applications are included in ./sorc directory and are used by the above three JJOBS:
    - global_chgres.fd
    - global_cycle.fd
    - global_fcst.fd
    - global_sfchdr.fd

○ global_sighdr.fd

COMPUTING RESOURCE INFORMATION

JGDAS_FORECAST_HIGH
  current operation: 145 tasks, ptile(threads)=4, 4 tasks/node, 36 nodes, ~3.6 minutes
  proposed package: 432 tasks, ptile(threads)=4, 4 tasks/node, 108 nodes, ~3.6 minutes

JGFS_FORECAST_HIGH
  current operation: 133 tasks, ptile(threads)=4, 4 tasks/node, 34 nodes,
         ~8.3 min/day for 8 days, total 66.4 minutes
  proposed package: 432 tasks, ptile(threads)=4, 4 tasks/node, 108 nodes,
         ~8.3 min/day for 10 days, total 83 minutes

JGFS_FORECAST_LOW
  current operation: 64 tasks, ptile(threads)=8, 2 tasks/node, 32 nodes,
         ~1.4 min/day for 8 days, 2 minutes fr chgres, total 14.0 minutes
  proposed package: 216 tasks, ptile(threads)=8, 2 tasks/node, 108 nodes,
         ~2.0 min/day for 6 days, 3 minutes for chgres, total 15 minutes

VERSIONS OF LIBRARIES, COMPILERS AND SHARED CODE BEING USED

- libraries
  - SIGIO_VER=v2.0.1
  - W3NCO_VER=v2.0.6
  - W3EMC_VER=v2.0.5
  - SP_VER=v2.0.2
  - BACIO_VER=v2.0.1
  - NEMSIO_VER=v2.2.1
  - IP_VER=v2.0.0
  - SFCIO_VER=v1.0.0
  - GFSIO_VER=v1.1.0
  - LANDSFCUTIL_VER=v2.0.0
- compiler (modules loaded during GSI build / run)
  - ics/14.0.1
  - lsf/9.1
  - /usrx/local/Modules/3.2.10/init/ksh

- Data retention for files in /com and /nwges under prod/para/test environments
  - same as current operations

PRE-IMPLEMENTATION TESTING REQUIREMENTS

- which production jobs should be tested as part of this implementation?
  - GSM v12.0.0 should be tested as part of the T1534 GFS package
- does this change require a 30-day evaluation?
  - YES
- suggested evaluators
  - same as rest of T1534 GFS package

DISSEMINATION INFORMATION

- where should this output be sent?
  - same as current operational GFS/GDAS Forecasts
- who are the users?
  - same as current operational GFS/GDAS Forecasts
- which output files should be transferred from PROD WCOSS to DEV WCOSS?
  - same as current operational GFS/GDAS Forecasts

HPSS ARCHIVE

- retention length?
  - same as current operational GFS/GDAS Forecasts
- list which output files should be archived
  - same as current operational GFS/GDAS Forecasts

IMPLEMENTATION INSTRUCTIONS

To implement gsm v12.0.0, please do the following:
> mkdir gsm.v12.0.0 in appropriate /nw${envir}
> cd /nw${envir}/gsm.v12.0.0
> svn checkout https://svnemc.ncep.noaa.gov/projects/gfs/branches/gsm_gfsimplementation
> cd /nw${envir}/gsm.v12.0.0/sorc/global_chgres.fd, execute makefile.sh
> cd /nw${envir}/gsm.v12.0.0/sorc/global_cycle.fd, execute makefile.sh
> cd /nw${envir}/gsm.v12.0.0/sorc/global_fcst.fd, execute makefile.sh
> cd /nw${envir}/gsm.v12.0.0/sorc/global_sfchdr.fd.fd, execute makefile.sh
> cd /nw${envir}/gsm.v12.0.0/sorc/global_sighdr.fd.fd, execute makefile.sh

JOB DEPENDENCIES

- JGDAS_FORECAST_HIGH has the following upstream / downstream dependencies
  - upstream
    - triggered upon completion of JGDAS_ANALYSIS_HIGH
  - downstream
    - triggers JGDAS_NCEPPOST

- JGFS_FORECAST_HIGH has the following upstream / downstream dependencies
  - upstream
    - triggered upon completion of JGFS_ANALYSIS
  - downstream
    - triggers JGFS_NCEPPOST and JGFS_FORECAST_LOW

- JGFS_FORECAST_LOW has the following upstream / downstream dependencies
  - upstream
    - triggered upon completion of JGFS_FORECAST_HIGH
  - downstream
    - triggers JGFS_NCEPPOST