RELEASE NOTES: gsi.v5.0.0

(https://docs.google.com/a/noaa.gov/document/d/1u-0ToJIRBqbBufnV6h_jji-UB_zZEoxTwcbRw7U2bUA/edit?usp=sharing)

v5.0.0 - released July 18, 2014

SVN HISTORY

- r43136 - 7/18/2014 - initial delivery to NCO
- r43939 - 8/7/2014 - update snogrib filename

CODE CHANGES

- convert GFS GSI to vertical structure
- upgrade GSI for use in T1534 GFS package
    - code optimization (improved computational efficiency, reduced memory usage)
    - changes in analysis configuration
        - increase horizontal resolution of ensemble from T254 to T574
        - reduce number of second outer loop iterations from 150 to 100.
    - changes in radiance assimilation
        - upgrade to CRTM v2.1.3
        - move to enhanced radiance bias correction scheme
            - NOTE: The new radiance bias correction scheme renders JGDAS_ANGUPDATE obsolete. JGDAS_ANGUPDATE is NOT needed with GSI v5.0.0
        - correct bug in AMSU-A cloud liquid water bias correction term
        - assimilate new radiances
            - F17 an F18 SSMIS
            - MetOp-B IASI
        - turn off known bad channels
            - AQUA AIRS channels 321
            - NOAA-19 AMSUA channel 7
            - NOAA-19 MHS channel 3
        - increase ATMS observation errors
            - increase channels 6 - 10 from 0.3 K to 0.4 K
            - increase channels 11 - 12 from 0.4 K to 0.45 K
        - turn on cloud detection channels for monitored instruments
            - NOAA-17, -19 HIRS
            - GOES-13 and -14 sounders
    - changes in assimilation of atmospheric motion vectors (AMV)
        - assimilate NESDIS GOES hourly AMVs
        - improve AMV quality control
    - improve GPS RO quality control

JOB CHANGES

- JGDAS_ANALYSIS_HIGH and JGFS_ANALYSIS changed as follows
    - update to vertical structure with references to the following packages:
        - gsm_ver = v12.0.0
        - gsi_ver = v5.0.0
        - crtm_ver = v2.1.3

SCRIPT CHANGES

- exglobal_analysis.sh.ecf changed as follows:
    - I/O
        - add
            - GRADSTAT - previous cycle radstat file (input)
            - SSMISBF - ssmisu bufr file (input)
            - ABIASe - intermediate radiance bias correction file (output)
        - remove
            - GSATANG - enhanced radiance bias correction scheme renders this file obsolete (input)
    - use version numbers for gsi and crtm
    - include more I/O options under FILESTYLE='L' (link) option
    - reduce number of second outer loop inner iterations from 150 to 100

RESOURCE INFORMATION

- jobs
    - JGDAS_ANALYSIS_HIGH
        - current operations: 224 tasks, 28 nodes (ptile=8), 2 threads/task
        - proposed package: 360 tasks, 90 nodes (ptile=4), 4 threads/task
    - JGFS_ANALYSIS
        - current operations: 200 tasks, 25 nodes (ptile=8), 2 threads/task
        - proposed package: 360 tasks, 90 nodes (ptile=4), 4 threads/task
- JGDAS_ANALYSIS_HIGH and JGFS_ANALYSIS run as parallel MPI/OpenMP hybrid jobs
- runtime before/after change
    - JGDAS_ANALYSIS_HIGH
        - current operations: 36 minutes
        - proposed package: 35 minutes
            - run 2014071112 gdas_analysis_high with various node counts
                - 100 nodes: 34 minutes
                - 90 nodes: 35 minutes
                - 80 nodes: 36 minutes
                - 70 nodes: 36 minutes
                - 60 nodes: 40 minutes
                - 50 nodes: 40 minutes
    - JGFS_ANALYSIS
        - current operations: 23 minutes

        - proposed package: 24 minutes
            - run 2014071112 gfs_analysis with various node counts
                - 100 nodes: 22 minutes
                - 90 nodes: 24 minutes
                - 80 nodes: 25 minutes
                - 70 nodes: 25 minutes
                - 60 nodes: 29 minutes
                - 50 nodes: 30 minutes
- disk space required per day (values below only reflect analysis job output)
    - JGDAS_ANALYSIS_HIGH
        - current operations: 10.15 Gb
        - proposed package: 34.29 Gb
    - JGFS_ANALYSIS
        - current operations: 2.93 Gb
        - proposed package: 16.67 Gb
- frequency of run
    - 6 hourly cycle (00, 06, 12, 18Z)
- specify **all** versions of libs, compilers, shared code being used
    - libraries
        - BACIO_VER = v2.0.1
        - BUFR_VER = v10.2.5
        - CRTM_VER = v2.1.3
        - NEMSIO_VER = v2.2.1
        - NETCDF_VER = 3.6.3
        - SFCIO_VER = v1.0.0
        - SIGIO_VER = v1.0.1
        - SP_VER = v2.0.1
        - W3EMC_VER = v2.0.5
        - W3NCO_VER = v2.0.6
    - compiler (modules loaded during GSI build / run)
        - ics/12.1
        - ibmpe/1.3.0.7
        - lsf/9.1
- 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?
    - GSI v5.0.0 should be tested as part of the T1534 GFS package
    - NOTE: GSI v5.0.0 requires T1534 GDAS and T574 EnKF ensemble guess files. If these guess files are not available from /nwges/${envir}/ or /com/gfs/${envir}/, they may be obtained from the EMC real-time parallel. It is necessary to prime (start) the NCO T1534 GFS parallel with files from the EMC parallel.

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

HPSS ARCHIVE

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

IMPLEMENTATION INSTRUCTIONS

- To implement gsi v5.0.0, please do the following:
    - mkdir gsi.v5.0.0 in appropriate /nw${envir}
    - cd /nw${envir}/gsi.v5.0.0
    - svn checkout https://svnemc.ncep.noaa.gov/projects/gsi/branches/REL-5.0.0
    - cd /nw${envir}/gsi.v5.0.0/sorc
    - file README.build explains two ways to build and install the gsi.v5.0.0 executable
        - all-in-one build and install
            - execute ./build.sh
        - one-at-a-time build and install
            - follow code instructions at top of README.build
        - NOTE: The gsi.v5.0.0 executable is installed in /nw${envir}/gsi.v5.0.0/exec. The install step creates this directory if it does not exist.

JOB DEPENDENCIES & FLOW DIAGRAM

- JGFS_ANALYSIS has the following upstream / downstream dependencies
    - upstream
        - triggered upon completion of both JGFS_PREP and JGFS_EMCSFC_SFC_PREP
        - NOTE: JGFS_EMCSFC_SFC_PREP is a new job included as part of the T1534 GFS package
    - downstream
        - triggers JGFS_FORECAST_HIGH

- JGDAS_ANALYSIS_HIGH has the following upstream / downstream dependencies
    - upstream
        - triggered upon completion of both JGDAS_PREP and JGDAS_EMCSFC_SFC_PREP
        - NOTE: JGDAS_EMCSFC_SFC_PREP is a new job included as part of the T1534 GFS package
    - downstream
        - triggers JGDAS_FORECAST_HIGH
        - NOTE: GSI v5.0.0 removes the need for JGDAS_ANGUPDATE. Please remove this job from the operational GDAS workflow
        - JGDAS_ENKF_INFLATE_RECENTER CANNOT start before completion of JGDAS_ANALYSIS_HIGH. This dependency is already part of the operational GDAS workflow
    - A graphical representation of these dependencies is shown below