# Running Global Model Parallel Experiments


**Version 6.0**

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**NOAA/NWS/NCEP/EMC**
**Global Climate and Weather Modeling Branch**

# Contents

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**Version 6.0 Change Notes:**

- Added data section.
    - Moved data related information to new "Data" section, including dump archive.
    - Expanded dump archive section.
    - Updated data information based on Q1FY15 GFS/GDAS implementation.
- Other general updates from Q1FY15 GFS/GDAS implementation and recent machine changes.
- Updated tutorial information.

# What is the Global Forecast System?

The **Global Forecast System (GFS)** is a global numerical weather prediction system containing a global computer model and variational analysis run by the U.S. National Weather Service (NWS). The mathematical model is run four times a day, and produces forecasts for up to 16 days in advance, with decreased spatial resolution after 10 days. The model is a spectral model with a resolution of T1534 from 0 to 240 hours (0-10 days) and T574 from 240 to 384 hours (10-16 days). In the vertical, the model is divided into 64 layers and temporally, it produces forecast output every hour for the first 12 hours, every 3 hours out to 10 days, and every 12 hours after that.

# 1. Introduction

So you'd like to run a GFS experiment? This page will help get you going and provide what you need to know to run an experiment with the GFS. Before continuing, some information:

- This page is for users who can access the R&D machine (Zeus), WCOSS (Gyre/Tide), or the S4 system.
- This page assumes you are new to using the GFS model and running GFS experiments. If you are familiar with the GFS Parallel System, or are even a veteran of it, feel free to jump ahead to specific sections.
- If at any time you are confused and can't find the information that you need please feel free to email for help.

To join the global model mailing list:

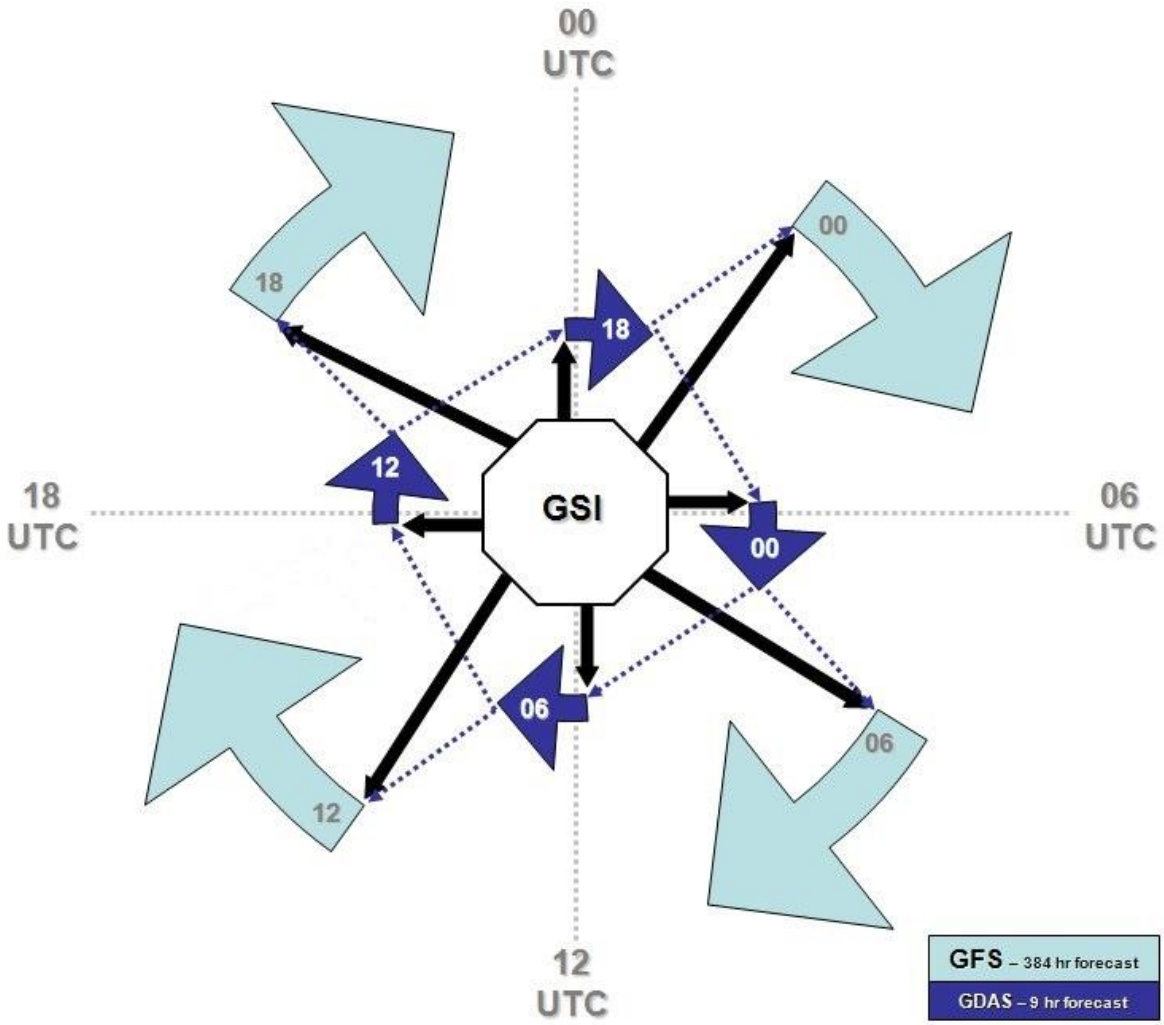
`Global parallel announcements -`
`https://lstsrv.ncep.noaa.gov/mailman/listinfo/ncep.list.emc.glopara-announce`

# 2. Operational Overview

The Global Forecast System (GFS) is a three-dimensional hydrostatic global spectral model run operationally at NCEP. The **GFS** consists of two runs per six-hour cycle (00, 06, 12, and 18 UTC), the "early run" **gfs** and the "final run" **gdas**:

- **gfs/GFS** refers to the "early run". In real time, the early run, is initiated approximately 2 hours and 45 minutes after the cycle time. The early gfs run gets the full forecasts delivered in a reasonable amount of time.
- **gdas/GDAS** refers to the "final run", which is initiated approximately six hours after the cycle time.. The delayed gdas allows for the assimilation of later arriving data. The gdas run includes a short forecast (nine hours) to provide the first guess to both the gfs and gdas for the following cycle.

## 2.1 Timeline of GFS and GDAS




*Times are approximate

## 2.2 Operational run steps

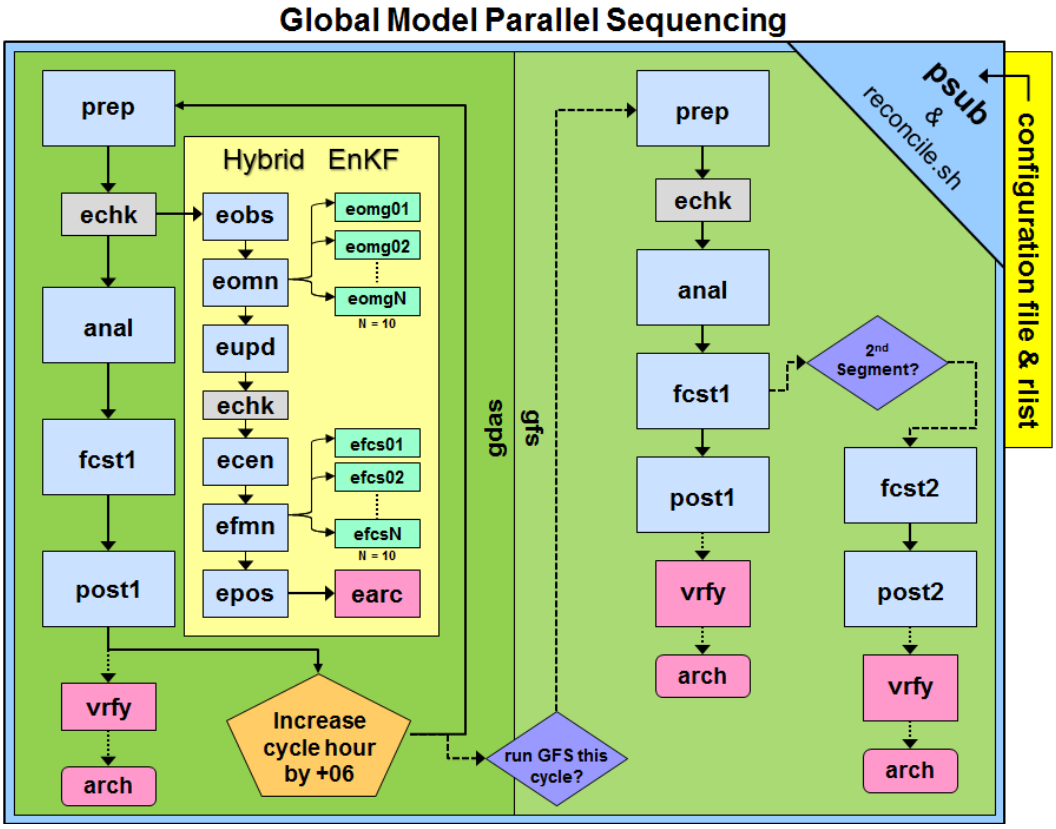
- **dump** - Gathers required (or useful) observed data and boundary condition fields (done during the operational GFS run); used in real-time runs, already completed for archived runs. Unless you are running your experiment in real-time, the dump steps have already been completed by the operational system (gdas and gfs) and the data is already waiting in a directory referred to as the dump archive.
- **storm relocation** - In the presence of tropical cyclones this step adjusts previous gdas forecasts if needed to serve as guess fields. For more info, see the relocation section of Dennis Keyser's Observational Data Dumping at NCEP document. The storm relocation step is included in the prep step (gfsprep/gdasprep) for experimental runs.
- **prep** - Prepares the data for use in the analysis (including quality control, bias corrections, and assignment of data errors) For more info, see Dennis Keyser's PREPBUFR PROCESSING AT NCEP document.
- **analysis** - Runs the data assimilation, currently Gridpoint Statistical Interpolation (GSI)
- **enkf** - Multiple jobs which run the hybrid ensemble Kalman filter–three-dimensional variational (3DVAR) analysis scheme
- **forecast** - From the resulting analysis field, runs the forecast model out to specified number of hours (9 for gdas, 384 for gfs)
- **post** - Converts resulting analysis and forecast fields to WMO grib for use by other models and external users.

Additional steps run in experimental mode are (pink boxes in flow diagram in next section):

- verification (gfs vrfy / gdas vrfy)
- archive (gfs arch / gdas arch) jobs

# 3. The Parallel Environment

**GFS** experiments employ the global model parallel sequencing (shown below). The system utilizes a collection of job scripts that perform the tasks for each step. A job script runs each step and initiates the next job in the sequence. Example: When the anal job finishes it submits the forecast job. When the forecast job finishes it submits the post job, etc.




Flow diagram of a typical experiment with Hybrid EnKF turned ON

As with the operational system, the **gdas** provides the guess fields for the **gfs**. The **gdas** runs for each cycle (00, 06, 12, and 18 UTC), however, to save time and space in experiments the **gfs** (right side of the diagram) is initially setup to run for only the 00 UTC cycle. (See the "run **GFS** this cycle?" portion of the diagram) The option to run the **GFS** for all four cycles is available (see gfs_cyc variable in configuration file).

As mentioned in section 2.2, an experimental run is different from operations in the following ways:

- Dump step is not run as it has already been completed during real-time production runs
- Addition steps in experimental mode:
  - verification (vrfy)
  - archive (arch)

# 4. Directories & Scripts

Copies of the GFS svn project trunk on various machines:

WCOSS: /global/save/emc.glopara/svn/gfs/trunk/para
Zeus: /scratch2/portfolios/NCEPDEV/global/save/glopara/svn/gfs/trunk/para
S4: /usr/local/jcsda/nwprod_v2012
SVN: https://svnemc.ncep.noaa.gov/projects/gfs/trunk/para

**NOTE:** It is not advised to run your experiments using the GFS trunk copies above, unless your experiment is really short or you check out a copy of the trunk yourself. The trunk is a moving target! It is best to run your experiments using a recent GFS tag.

**bin** - These scripts control the flow of an experiment

| | |
|---|---|
| **pbeg** | Runs when parallel jobs begin. |
| **pcne** | Counts non-existent files |
| **pcon** | Searches standard input (typically rlist) for given pattern (left of equal sign) and returns assigned value (right of equal sign). |
| **pcop** | Copies files from one directory to another. |
| **pend** | Runs when parallel jobs end. |
| **perr** | Runs when parallel jobs fail. |
| **plog** | Logs parallel jobs. |
| **pmkr** | Makes the rlist, the list of data flow for the experiment. |
| **psub** | Submits parallel jobs (check here for variables that determine resource usage, wall clock limit, etc). |

**jobs** - These scripts, combined with variable definitions set in configuration, are similar in function to the wrapper scripts in /nwprod/jobs, and call the main driver scripts. E-scripts are part of the Hybrid EnKF.

| | |
|---|---|
| **anal.sh** | Runs the analysis. Default ex-script does the following:<br>1) update surface guess file via global_cycle to create surface analysis;<br>2) runs the atmospheric analysis (global_gsi);<br>3) updates the angle dependent bias (satang file) |
| **arch.sh** | Archives select files (online and hpss) and cleans up older data. |
| **copy.sh** | Copies restart files. Used if restart files aren't in the run directory. |
| **dcop.sh** | This script sometimes runs after dump.sh and retrieves data assimilation files. |
| **dump.sh** | Retrieves dump files (not used in a typical parallel run). |
| **earc.sh** | Archival script for Hybrid EnKF.<br>1) Write select EnKF output to HPSS,<br>2) Copy select files to online archive,<br>3) Clean up EnKF temporary run directories,<br>4) Remove "old" EnKF files from rotating directory. |
| **ecen.sh** | Multiple functions: |

1) Compute ensemble mean analysis from 80 analyses generated by eupd,
2) Perturb 80 ensemble analyses,
3) Compute ensemble mean for perturbed analyses,
4) Chgres T574L64 high resolution analysis (sanl/siganl) to ensemble resolution (T254L64),
5) Recenter perturbed ensemble analysis about high resolution analysis.

**echk.sh** Check script for Hybrid EnKF.
1) Checks on availability of ensemble guess files from previous cycle. (The high resolution (T574L64) GFS/GDAS hybrid analysis step needs the low resolution (T254L64) ensemble forecasts from the previous cycle);
2) Checks availability of the GDAS sanl (siganl) file (The low resolution (T254L64) ensemble analyses (output from eupd) are recentered about the high resolution (T574L64). This recentering can not be done until the high resolution GDAS analysis is complete.)

**efcs.sh** Run 9 hour forecast for each ensemble member. There are 80 ensemble members. Each efcs job sequentially processes 8 ensemble members, so there are 10 efcs jobs in total.

**efmn.sh** Driver (manager) for ensemble forecast jobs. Submits 10 efcs jobs and then monitors the progress by repeatedly checking status file. When all 10 efcs jobs are done (as indicated by status file) it submits epos.

**eobs.sh** Run GSI to select observations for all ensemble members to process. Data selection done using ensemble mean.

**eomg.sh** Compute innovations for ensemble members. Innovations computed by running GSI in observer mode. It is an 80 member ensemble so each eomg job sequentially processes 8 ensemble members.

**eomn.sh** Driver (manager) for ensemble innovations jobs. Submit 10 eomg jobs and then monitors the progress by repeatedly checking status file. When all 10 eomg jobs are done (as indicated by status file) it submits eupd.

**epos.sh** Compute ensemble mean surface and atmospheric mean ensemble files.

**eupd.sh** Perform EnKF update (i.e., generate ensemble member analyses).

**fcst.sh** Runs the forecast.

**prep.sh** Runs the data preprocessing prior to the analysis (storm relocation if needed and generation of prepbufr file).

**post.sh** Runs the post processor.

**vrfy.sh** Runs the verification step.

**exp** - This directory typically contains config files for various experiments and some rlists.

Filenames with "config" in the name are configuration files for various experiments. Files ending in "rlist" are used to define mandatory and optional input and output files and files to be archived. For the most up-to-date configuration file that matches production see section 5.2.

**scripts** - Development versions of the main driver scripts. The production versions of these scripts are in /nwprod/scripts.

**ush** - Additional scripts pertinent to the model typically called from within the main driver scripts, also includes:

| | |
|---|---|
| **reconcile.sh** | This script sets required, but unset variables to default values. |

# 5. Data

## 5.1 Global Dump Archive

### 5.1.1 Location

An archive of global dump data is maintained in the following locations:

```
WCOSS: /globaldump/YYYYMMDDCC
Zeus: /scratch2/portfolios/NCEPDEV/global/noscrub/dump/YYYYMMDDCC
S4: /usr/local/jcsda/dataset/global/YYYYMMDDCC
```

...where: YYYY = year, MM = month, DD = day, CC = cycle (00, 06, 12, or 18)

### 5.1.2 Grouping

The dump archive is divided into sub-directories:

- gdas[gfs] - main production dump data
- gdas[gfs]**nr** - non-restricted copies of restricted dump files
- gdas[gfs]**x** - experimental data, planned implementation
- gdas[gfs]**y** - experimental data, no planned implementation
- gdas[gfs]**p** - parallel dump data (short term)

Example of a typical 00z dump archive folder:

```
/global/save/emc.glopara/dump_archive[121]ll /globaldump/2014100100
total 512
drwxr-xr-x 2 emc.glopara global 131072 Oct  1 02:13 gdas
drwxr-xr-x 2 emc.glopara global    512 Oct  1 02:14 gdasnr
drwxr-xr-x 2 emc.glopara global    512 Oct  1 02:16 gdasx
drwxr-xr-x 2 emc.glopara global    512 Oct  1 02:16 gdasy
drwxr-xr-x 2 emc.glopara global 131072 Sep 30 23:07 gfs
drwxr-xr-x 2 emc.glopara global    512 Sep 30 23:08 gfsnr
drwxr-xr-x 2 emc.glopara global    512 Sep 30 23:09 gfsx
drwxr-xr-x 2 emc.glopara global    512 Sep 30 23:09 gfsy
```

### 5.1.3 Files & Availability

Time period covered by dump archive (as of 2/1/15): **2012010100 - present**

Not all data is available every day of the covered time period. The table in section 5.2.2 lists the files found within the global dump archive.

## 5.2 Input/output files

Many of the parallel files are in GRIB or BUFR formats, the WMO standard for gridded and ungridded meteorological data, respectively.

Other parallel files such as restart files are in flat binary format, and are not generally intended to be accessed by the general user.

Unfortunately but predictably, the global parallel follows a different file naming convention than the operational file naming convention. (The global parallel file naming convention started in 1990 and predates the operational file naming convention.)

The global parallel file naming convention is a file type followed by a period, the run (gdas or gfs), and the 10-digit current date $CDATE in YYYYMMDDHH form:

FILETYPE.CDUMP.CDATE

(i.e. pgbf06.gfs.2008060400).

Some names may have a suffix, for instance if the file is compressed.

For the sake of users that are accustomed to working with production files or those who want to do comparisons, the equivalent production file name info is included here. Production file naming convention is the run followed by a period, the cycle name, followed by a period, and the file type. (i.e. gfs.t00z.pgrbf06). In the table below, only the file type is listed for production names.

The files are divided into the categories restart files, observation files, and diagnostic files. Some files may appear in more than one category. Some verification files in the diagnostics table do not include a run qualifier.

Guide to variables in sections 5.2.1, 5.2.2, and 5.2.3:

| Variable | Description | Values |
|---|---|---|
| **$CDUMP** | Dump type | gdas, gfs |
| **$CDATE** | Cycle date | YYYYMMDDCC |
| **$FF** | Forecast hour | 00[000]-384 |
| **$FE** | Forecast hour (GDAS EnKF) | 03, 06, 09 |
| **$MEM** | Hybrid EnKF member number | 001-080 |
| **$GRP** | Hybrid EnKF member group number | 01-10 |

### 5.2.1 Restart / Initial Condition (IC) Files

| glopara filename | production base name (eg, gdas1.t00z.prepbufr) | file description | format |
|---|---|---|---|
| biascr.$CDUMP.$CDATE | abias | Information about sensor/instrument/satellite, channel, tlapmean, and bias predictor coefficients | text |
| biascr_pc.$CDUMP.$CDATE | abias_pc | Information about observation number and the estimates of analysis error variances for bias predictor coefficients. | text |
| bfg_$CDATE_fhr$FE_ensmean | *same as glopara filename* | Mean of ensemble surface forecasts at fhr$FE | binary |
| bfg_$CDATE_fhr$FE_mem$MEM | *same as glopara filename* | Surface foreacast at fhr$FE for member $MEM starting from $CDATE ICs | binary |
| pgbanl.$CDUMP.$CDATE | pgrbanl | pressure level data from analysis | GRIB2 |
| pgbl$FF.$CDUMP.$CDATE | pgrb2.2p50.f$FF | 2.5° pressure level data from forecast | GRIB2 |
| pgbf$FF.$CDUMP.$CDATE | pgrb2.1p00.f$FF | 1° pressure level data from forecast | GRIB2 |
| pgbh$FF.$CDUMP.$CDATE | pgrb2.0p50.f$FF | 0.5° pressure level data from forecast | GRIB2 |
| pgbq$FF.$CDUMP.$CDATE | pgrb2.0p25.f$FF | 0.25° pressure level data from forecast | GRIB2 |
| pgbe$FF.$CDUMP.$CDATE | TBD – not yet implemented | 0.125° pressure level data from forecast | GRIB2 |
| prepqc.$CDUMP.$CDATE | prepbufr | Conventional Observations with quality control | BUFR |
| radstat.$CDUMP.$CDATE | radstat | Radiance assimilation statistics | binary |
| sfcanl.$CDUMP.$CDATE | sfcanl | surface analysis | binary |
| sfcanl_$CDATE_ensmean | *same as glopara filename* | mean of ensemble surface ICs valid at $CDATE | binary |
| sfcanl_$CDATE_mem$MEM | *same as glopara filename* | Surface ICs for member $MEM valid at $CDATE; input to ensemble forecasts | binary |
| siganl.$CDUMP.$CDATE | sanl | atmospheric analysis (aka sigma file) | binary |
| sanl_$CDATE_ensmean | *same as glopara filename* | Mean of ensemble atmospheric analyses generated by EnKF update code valid at $CDATE | binary |
| sanl_$CDATE_mem$MEM | *same as glopara filename* | Atmospheric analyses generated by EnKF update code for member $MEM valid at $CDATE | binary |
| sfcf$FF.$CDUMP.$CDATE | bf$FF | surface boundary condition at forecast hour $FF | binary |
| sfg_$CDATE_fhr$FE_ensmean | *same as glopara filename* | Mean of ensemble atmospheric forecasts at fhr$FE | binary |
| sfg_$CDATE_fhr$FE_mem$MEM | *same as glopara filename* | Atmospheric forecast at fhr$FE for member $MEM starting from $CDATE ICs | binary |
| sfg_$CDATE_fhr$FEs_mem$MEM | *same as glopara filename* | Spectrally smoothed atmospheric foreacast at fhr$FE for member $MEM starting from $CDATE ICs | binary |
| sig$FF.$CDUMP.$CDATE | sf$FF | atmospheric model data at forecast hour $FF | binary |
| siganl_$CDATE_mem$MEM | *same as glopara filename* | Atmospheric ICs for member $MEM valid at $CDATE at END of ecen; input to ensemble forecasts | binary |

### 5.2.2 Observation files

| glopara filename (FILE. $CDUMP.$CDATE, unless otherwise noted) | production base name (eg,gdas1.t00z.engicegrb) | file description | format |
|---|---|---|---|
| 1bamua | 1bamua.tm00.bufr_d | AMSU-A NCEP-proc. br. temps | BUFR |
| 1bhrs4 | 1bhrs4.tm00.bufr_d | HIRS-4 1b radiances | BUFR |
| 1bmhs | 1bmhs.tm00.bufr_d | MHS NCEP-processed br. temp | BUFR |
| adpsfc | adpsfc.tm00.bufr_d | Surface land | BUFR |
| adpupa | adpupa.tm00.bufr_d | Upper-air | BUFR |
| aircar | aircar.tm00.bufr_d | MDCRS ACARS Aircraft | BUFR |
| aircft | aircft.tm00.bufr_d | Aircraft | BUFR |
| airsev | airsev.tm00.bufr_d | AQUA-AIRS AIRS/AMSU-A/HSB proc. btemps- every FOV | BUFR |
| ascatt | ascatt.tm00.bufr_d | METOP-2 ASCAT products (not superobed) | BUFR |
| ascatw | ascatw.tm00.bufr_d | METOP 50 KM ASCAT scatterometer data (reprocessed by wave_dcodquikscat | BUFR |
| atms | atms.tm00.bufr_d | NPP Adv. Tech. Microwave Sounder (ATMS) radiances | BUFR |
| avcsam | avcsam.tm00.bufr_d | A.M.(N17,M2) AVHRR GAC NCEP-proc clr & sea btmps | BUFR |
| avcspm | avcspm.tm00.bufr_d | P.M.(N18-19) AVHRR GAC NCEP-proc clr & sea btmps | BUFR |
| bathy | bathy.tm00.bufr_d | Bathythermal | BUFR |
| cris | cris.tm00.bufr_d | NPP Cross-track Infrared Sounder (CrIS) radiances | BUFR |
| esamua | esamua.tm00.bufr_d | NOAA 15-19 AMSU-A proc. bright. temps from RARS | BUFR |
| eshrs3 | eshrs3.tm00.bufr_d | NOAA 15-19 HIRS-3/-4 proc bright. temps from RARS | BUFR |
| esmhs | esmhs.tm00.bufr_d | NOAA 18-19 MHS processed bright. temps from RARS | |
| geoimr | geoimr.tm00.bufr_d | GOES 11x17 fov imager clear radiances | BUFR |
| goesfv | goesfv.tm00.bufr_d | GOES 1x1 fov sounder radiances | BUFR |
| gome | gome.tm00.bufr_d | METOP-2 Global Ozone Monitoring Exp.-2 (GOME-2) | BUFR |
| gpsipw | gpsipw.tm00.bufr_d | GPS - Integrated Precipitable Water | BUFR |
| gpsro | gpsro.tm00.bufr_d | GPS radio occultation data | BUFR |
| icegrb | engicegrb | Sea Ice Analysis | GRIB |
| imssnow96.grib2 | imssnow96.grib2 | IMS NH snow and ice cover analysis. 96$^{th}$ mesh (or 4km) resolution. | GRIB2 |
| mls | mls.tm00.bufr_d | Aura Microwave Limb Sounder (MLS) ozone data | BUFR |
| mtiasi | mtiasi.tm00.bufr_d | METOP-2 IASI 1C radiance data (variable channels) | BUFR |
| NPR.SNWN.SP.S1200.MESH16.grb | *same as glopara file* | AFWA NH snow depth analysis. 16$^{th}$ mesh (or 23 km) resolution. | GRIB1 |
| NPR.SNWS.SP.S1200.MESH16.grb | *same as glopara file* | AFWA SH snow depth analysis. 16$^{th}$ mesh (or 23 km) resolution. | GRIB1 |
| obsinput_$CDATE_ensmean | *same as glopara file* | Tarball containing $CDATE data (observations) selected using ensemble means; generated by eobs | tarball |
| omi | omi.tm00.bufr_d | Aura Ozone Monitoring Instrument (OMI) data | BUFR |
| osbuv8 | osbuv8.tm00.bufr_d | SBUV layer ozone product (Version 8) | BUFR |
| proflr | proflr.tm00.bufr_d | Wind Profiler | BUFR |
| rassda | rassda.tm00.bufr_d | Radio Acoustic Sounding System Temp Profiles | BUFR |
| rtgssthr.grb[grib2] | rtgssthr.grb[grib2] | Global 5-minute RTG SST analysis | GRIB[2] |
| satwnd | satwnd.tm00.bufr_d | Satellite-derived wind reports | BUFR |

| | | | |
|---|---|---|---|
| seaice.5min.[grb][grib2] | seaice.5min.[grb][grib2] | EMC global 5-minute ice concentration analysis | GRIB |
| seaice.5min.blend.grb | seaice.5min.blend.grb | Global blended sea ice concentration analysis at 5-minute resolution. A blend of the EMC 5-min ice analysis and the 4km IMS ice cover analysis. | GRIB1 |
| sfcshp | sfcshp.tm00.bufr_d | Surface marine | BUFR |
| snogrb | snogrb | Global 0.5-degree Snow cover and snow liquid equivalent analysis | GRIB1 |
| snogrb_t###.$LONB.$LATB | Generated in dump step using a blend of the 4km IMS snow cover and the 23 km AFWA snow depth. | Snow depth and snow cover analysis on spectral t### grid (# = resolution, i.e. 1534) | GRIB1 |
| ssmisu | ssmisu.tm00.bufr_d | DMSP SSM/IS 1C radiance data (Unified Pre-Proc.) | BUFR |
| sstgrb | sstgrb | Global 1.0-degree Sea Surface Temperature Analysis | GRIB1 |
| statup | updated.status.tm00.bufr_d | Summary | text |
| stat01 | status.tm00.bufr_d | Bufr status | text |
| tcvitl | syndata.tcvitals.tm00 | Tropical Storm Vitals | text |
| tesac | tesac.tm00.bufr_d | TESAC | BUFR |
| trkob | trkob.tm00.bufr_d | TRACKOB | BUFR |
| vadwnd | vadwnd.tm00.bufr_d | VAD (NEXRAD) wind | BUFR |

For more information on dump data types (as seen in production) visit this site:
http://www.nco.ncep.noaa.gov/pmb/nwprod/realtime/index.bufrdump.shtml

### 5.2.3 Diagnostic files

| glopara filename | production base name (eg,gdas1.t00z.gsistat) | file description | format |
|---|---|---|---|
| adpsfc.anl.$CDATE | | Surface observation and analysis fit file | GrADS |
| adpsfc.fcs.$CDATE | | Surface observation and forecast fit file3 | GrADS |
| adpupa.mand.anl.$CDATE | | Rawinsonde observation and analysis fit file | GrADS |
| adpupa.mand.fcs.$CDATE | | Rawinsonde observation and forecast fit file3 | GrADS |
| gsistat.$CDUMP.$CDATE | gsistat | GSI (obs-ges), qc, and iteration statistics | text |
| gsistat_$CDATE_ensmean | *same as glopara file* | gsistat file for $CDATE; based on data selection run (eobs) using ensemble mean background fields | text |
| gsistat_$CDATE_mem$MEM | *same as glopara file* | gsistat file for member $MEM for $CDATE | text |
| radstat_$CDATE_ensmean | *same as glopara file* | Radiance diagnostic file with $CDATE observations; generated by eobs (data selection using ensemble mean)3 | binary |
| radstat_$CDATE_mem$MEM | *same as glopara file* | Radiance diagnost file for member $MEM with $CDATE observations | binary |
| cnvstat.$CDUMP.$CDATE | cnvstat | Conventional observation assimilation statistics | binary |
| cnvstat_$CDATE_ensmean | *same as glopara file* | Conventional diagnostic file with $CDATE observations; generated by eobs (data selection using ensemble mean) | binary |
| cnvstat_$CDATE_mem$MEM | *same as glopara file* | Conventional diagnostic file for member $MEM with $CDATE observations | binary |
| enkfstat_$CDATE | *same as glopara file* | EnKF update code stdout for $CDATE | text |
| ensstat_$CDATE_all | *same as glopara file* | Log file denoting completion of averaging of ensemble forecasts (epos step) for $CDATE | text |
| fcsstat_$CDATE_all | *same as glopara file* | Log file for denoting completion of all $CDATE ensemble forecasts | text |
| fcsstat_$CDATE_grp$GRP | *same as glopara file* | Log file for completion of group $GRP ensemble forecasts for $CDATE | text |
| flxf$FF.$CDUMP.$CDATE | fluxgrbf$FF | Model fluxes at forecast hour $FF | GRIB |

| | | | |
|---|---|---|---|
| logf$FF.$CDUMP.$CDATE | logf$FF | Model logfile at forecast hour $F | text |
| omgstat_$CDATE_all | *same as glopara file* | Log file denoting completion of all $CDATE ensemble innovation jobs | text |
| omgstat_$CDATE_grp$GRP | *same as glopara file* | Log file for completion of group $GRP ensemble innovation job for $CDAT | text |
| oznstat.$CDUMP.$CDATE | oznstat | Ozone observation assimilation statistics | binary |
| oznstat_$CDATE_ensmean | *same as glopara file* | Ozone diagnostic file with $CDATE observations; generated by eobs (data selection using ensemble mean) | binary |
| oznstat_$CDATE_mem$MEM | *same as glopara file* | Ozone diagnost file for member $MEM with $CDATE observations3 | binary |
| pertdates_$CDATE | pertdates_$CDATE | Dates from from pertubation database used in $CDATE additive inflation step (ecen | text |
| pcpstat.$CDUMP.$CDATE | pscpstat | Precipitation assimilation statistics | binary |
| prepqa.gdas.$CDATE | | Observations with QC plus analysis | BUFR |
| prepqc.$CDUMP.$CDATE | prepbufr | Conventional Observations with QC | BUFR |
| prepqf.gdas.$CDATE | | Observations with QC plus forecast | BUFR |
| radstat.$CDUMP.$CDATE | radstat | Radiance assimilation statistics | binary |
| sfcshp.anl.$CDATE | | Ship observation and analysis fit file3 | GrADS |
| sfcshp.fcs.$CDATE | | Ship observation and forecast fit file | GrADS |
| tcinform_relocate.$CDUMP.$CDATE | | Storm relocation information | text |
| tcvitals_relocate.$CDUMP.$CDATE | | tropical cyclone vitals | text |

## 5.3 Finding GDAS and GFS production run files

Locations below use the following:

```
YYYY  = 4-digit year of run date
MM  = 2-digit month of run date
DD  = 2-digit day of run date
CC = run cycle (00, 06, 12 18) in UTC
```

NCO maintains files for the last 10 days in WCOSS directories:

```
/com/gfs/prod/gdas.YYYYMMDD
/com/gfs/prod/gfs.YYYYMMDD
/com/gfs/prod/enkf.YYYYMMDD/CC
```

…and the last two days in Zeus directories:

```
/scratch2/portfolios/NCEPDEV/rstprod/com/gfs/prod/gdas.YYYYMMDD
/scratch2/portfolios/NCEPDEV/rstprod/com/gfs/prod/gfs.YYYYMMDD
/scratch2/portfolios/NCEPDEV/rstprod/com/gfs/prod/enkf.YYYYMMDD/CC
```

Locations of production files on HPSS (tape archive):

```
/NCEPPROD/hpssprod/runhistory/rhYYYY/YYYYMM/YYYYMMDD/
```

Example for December 16th, 2013 00Z (2013121600):

```
/NCEPPROD/hpssprod/runhistory/rh2013/201312/20131216

gdas files:    com_gfs_prod_gdas.2013121600.tar         (contains fcst ICs)
gfs files:     com_gfs_prod_gfs.2013121600.anl.tar      (contains fcst ICs)
               com_gfs_prod_gfs.2013121600.pgrb2.tar
enkf files:    com_gfs_prod_enkf.20131216_00.anl.tar    (contains efmn ICs)
               com_gfs_prod_enkf.20131216_00.fcs.tar
               com_gfs_prod_enkf.20131216_00.fcs03.tar
               com_gfs_prod_enkf.20131216_00.fcs09.tar
               com_gfs_prod_enkf.20131216_00.omg.tar
```

Example pulling ICs off HPSS for a fully-cycled GFS run with the Hybrid EnKF starting at 2013121600 gdas:

```
hpsstar get
/NCEPPROD/hpssprod/runhistory/rh2013/201312/20131216/com_gfs_prod_gdas.201312
1600.tar ./gdas1.t00z.abias ./gdas1.t00z.satang ./gdas1.t00z.sanl
./gdas1.t00z.sfcanl
hpsstar get
/NCEPPROD/hpssprod/runhistory/rh2013/201312/20131216/com_gfs_prod_enkf.201312
16_00.anl.tar
```

See "Notes" on next page...

NOTES:

Make sure to rename the gdas.t00z.* files you pull from the first tarball. Those files need to be in the parallel naming convention (see previous page).

The 2nd command will pull all of the contents of that EnKF tarball. This is MUCH faster than trying to list all 160 ICs you'd need to pull from that tarball. You'll get a few extra files you don't need but oh well.

# 6. System Settings

## 6.1 Grid dimensions

| SPECTRAL RESOLUTION | EULERIAN | | SEMI-LAGRANGIAN | |
|---|---|---|---|---|
| | LONB | LATB | LONB | LATB |
| **T62** | 192 | 94 | 128 | 64 |
| **T126** | 384 | 190 | 256 | 128 |
| **T170** | 512 | 256 | 352 | 176 |
| **T190** | 576 | 288 | 384 | 192 |
| **T254** | 768 | 384 | 512 | 256 |
| **T382** | 1152 | 576 | 768 | 384 |
| **T574** | 1760 | 880 | 1152 | 576 |
| **T878** | 2304 | 1152 | 1760 | 880 |
| **T1148** | | | 2304 | 1152 |
| **T1534** | | | 3072 | 1536 |
| **T2014** | | | 4032 | 2016 |
| **T2046** | | | 4096 | 2048 |
| **T3070** | | | 6144 | 3072 |

## 6.2 Global Model Variables

To view the full list of global model variables please see Appendix A.

# 7. Setting up an experiment

Steps:

1. Is your environment setup correctly? If you're not sure, check out the "Setting up your environment" section below.
2. Do you have restricted data access? If not go to: http://www.nco.ncep.noaa.gov/sib/restricted_data/restricted_data_sib/ and submit a registration form to be added to group rstprod.
3. Important terms
4. Set up experiment configuration file
5. Set up rlist
6. Submit first job

Additional information in this section:

1. Plotting model output
2. Experiment troubleshooting
3. Related utilities

## 7.1 Important terms

- **configuration file** - List of variables to be used in experiment and their configuration/value. The user can change these variables for their experiment. Description of variables.
- **job** - A script, combined with variable definitions set in configuration, which is similar in function to the wrapper scripts in /nwprod/jobs, and which calls the main driver scripts. Each box in above diagram is a job.
- **reconcile.sh** - Similar to the configuration file, the reconcile.sh script sets required, but unset variables to default values.
- **rlist** - List of data to be used in experiment. Created in reconcile.sh (when the pmkr script is run) if it does not already exist at beginning of experiment. More information on setting up your own rlist see section 5.4.
- **rotating directory (ROTDIR)** - Typically your "noscrub" directory is where the data and files from your experiment will be stored. Example on Zeus: /scratch2/portfolios/NCEPDEV/global/noscrub/$LOGNAME/pr$PSLOT

## 7.2 Setting up your environment

For successful GFS model runs it is important that your supercomputer environment be setup correctly. If you are unsure of what PATHs need setting, modules loaded, etc. then take a peek at the following .profile and .bashrc/.cshrc files:

| MACHINE | .profile | .bashrc |
|---|---|---|
| WCOSS | /u/Kate.Howard/.profile | /u/Kate.Howard/.bashrc |
| Zeus | /home/Kate.Howard/.profile | /home/Kate.Howard/.cshrc |

## 7.3 Configuration file

The following files have settings that will produce results that match production results. Copy this file, or any other configuration file you wish to start working with, to your own space and modify it as needed for your experiment.

| MACHINE | LOCATION | FILE NAME | WHAT |
|---|---|---|---|
| **WCOSS** | /global/save/emc.glopara/svn/gfs/tags/... TAG_OF_CHOICE... /para/exp/ | para_config_T254 | Q1FY15 at T254 |
| | | para_config_T574 | ^ same at T574 |
| | | para_config_T670_T254 | ^ same at T670 |
| | | para_config_T1534* | ^ same at T1534* |
| **Zeus** | /scratch2/portfolios/NCEPDEV/global/save/ glopara/svn/gfs/tags/TAG_OF_CHOICE/para/exp | Same as WCOSS | |
| **S4** | /home/khoward/GFS_tutorial/prtest | para_config | May 2012 version |

* Mimics production

Make sure to check the following user specific configuration file variables, found near the top of the configuration file:

**ACCOUNT** LoadLeveler account, i.e., GFS-MTN (see more examples below for ACCOUNT, CUE2RUN, and GROUP)
**ARCDIR** Online archive directory (i.e. ROTDIR/archive/prPSLOT)
**ATARDIR** HPSS tape archive directory (see configuration file for example)
**CUE2RUN** LoadLeveler (or Moab) class for parallel jobs (i.e., dev) (see more examples of CUE2RUN below)
**EDATE** Analysis/forecast cycle ending date (YYYYMMDDCC, where CC is the cycle)
**EDUMP** Cycle ending dump (gdas or gfs)
**ESTEP** Cycle ending step (prep, anal, fcst1, post1, etc.)
**EXPDIR** Experiment directory under save, where your configuration file, rlist, runlog, and other experiment scripts sit.
**GROUP** LoadLeveler group (i.e., g01) (see more examples of GROUP below)
**PSLOT** Experiment ID (change this to something unique for your experiment)
**ROTDIR** Rotating/working directory for model data and i/o (i.e. /global/noscrub/$LOGNAME/pr$PSLOT)

## 7.4 Reconcile.sh

If concerned, make sure to take a look at the current reconcile script to assure that any changes you made in the configuration file are not overwritten. The reconcile script runs after reading in the configuration file settings and sets default values for many variables that may or may not be defined in the configuration file. If there are any default choices in reconcile that are not ideal for your experiment make sure to set those variables in your configuration file, perhaps even at the end of the file after reconcile has been run.

## 7.5 Rlist

You can start with an existing rlist and modify it by hand as needed or grab the sample that exists in the exp subdirectory of the tag (or other release) you wish to run (RECOMMENDED):

SVN: https://svnemc.ncep.noaa.gov/projects/gfs/trunk/para/exp/prsample1.gsi.rlist

The sample rlist files already contain the append.rlist entries.

If the rlist file does not exist when a job is submitted, pmkr will generate one based on your experiment configuration. However, it is currently advised that you **do not** use pmkr to create an rlist, but rather, pick up the sample rlist.

If the variable $ARCHIVE is set to YES (the default is NO), this file is then appended automatically to the rlist by reconcile.sh, but only when the rlist is generated on the fly by pmkr. So, eg, if you submit the first job, which creates an rlist and then you realize that your ARCx entries are missing, creating the append_rlist after the fact won't help unless you remove the now existing rlist. If you delete the errant rlist (and set $ARCHIVE to YES, the next job you submit will see that the rlist does not exist, create it using pmkr, then append the $append_rlist file.

Also, along those lines, you may find that pmkr does not account for some new or development files. You can list those needed entries in the file pointed to by variable $ALIST. The difference between $ALIST and $append_rlist is that the latter only gets appended if variable $ARCHIVE is YES.

Got all that?? (Now you know why it is sometimes easier to start with an existing rlist).

Brief overview of an rlist format:

```
Sample entries:

# rotational input
*/*/anal/ROTI   =       biascr.$GDUMP.$GDATE
*/*/anal/ROTI   =       satang.$GDUMP.$GDATE
*/*/anal/ROTI   =       sfcf06.$GDUMP.$GDATE
*/*/anal/ROTI   =       prepqc.$CDUMP.$CDATE
# optional input
*/*/anal/OPTI   =       sfcf03.$GDUMP.$GDATE
*/*/anal/OPTI   =       sfcf04.$GDUMP.$GDATE
*/*/anal/OPTI   =       sfcf05.$GDUMP.$GDATE
*/*/anal/OPTI   =       sfcf07.$GDUMP.$GDATE
*/*/anal/OPTI   =       sfcf08.$GDUMP.$GDATE

The left hand side is set of 4 patterns separated by slashes.

The first pattern represents the cycle (full date)
The second pattern represents the dump.
The third pattern represents the job.
The fourth pattern is a string that defines whether a file is
optional/required input/output, eg:

DMPI - dump input from current cycle
```

```
DMPG - dump input from previous cycle
DMPH - dump input from two cycles prior
ROTI - required input from the rotating directory
OPTI - optional input from the rotating directory
ROTO - required output to the rotating directory (if the file is not
available, a flag is set and the next job is not triggered)
OPTO - optional output to the rotating directory (save it if available, no
worries if it's not)
ARCR - files to archive in online archive  (should be required, but depends
on setup of arch.sh)
ARCO - files to archive in online archive
ARCA - files saved to "ARCA" HPSS archive
ARCB - files saved to "ARCB" HPSS archive  (check arch.sh job for other HPSS
options... current version allows for ARCA thru ARCF)
COPI - required restart and files to initiate experiment with copy.sh job
(fcst input)
DMRI - prerequisite dump file for submit (used in psub, but not used in job
scripts to copy data!)

The right hand side typically represents a file.

An asterisk on either side is a wild card.  Eg:
*/*/arch/ARCR        =       pgbf06.$CDUMP.$CDATE
The above entry in your rlist means that for any cycle, or any dump, the
archive job will copy pgbf06.$CDUMP.$CDATE to the online archive.

If you change that to:
 */gfs/arch/ARCR        =       pgbf06.$CDUMP.$CDATE
only the the gfs pgbf06 files will be copied to the online archive.

If you changed it to:
*00/gfs/arch/ARCR        =       pgbf06.$CDUMP.$CDATE
only the 00Z gfs pgbf06 files will be copied to the online archive.

If you changed it to:
20080501*/gfs/arch/ARCR        =       pgbf06.$CDUMP.$CDATE
only the May 1, 2008 gfs pgbf06 files will be copied to the online archive.
(Not a likely choice, but shown as an example)

Changing that first example to:
 */*/arch/ARCR        =       pgbf*.$CDUMP.$CDATE
tells the archive job to copy the the pgb file for any forecast hour (from
the current $CDUMP and $CDATE) to the online archive.

A more complex set of wildcards can be useful for splitting up the HPSS
archive to keep tar files manageable.  Eg:

# all gdas sigma files go to ARCA HPSS archive
*/gdas/arch/ARCA =       sigf*.$CDUMP.$CDATE

# gfs sigf00 thru sigf129 go to ARCB HPSS archive
*/gfs/arch/ARCB =       sigf??.$CDUMP.$CDATE
*/gfs/arch/ARCB =       sigf1[0-2]?.$CDUMP.$CDATE

# gfs sigf130 thru sigf999 go to ARCC HPSS archive
*/gfs/arch/ARCC =       sigf1[3-9]?.$CDUMP.$CDATE
*/gfs/arch/ARCC =       sigf[2-9]??.$CDUMP.$CDATE
```

## 7.6 Initial Conditions / Required Forcing Files

The following files are needed to run the GFS/GDAS:

| | PARALLEL | PRODUCTION |
|---|---|---|
| **NON-CYCLING / FREE FORECAST** | sfcanl.$CDUMP.$CDATE | gdas1.tCCz.sfcanl |
| | siganl.$CDUMP.$CDATE | gdas1.tCCz.sanl |
| **CYCLING w/o HYBRID ENKF** | *biascr.$CDUMP.$CDATE | gdas1.tCCz.abias |
| | *biascr_pc.$CDUMP.$CDATE | gdas1.tCCz.abias_pc |
| | *radstat.$CDUMP.$CDATE | gdas1.tCCz.radstat |
| | sfcanl.$CDUMP.$CDATE | gdas1.tCCz.sfcanl |
| | siganl.$CDUMP.$CDATE | gdas1.tCCz.sanl |
| **CYCLING w/ HYBRID ENKF** | *biascr.$CDUMP.$CDATE | gdas1.tCCz.abias |
| | *biascr_pc.$CDUMP.$CDATE | gdas1.tCCz.abias_pc |
| | *radstat.$CDUMP.$CDATE | gdas1.tCCz.radstat |
| | sfcanl.$CDUMP.$CDATE | gdas1.tCCz.sfcanl |
| | siganl.$CDUMP.$CDATE | gdas1.tCCz.sanl |
| | siganl_$CDATE_mem$MEM | siganl_$CDATE_mem$MEM |
| | sfcanl_$CDATE_mem$MEM | sfcanl_$CDATE_mem$MEM |

Where CC is the cycle (00, 06, 12, or 18 Z) & $MEM is the member number (001-080)

* Prior to Q1FY15 implementation these ICs should be pulled from pre-implementation parallels

So where do I find initial conditions (ICs)? See section 5.3

# 8. Submitting & running your experiment

1. Create directory $EXPDIR (defined in configuration file)
2. Place a configuration file and rlist into $EXPDIR
3. Create directory $ROTDIR (defined in configuration file)
4. Copy required initial condition / forcing files into $ROTDIR
5. Make the necessary edits to your configuration file to match the kind of experiment you wish to run (see section 7.3). Make sure to rename your rlist to match your experiment PSLOT (i.e. pr$PSLOT1.gsi.rlist).
6. Then, it's time to submit! On command line type:

   **$PSUB $CONFIG $CDATE $CDUMP $CSTEP**

   Where:

   **$PSUB** = psub script with full location path. It is always recommended to use the psub script from within the tag (or other release) you plan to run. The psub script currently works on both WCOSS and Zeus.
   **$CONFIG** = name of configuration file (with full location path if not submitting from within your $EXPDIR)
   **$CDATE** = YYYYMMDDCC, initial/starting year (YYYY), month (MM), day (DD), and cycle (CC) for model run
   **$CDUMP** = dump (gdas or gfs) to start run
   **$CSTEP** = initial model run step (see flow diagram above for options)

   Example on WCOSS:

   **/global/save/emc.glopara/svn/gfs/trunk/para/bin/psub para_config_T1534 2015011412 gdas fcst1**

   Notes:
   - If you wish to cycle AND run the Hybrid EnKF then you need to submit both the fcst1 and efmn steps at the beginning.
   - If you do not wish to cycle OR you do not wish to run the Hybrid EnKF then start with just the gdas fcst1 step.
   - If you just wish to run a GFS free-forecast, start with the gfs fcst1 step.
   - If you have a submit script that you are comfortable with then please feel free to use that to submit your experiment instead of the psub command, which should already be built into the submit script.

Additional information about running an experiment:

- The script "psub" kicks off the experiment and each parallel sequenced job.
- Remember that since each job script starts the next job, you need to define ESTEP as the job that follows the step with which you wish to end on. For example: You want to finish when your final planned cycle completes...your ESTEP could be "prep", which is the first step of the next cycle. Typically EDUMP is gdas…which means that if gfs_cyc > 0 the next gfs cycle may be submitted even though it is the cycle after the end of your experiment.

A handy way to follow the status of your experiment is to do a tail of your runlog in your $EXPDIR directory:

```
tail -f pr$PSLOT.runlog
```
(where $PSLOT is your experiment tag)

## 8.1 Plotting output

Everyone has a favorite plotting program but one great option is GrADS. To use GrADS you'll first need to create a control file from your GRIB output:

1. Create GrADS readable ctl file using grib2ctl script:

   Find copy here: /u/Wesley.Ebisuzaki/bin/grib2ctl.pl (WCOSS)

   To run: **GRIB2CTL [options] INPUT > OUTPUT.ctl**

   **GRIB2CTL** = full path of grib2ctl.pl or simply grib2ctl.pl if it's already in your environment
   **INPUT** = the full name and path of the GRIB file
   **OUTPUT** = the name of the ctl file you wish to create
   **[options]** = full list of options can be found if you type "grib2ctl.pl" and hit enter. If you are making a ctl file from a forecast file then it is suggested to use the -verf option.

2. Create index file using gribmap:

   **gribmap -i OUTPUT.ctl**

   You should now have .ctl and .idx files.

3. Open GrADS (**grads** or **gradsc**) and then open your ctl file (**open OUTPUT.ctl**)

   For information on using GrADS go here: http://www.iges.org/grads/gadoc/

## 8.2 Experiment troubleshooting

Machine issues? Contact appropriate helpdesk:

```
WCOSS - wcoss-helpdesk@noaa.gov
Zeus - rdhpcs.zeus.help@noaa.gov
S4 - s4.admin@ssec.wisc.edu
```

As model implementations occur, ensure that you are using up-to-date versions of scripts/code and configuration file for your experiment. For instance, don't use the newest production executables with older job scripts. Changes may have been made to the production versions that will impact your experiment but may not be obvious.

For problems with your experiment please contact Kate Howard: kate.howard@noaa.gov

**Please make sure to provide the following information in the email:**

- Machine you are working on (WCOSS, Zeus, or S4)
- Configuration file name and location
- Any other specific information pertaining to your problem, i.e., dayfile name and/or location.

## 8.3 Tutorials

Tutorials are available for users, who are perhaps unfamiliar with both the machine and the GFS. See the following table for tutorial information:

| Machine | Location |
|---|---|
| **WCOSS** | /global/save/emc.glopara/TUTORIAL |
| **Zeus** | /scratch2/portfolios/NCEPDEV/global/save/glopara/TUTORIAL |

# 9. Parallels

View the Global Parallel Spreadsheet here:
https://docs.google.com/a/noaa.gov/spreadsheet/ccc?key=0AoyO6L08rs23dE9HdFhqa25YdUVyNUVZWTVrY01EeWc#gid=0%7C

# 10. Subversion & Trac

GFS Trac page - https://svnemc.ncep.noaa.gov/trac/gfs
SVN project page - https://svnemc.ncep.noaa.gov/projects/gfs/

GSM Trac page - https://svnemc.ncep.noaa.gov/trac/gsm
SVN project page - https://svnemc.ncep.noaa.gov/projects/gsm/

# 11. Related utilities

Information on some useful related utilities:

**copygb** copies all or part of one GRIB file to another GRIB file, interpolating if necessary

**sfchdr** global_sfchdr prints information from the header of a surface file

**sighdr** global_sighdr prints information from the header of a sigma file

**ss2gg** ss2gg converts a sigma file to a grads binary file and creates a corresponding descriptor (ctl) file

## 11.1 copygb

The command copygb copies all or part of one GRIB file to another GRIB file, interpolating if necessary.

copygb can be found at: /nwprod/util/exec/copygb

Documentation is in: /nwprod/util/sorc/copygb.fd/copygb.doc

The NCEP grids for the -g option are listed in:
http://www.nco.ncep.noaa.gov/pmb/docs/on388/tableb.html

Documentation for the interpolation options are covered in: /nwprod/lib/sorc/ip/iplib.doc (though some parts may be outdated).

If you want to dig into any "w3" subroutines referenced, they generally have good docblocks in their source code. The directory is /nwprod/lib/sorc/w3 and a there's a web doc at http://www.nco.ncep.noaa.gov/pmb/docs/libs/w3lib/ncep_w3lib.shtml

## 11.2 sfchdr

global_sfchdr prints information from the header of a surface file

```
global_sfchdr can be found at:

    /nwprod/exec/global_sfchdr

Usage: global_sfchdr sfcfile <variable.list >value.list
    or  global_sfchdr sfcfile variable >value
    or  global_sfchdr sfcfile

Running sfchdr with no additional arguments (other than the input file) as in
the last example allows for keyboard input of multiple variables,
one at a time, until the program is interrupted (eg, via CTRL-c).

Enter "?" (without the quotes) as standard input and the possible input
values will be printed.

Description of those possible values follows:
     filetype  - description ("GFS/SFC")
     fhour             - forecast hour
     ifhr              - integral forecast hour as string
     idate             - initial date (YYYYMMDDHH)
     iyr               - initial year
     imo               - initial month
     idy               - initial day
     ihr               - initial hour
     vdate             - valid date (YYYYMMDDHH)
     vyr               - valid year
     vmo               - valid month
     vdy               - valid day
     vhr               - valid hour
     latb              - number of latitudes
     lonb              - number of longitudes
     ivs               - version number
     lsoil             - number of soil levels
     irealf    - floating point flag (=1 for 4-byte ieee, =2 for 8-byte ieee)
     lpl               - number of longitudes for each latitude
     zsoil     - soil depths (in meters)
```

## 11.3 sighdr

global_sighdr prints information from the header of a sigma file

```
global_sighdr can be found at:

       /nwprod/exec/global_sighdr

Usage: global_sighdr sigfile <variable.list >value.list
       or  global_sighdr sigfile variable >value

The following is from the docblock of /nwprod/sorc/global_sighdr.fd/sighdr.f

program sighdr
!$$$  main program documentation block
```

```
!
! Main program: sighdr              Print information from sigma header
!   Prgmmr: Iredell          Org: np23        Date: 1999-08-23
!
! Abstract: This program prints information from the sigma header.
!   The following parameters may be printed out:
!     filetype
!     fhour
!     ifhr
!     idate
!     iyr
!     imo
!     idy
!     ihr
!     vdate
!     vyr
!     vmo
!     vdy
!     vhr
!     si
!     sl
!     ak
!     bk
!     siglev
!     jcap
!     levs
!     itrun
!     iorder
!     irealf
!     igen
!     latf
!     lonf
!     latb
!     lonb
!     latr
!     lonr
!     ntrac
!     icen2
!     ienst
!     iensi
!     idpp
!     idsl
!     idvc
!     idvm
!     idvt
!     idrun
!     idusr
!     pdryini
!     ncldt
!     ixgr
!     nxgr
!     nxss
!     ivs
!     nvcoord
!     vcoord
!     cfvars
```

## 11.4 ss2gg

ss2gg converts a sigma file to a grads binary file and creates a corresponding descriptor (ctl) file

```
Original Author: Mark Iredell

Usage: ss2gg sigfile(s) gggfile ctlfile idrt imax jmax

where:

sigfile(s) = sigma file(s) to be converted to grads readable ieee files

gggfile = output file name

ctlfile = name of grads descriptor file (output)

idrt = output grid type
         0 = linear S->N
         4 = gaussian
       256 = linear N->S

imax = integer number of longitude points for output grid

jmax = integer number of latitude points for output grid

!                (IDRT=4 FOR GAUSSIAN GRID,
!                 IDRT=0 FOR EQUALLY-SPACED GRID INCLUDING POLES.
!     imax     - Integer even number of longitudes for output grid
!     jmax     - Integer number of latitudes for output grid
```

# Appendix A – Global Model Variables

| VARIABLE | GROUP | DESCRIPTION |
|---|---|---|
| **ACCOUNT** | GENERAL | LoadLeveler account, i.e. GFS-MTN |
| **adiab** | FCST | Debugging, true=run adiabatically |
| **AERODIR** | FCST | Directory, usually set to $FIX_RAD, see $FIX_RAD |
| **AIRSBF** | ANAL | Naming convention for AIRSBF data file |
| **ALIST** | GENERAL | Extra set of files to be added to rlist if ARCHIVE=YES; used only if rlist is being generated on the fly in this step; done in reconcile.sh |
| **AM_EXEC** | FCST | Atmospheric model executable |
| **AM_FCS** | FCST | See $FCSTEXECTMP |
| **AMSREBF** | ANAL | AMSR/E bufr radiance dataset |
| **ANALSH** | ANAL | Analysis job script, usually "anal.sh" |
| **ANALYSISSH** | ANAL | Analysis driver script |
| **ANAVINFO** | ANAL | Text files containing information about the state, control, and meteorological variables used in the GSI analysis |
| **ANGUPDATESH** | ANGU | Angle update script |
| **ANGUPDATEXEC** | ANGU | Angle update executable |
| **ANISO_A_EN** | ENKF | TRUE = use anisotropic localization of hybrid ensemble control variable a_en |
| **anltype** | ANAL | Analysis type (gfs or gdas) for verification (default=gfs) |
| **Apercent** | FCST | For idvc=3, 100: sigma-p, 0: pure-theta |
| **append_rlist** | GENERAL | Location of append_rlist (comment out if not using) |
| **AQCX** | PREP | Prep step executable |
| **ARCA00GDAS** | ARCH | Points to HPSS file name for ARCA files for 00Z cycle GDAS |
| **ARCA00GFS** | ARCH | Points to HPSS file name for ARCA files for 00Z cycle GFS |
| **ARCA06GDAS** | ARCH | Points to HPSS file name for ARCA files for 06Z cycle GDAS |
| **ARCA06GFS** | ARCH | Points to HPSS file name for ARCA files for 06Z cycle GFS |
| **ARCA12GDAS** | ARCH | Points to HPSS file name for ARCA files for 12Z cycle GDAS |
| **ARCA12GFS** | ARCH | Points to HPSS file name for ARCA files for 12Z cycle GFS |
| **ARCA18GDAS** | ARCH | Points to HPSS file name for ARCA files for 18Z cycle GDAS |
| **ARCA18GFS** | ARCH | Points to HPSS file name for ARCA files for 18Z cycle GFS |
| **ARCB00GFS** | ARCH | Points to HPSS file name for ARCB files for 00Z cycle GFS |
| **ARCB06GFS** | ARCH | Points to HPSS file name for ARCB files for 06Z cycle GFS |
| **ARCB12GFS** | ARCH | Points to HPSS file name for ARCB files for 12Z cycle GFS |
| **ARCB18GFS** | ARCH | Points to HPSS file name for ARCB files for 18Z cycle GFS |
| **ARCC00GFS** | ARCH | Points to HPSS file name for ARCC files for 00Z cycle GFS |
| **ARCC06GFS** | ARCH | Points to HPSS file name for ARCC files for 06Z cycle GFS |
| **ARCC12GFS** | ARCH | Points to HPSS file name for ARCC files for 12Z cycle GFS |
| **ARCC18GFS** | ARCH | Points to HPSS file name for ARCC files for 18Z cycle GFS |
| **ARCDIR** | ARCH | Location of online archive |
| **ARCDIR1** | ARCH | Online archive directory |
| **ARCH_TO_HPSS** | ARCH | Make hpss archive |
| **ARCHCFSRRSH** | ARCH | Script location |
| **ARCHCOPY** | ARCH | If yes then copy select files (ARCR and ARCO in rlist) to online archive |
| **ARCHDAY** | ARCH | Days to delay online archive step |
| **ARCHIVE** | ARCH | Make online archive |
| **ARCHSCP** | ARCH | If yes & user glopara, scp all files for this cycle to alternate machine |
| **ARCHSCPTO** | ARCH | Remote system to receive scp'd data (mist->dew, dew->mist) |
| **ARCHSH** | ARCH | Archive script |
| **ASYM_GODAS** | ANAL | For asymmetric godas (default=NO) |
| **ATARDIR** | ARCH | HPSS tape archive directory |
| **ATARFILE** | ARCH | HPSS tape archive tarball file name, $ATARDIR/\$ADAY.tar |
| **AVG_FCST** | FCST | Time average forecast output files |
| **AVRG_ALL** | AVRG | To submit averaging and archiving scripts; this should be set to 'YES' - valid for reanalysis |
| **AVRGALLSH** | AVRG | Script location |
| **B1AMUA** | ANAL | Location and naming convention of B1AMUA data file |
| **B1HRS4** | ANAL | Location and naming convention of B1HRS4 data file |
| **B1MHS** | ANAL | Location and naming convention of B1MHS data file |
| **BERROR** | ANAL | Location and naming convention of BERROR files |
| **beta1_inv** | ENKF | 1/beta1 = the weight given to static background error covariance |
| **BUFRLIST** | PREP | BUFR data types to use |
| **C_EXEC** | FCST | Coupler executable |
| **CAT_FLX_TO_PGB** | POST | Cat flx file to pgb files (only works for ncep post and IDRT=0) |
| **ccnorm** | FCST | Assumes all cloud water is inside cloud (true), operation (false) |

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|---|---|---|
| **CCPOST** | POST | To run concurrent post |
| **ccwf** | FCST | Cloud water function, ras, 1: high res, 2: T62 |
| **CDATE** | GENERAL | Date of run cycle (YYYMMDDCC), where CC is the forecast cycle, e.g. 00, 06, 12, 18 |
| **CDATE_SKIP** | ANAL | LDAS modified sfc files not used before this date; must be >24 hours from the start |
| **CDFNL** | VRFY | SCORES verification against selected dump, pgbanl.gdas or pgbanl.gfs |
| **CDUMP** | GENERAL | Dump name (gfs or gdas) |
| **CDUMPFCST** | PREP | Fits-to-obs against gdas or gfs prep |
| **CDUMPPREP** | PREP | Prep dump to be used in prepqfit |
| **CFSRDMP** | DUMP | Location of CFS/climate dump archive |
| **CFSRR_ARCH** | ARCH | Script location |
| **CFSRRPLOTSH** | AVRG | Script location |
| **CFSV2** | FCST | CFS switch, YES=run CFS version 2 |
| **ch1** | FCST | Hours in gdas fcst1 & post1 job wall-clock-limit [hours:minutes:seconds] (see reconcile script) |
| **ch1** | POST | See ch1 (FCST) |
| **ch2** | FCST | Same as ch1 but for segment 2 |
| **ch2** | POST | See ch2 (FCST) |
| **cha** | ANAL | Analysis wall time; hours in job wall-clock-limit [hours:minutes:seconds] (see reconcile script) |
| **CHG_LDAS** | ANAL | To bring in new vegtyp table to LDAS |
| **CHGRESEXEC** | GENERAL | Chgres executable location |
| **CHGRESSH** | GENERAL | Chgres script location |
| **CHGRESTHREAD** | GENERAL | Number of threads for chgres (change resolution) |
| **CHGRESVARS** | GENERAL | Chgres variables |
| **CLDASSH** | ANAL | CLDAS script |
| **climate** | FCST | CFS variable, grib issue |
| **CLIMO_FIELDS_OPT** | FCST | Interpolate veg type, soil type, and slope type from inputgrid, all others from sfcsub.f, 3: to coldstart higher resolution run |
| **cm1** | FCST | Minutes in gdas fcst1 & post1 job wall-clock-limit [hours:minutes:seconds] (see reconcile script) |
| **cm1** | POST | See cm1 (FCST) |
| **cm2** | FCST | Same as cm1 but for segment 2 |
| **cm2** | POST | See cm2 (FCST) |
| **cma** | ANAL | Analysis wall time; minutes in job wall-clock-limit [hours:minutes:seconds] (see reconcile script) |
| **cmapdl** | GENERAL | Cmap dump location in $COMDMP |
| **cmbDysPrf4** | ANAL | GODAS executable |
| **cmbDysPrfs4** | ANAL | GODAS executable |
| **CO2_seasonal_cycle** | FCST | CO2 seasonal cycle; global_co2monthlycyc1976_YYYY.txt |
| **CO2DIR** | FCST | Directory with CO2 files |
| **COMCOP** | GENERAL | Location where copy.sh looks for production (or alternate) files |
| **COMDAY** | GENERAL | Directory to store experiment "dayfile" output (dayfile contains stdout & stderr), see $ROTDIR |
| **COMDIR** | GENERAL | See $TOPDIR |
| **COMDMP** | GENERAL | Location of key production (or alternate) files (observation data files, surface boundary files) |
| **COMDMPTMP** | GENERAL | Temporary version of $COMDMP |
| **COMROTTMP** | GENERAL | If set, replaces config value of $ROTDIR |
| **CONFIG** | GENERAL | Configuration file name |
| **cont_eq_opt1** | FCST | TRUE = when the advected and nonlinear fields of the mass-continuity equation are separated into two parts so that a different interpolation can be used for each part - following the EC approach. Only use with herm_x = herm_y = herm_z = lin_xy = false and lin_xyz = true. Additionally, opt1_3d_cubic = true, if quasi-tricubic interpolation is used for nonlinear terms |
| **CONVINFO** | ANAL | Location of convinfo.txt file, conventional data |
| **COPYGB** | GENERAL | Location of copygb utility |
| **COUP_FCST** | FCST | NO: AM model only, YES: coupled A-O forecast (default=NO) |
| **COUP_GDAS** | FCST | YES: run coupled GDAS |
| **COUP_GFS** | FCST | YES: run coupled GFS forecast |
| **CQCX** | PREP | Prep executable |
| **crtrh** | FCST | For Zhao microphysics, if zhao_mic is .false., then for Ferrier-Moorthi microphysics |
| **cs1** | FCST | Seconds in gdas fcst1 & post1 job wall-clock-limit [hours:minutes:seconds] (see reconcile script) |
| **cs1** | POST | See cs1 (FCST) |
| **cs2** | FCST | Same as cs1 but for segment 2 |
| **cs2** | POST | See cs2 (FCST) |
| **csa** | ANAL | Analysis wall time; seconds in job wall-clock-limit [hours:minutes:seconds] (see reconcile script) |
| **CSTEP** | GENERAL | Step name (e.g. prep, anal, fcst2, post1, etc.) |
| **ctei_rm** | FCST | Cloud top entrainment instability criterion, mstrat=true |
| **CTL_ANL** | POST | Parameter file for grib output |
| **CTL_FCS** | POST | Parameter file for grib output |
| **CTL_FCS_D3D** | POST | Parameter file for grib output |
| **CUE2RUN** | COMP | User queue variable; LoadLeveler class for parallel jobs (i.e. dev) |
| **CUE2RUN1** | COMP | Similar to $CUE2RUN but alternate queue |

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|---|---|---|
| **CUE2RUN3** | COMP | Similar to $CUE2RUN but alternate queue |
| **cWGsh** | ANAL | GODAS script |
| **CYCLESH** | GENERAL | Script location |
| **CYCLEXEC** | GENERAL | Executable location |
| **CYINC** | GENERAL | Variable used to decrement GDATE {06} |
| **DATATMP** | GENERAL | Working directory for current job |
| **DAYDIR** | GENERAL | See $ROTDIR |
| **DELTIM** | FCST | Time step (seconds) for segment 1 |
| **DELTIM2** | FCST | Time step (seconds) for segment 2 |
| **DELTIM3** | FCST | Time step (seconds) for segment 3 |
| **DELTIM_EFCS** | ENKF | Time step for ensemble forecast |
| **diagtable** | PREP | Ocean and ice diagnostic file |
| **diagtable_1dy** | PREP | Oceanand ice diagnostic file |
| **diagtable_1hr** | PREP | Ocean and ice diagnostic file |
| **diagtable_3hr** | PREP | Ocean and ice diagnostic file |
| **diagtable_6hr** | PREP | Ocean and ice diagnostic file |
| **diagtable_hrs** | PREP | Ocean and ice diagnostic file |
| **diagtable_long** | PREP | Ocean and ice diagnostic file |
| **dlqf** | FCST | Fraction of cloud water removed as parcel ascends |
| **DMPDIR** | DUMP | Dump directory location |
| **DMPEXP** | DUMP | Dump directory location, gdasy/gfsy |
| **DMPOPR** | DUMP | Dump directory location |
| **DO_RELOCATE** | PREP | Switch; to perform relocation or not |
| **DO2ANL** | ANAL | Do second analysis run, depends on value of CDFNL |
| **DODUMP** | DUMP | For running in real-time, whether or not to run the dump step |
| **DOENKF** | ENKF | YES = turns on EnKF script processing |
| **DOHYBVAR** | ENKF | YES = tells analysis step to use ensemble background error products from previous cycle |
| **DSDUMP** | DUMP | CFS dump directory |
| **dt_aocpl** | FCST | Coupler timestep |
| **dt_cpld** | FCST | Coupled timestep |
| **dt_ocean** | FCST | Ocean timestep |
| **dt_rstrt** | FCST | OM restart writing interval/timestep (small) |
| **dt_rstrt_long** | FCST | OM restart writing interval/timestep (long) |
| **Dumpsh** | DUMP | Dump script location and name |
| **EDATE** | GENERAL | Analysis/forecast cycle end date - must be >CDATE; analysis/forecast cycle ending date (YYYYMMDDCC, where CC is the cycle) |
| **EDUMP** | GENERAL | Cycle ending dump (gdas or gfs) |
| **EMISDIR** | FCST | Directory, usually set to $FIX_RAD, see $FIX_RAD |
| **ENS_NUM_ANAL** | ENKF | Number of ensemble members |
| **ENS_NUM_ENKF** | ENKF | Number of ensemble members |
| **ENTHALPY** | FCST | Control the chgres and nceppost (default=NO) |
| **ESTEP** | GENERAL | Cycle ending step; stop experiment when this step is reached for $EDATE; this step is not run |
| **EXEC_AMD** | FCST | Atmospheric model directory |
| **EXEC_CD** | FCST | Coupler directory |
| **EXEC_OMD** | FCST | Ocean model directory |
| **EXECcfs** | FCST | CFS executable directory location |
| **EXECDIR** | GENERAL | Executable directory (typically underneath HOMEDIR) |
| **execdir_godasprep** | PREP | GODAS prep executable directory, see $EXECDIR |
| **EXECICE** | FCST | Sea ice executable directory, see $EXECDIR |
| **EXPDIR** | GENERAL | Experiment directory under /save, where your configuration file, rlist, runlog, and other experiment scripts reside |
| **FAISS** | FCST | Scale in days to relax to sea ice to climatology |
| **fbak2** | FCST | Back up time for 2nd segment |
| **fbak3** | FCST | Back up time for 3rd segment |
| **FCSTEXECDIR** | FCST | Location of forecast executable directory (usually set to $EXECDIR) |
| **FCSTEXECTMP** | FCST | Location and name of forecast executable |
| **FCSTSH** | FCST | Forecast script name and location |
| **FCSTVARS** | FCST | Group of select forecast variables and their values |
| **fcyc** | FCST | Surface cycle calling interval |
| **fdfi_1** | FCST | Digital filter time for AM 1st segment (default=3) |
| **fdfi_2** | FCST | Run digital filter for 2nd segment (default=0) |
| **fdump** | VRFY | Verifying forecasts from gfs: GFS analysis or gdas: GDAS analysis |
| **FH_END_POST** | POST | Implying use FHMAX (defaul=99999) |
| **FH_STRT_POST** | POST | Implying to use FHINI or from file $ROTDIR/FHREST.$CDUMP.$CDATE.$nknd (default=99999) |
| **FHCYC** | FCST | Cycling frequency in hours |

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|---|---|---|
| **FHDFI** | FCST | Initialization window in hours (if =0, no digital filter; if =3, window is +/- 3hrs) |
| **FHGOC3D** | FCST | Hour up to which data is needed to force offline GOCART to write out data |
| **FHINI** | FCST | Initial forecast hour |
| **FHLWR** | FCST | LW radiation calling interval (hrs); longwave frequency in hours |
| **FHMAX** | FCST | Maximum forecast hour |
| **FHMAX_HF** | FCST | High-frequency output maximum hours; for hurricane track, gfs fcst only for 126-hr is needed |
| **FHOUT** | FCST | Output frequency in hours |
| **FHOUT_HF** | FCST | High frequency output interval in hours; for hurricane track, gfs fcst only for 126-hr is needed |
| **FHRES** | FCST | Restart frequency in hours |
| **FHROT** | FCST | Forecast hour to Read One Time level |
| **FHSTRT** | FCST | To restart a forecast from a selected hour, default=9999999 |
| **FHSWR** | FCST | SW radiation calling interval (hrs); frequency of solar radiation and convective cloud (hours) |
| **FHZER** | FCST | Zeroing frequency in hours |
| **FIT_DIR** | VRFY | Directory for SAVEFITS output |
| **FIX_LIS** | PREP | Location of land model fix files |
| **FIX_OCN** | PREP | Location of ocean model fix files |
| **FIX_OM** | PREP | See $FIX_OCN |
| **FIX_RAD** | PREP | Fix directory, usually set to $FIXGLOBAL |
| **FIXDIR** | PREP | Fix file directory |
| **FIXGLOBAL** | PREP | Atmospheric model fix file directory |
| **flgmin** | FCST | Minimum large ice fraction |
| **fmax1** | FCST | Maximum forecast hour in 1st segment (default=192 hrs) |
| **fmax2** | FCST | Maximum forecast hour in 2nd segment (default=384 hrs) |
| **fmax3** | FCST | Maximum forecast hour in 3rd segment (default=540 hrs) |
| **FNAISC** | FCST | CFS monthly ice data file |
| **FNMASK** | FCST | Global slmask data file, also see $SLMASK |
| **FNOROG** | FCST | Global orography data file |
| **FNTSFC** | FCST | CFS oi2sst data file |
| **FNVEGC** | FCST | CFS vegfrac data file |
| **FNVETC** | FCST | Global vegetable type grib file |
| **FORECASTSH** | FCST | Forecast script name and location |
| **fout_a** | FCST | GDAS forecast output frequency (default=3); used when gdas_fh is not defined (i.e. no long gdas fcst) |
| **fout1** | FCST | GFS sig, sfc, flx output frequency for 1st segment (default=3 hr) |
| **fout2** | FCST | GFS sig, sfc, flx output frequency for 2nd segment (default=3 hr) |
| **fout3** | FCST | GFS sig, sfc, flx output frequency for 3rd segment (default=3 hr) |
| **foutpgb1** | POST | NCEPPOST pgb frequency for 1st segment (default=fout1) |
| **foutpgb2** | POST | NCEPPOST pgb frequency for 2nd segment (default=fout1) |
| **foutpgb3** | POST | NCEPPOST pgb frequency for 3rd segment (default=fout1) |
| **fres1** | FCST | Interval for restart write, 1st segment (default=24 hr) |
| **fres2** | FCST | Interval for restart write, 2nd segment (default=24 hr) |
| **fres3** | FCST | Interval to write restart for 3rd segment (default=fres2) |
| **fseg** | FCST | Number of AM forecast segments; maximum=3 (default=1) |
| **FSNOL** | FCST | Scale in days to relax to snow to climatology |
| **FTSFS** | FCST | Scale in days to relax to SST anomaly to zero |
| **fzer1** | FCST | GFS output zeroing interval for 1st segment (default=6 hr) |
| **fzer2** | FCST | GFS output zeroing interval for 2nd segment (default=6 hr) |
| **fzer3** | FCST | GFS output zeroing interval for 3rd segment (default=6 hr) |
| **G3DPSH** | ANAL | G3DP script name and location |
| **gdas_cyc** | FCST | Number of GDAS cycles |
| **gdas_fh** | FCST | Default=999, i.e. no long fcst in GDAS step when <999, that would be the interval at which seasonal or longer from gdas initial conditions are made; for example, if gdas_fh=6 runs are made |
| **GDAS_GP** | POST | YES: use old post (global_postgp.sh), NO: nceppost |
| **GDUMP** | GENERAL | Dump to use for guess files (defaults to $CDFNL, which defaults to "gdas") |
| **generate_ens** | ENKF | TRUE = generate internal ensemble based on existing background error |
| **GENPSICHI** | POST | Generate psi (streamfunction) and chi (velocity potential) |
| **GENPSICHIEXE** | POST | Executable for GENPSICHI |
| **gfs_cyc** | FCST | GFS cycles (00, 06, 12, and 18Z) (default=1 - (00Z) cycle) |
| **GFSDUMP** | DUMP | GFS dump subdirectory name and location, usually "$DMPDIR/dump" |
| **gg_tracers** | FCST | Semilag option |
| **GLDASCYCHR** | FCST | GLDAS cycling frequency |
| **GODAS_DATA_DELAY** | ANAL | Delay for ocean data in days |
| **GODAS_WNDO** | ANAL | Data window for asymmetric godas |
| **GODASEXEC** | ANAL | GODAS executable |
| **GODASSH** | ANAL | GODAS script |
| **GRID_IDD** | FCST | 3D output options |

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|---|---|---|
| **GRID11FCST00gdas** | FCST | Grib identifier for 00z GDAS forecast output |
| **GRID11FCST06gdas** | FCST | Grib identifier for 06z GDAS forecast output |
| **GRID11FCST12gdas** | FCST | Grib identifier for 12z GDAS forecast output |
| **GRID11FCST18gdas** | FCST | Grib identifier for 18z GDAS forecast output |
| **grid25_1** | POST | Define this to interpolate pgb file to 2.5 x 2.5 |
| **grid25_2** | POST | Same as grid25_1 but for segment 2 of post |
| **grid62_1** | POST | Define this to interpolate fix file to T62 grid |
| **GROUP** | GENERAL | LoadLeveler group (i.e. g01) |
| **group_name** | GENERAL | Similar to $GROUP |
| **GSIDIR** | ANAL | GSI HOMEDIR, usually equals $HOMEDIR |
| **GSIEXEC** | ANAL | GSI executable name and location |
| **GSIFIXDIR** | ANAL | Location of GSI fix files |
| **HOMEcfs** | FCST | CFS HOMEDIR, usually equals $HOMEDIR |
| **HOMEDIR** | GENERAL | Home directory for parallel scripts |
| **HORZ_DIR** | VRFY | Directory for SAVEFITS output |
| **HPSSTAR** | ARCH | Location of hpsstar utility (creates, retrieves, and manages tarfiles on HPSS) |
| **HRKDAY** | GENERAL | Hours to keep dayfiles in ROTDIR |
| **HRKOCN_ANL** | GENERAL | Hours to keep ocean analysis file |
| **HRKOCN_GRB** | GENERAL | Hours to keep ocean grib output file |
| **HRKRES** | GENERAL | Hours to keep restart files |
| **HRKROT** | GENERAL | Hours to keep rotating archive |
| **HRKSIG** | GENERAL | Hours to keep sigma and sfc fcst files in directory $ROTDIR |
| **HRKSIGG** | GENERAL | Hours to keep sigma files from analysis in directory ROTDIR |
| **HRKTMP** | GENERAL | Hours to keep tmpdir |
| **HRKVFY** | GENERAL | Hours to keep verification files in directory ROTDIR |
| **HYBRID** | FCST | Switch to run hybrid |
| **HYBRID_ENSEMBLE** | ENKF | GSI namelist for hybrid ensemble variables |
| **IAER** | FCST | 111: with stratospheric aerosol, tropospheric aerosol LW, tropospheric aerosol SW |
| **ialb** | FCST | For original albedo, 0: climatology SW albedo based on surface vegetation types, 1: MODIS based land surface albedo |
| **ICO2** | FCST | 0: fixed CO2 constant, 1: time varying global mean CO2, 2: changing CO2 |
| **ictm** | FCST | CO2 option for radiation, YYYY# |
| **IDRT_NP** | POST | Master pgb from global_nceppost.sh, 4: gaussian, 0: linear |
| **IDSL** | FCST | Integer new type of sigma structure, 1: Phillips approach, 2: Henry, plain average |
| **idvc_a** | FCST | AM vertical coordinate for analysis, 2: sigma-p (Sela), 3: generalized (Juang) |
| **idvc_f** | FCST | For hybrid model forecast (2: Joe Sela, 3: Henry Juang) |
| **IDVM** | FCST | Integer new vertical mass variable ID |
| **idvt** | FCST | Integer new tracer variable ID; first number: # of cloud species, second number: location of ozone in tracer |
| **IEMS** | FCST | 0: blackbody ground emission, 1: climatology on one-deg map |
| **IGEN** | FCST | Integer output generating code (See ON388 Table A), grib output identifier, GFS=82, CFS=197 |
| **IGEN_ANL** | FCST | Same as IGEN but for analysis |
| **IGEN_FCST** | FCST | Same as IGEN but for forecast |
| **IGEN_OCNP** | FCST | Same as IGEN but for ocean analysis |
| **inch_1** | FCST | Interval of coupled run (default=360) |
| **inch_2** | FCST | Coupled model interval of increment hour look (segment 2) |
| **io_1** | FCST | Forecast pgb output lon resolution, 1st segment |
| **io_2** | FCST | Forecast pgb output lon resolution, 2nd segment |
| **io_3** | FCST | Forecast pgb output lon resolution, 3rd segment |
| **io_a** | ANAL | Analysis pgb output lon and lat resolution |
| **io_save** | ARCH | Longitude dimension for online archive pgb files (defaults to 144... only applies if lower res than posted pgb files) |
| **IOVR_LW** | FCST | 0: random cloud overlap for LW, 1: maximum/random cloud overlap for LW |
| **IOVR_SW** | FCST | 0: random cloud overlap for SW, 1: maximum/random cloud overlap for SW |
| **ISOL** | FCST | 0: fixed solar constant, 1: changing solar constant |
| **ISUBC_LW** | FCST | 0: standard LW clouds (no MCICA), 1: prescribed MCICA seeds, 2: random MCICA seeds |
| **ISUBC_SW** | FCST | 0: standard SW clouds (no MCICA), 1: prescribed MCICA seeds, 2: random MCICA seeds |
| **iter_one_no_interp** | FCST | TRUE = omits the trilinear interpolation for the first iteration of the departure-point calculations |
| **IVS** | FCST | Sigma file format (options 198410, 200509 defined in /nwprod/sorc/global_fcst.fd/sigio_module.f) |
| **ivssfc** | FCST | Surface file version |
| **ivssig** | FCST | Sigma file version |
| **JCAP** | FCST | Wave number (0-192 hr), atmospheric model resolution (spectral truncation), eg. JCAP=382 |
| **JCAP_A** | FCST | See $JCAP |
| **JCAP_TMP** | FCST | See $JCAP |
| **JCAP_ENKF** | ENKF | Spectral resolution for Hybrid EnKF; similar to JCAP |
| **JCAP_ENS** | ENKF | $JCAP_ENKF; Project T254 ensemble into linear grid (512x256) |

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|---|---|---|
| **JCAP2** | FCST | Wave number (192-384 hr) for 2nd segment, see $JCAP |
| **JCAP3** | FCST | Wave number (384-540 hr) for 3rd segment, see $JCAP |
| **jo_1** | FCST | Forecast pgb output lat resolution, 1st segment |
| **jo_2** | FCST | Forecast pgb output lat resolution, 2nd segment |
| **jo_3** | FCST | Forecast pgb output lat resolution, 3rd segment |
| **jo_a** | FCST | Analysis pgb output lon and lat resolution |
| **jo_save** | FCST | Lat dimension for online archive pgb files (defaults to 72... only applies if lower res than posted pgb files |
| **JOBSDIR** | GENERAL | Job script directory (typically underneath HOMEDIR) |
| **JUST_AVG** | AVRG | Default=NO |
| **JUST_POST** | POST | Terminate jobs after finishing post |
| **JUST_TSER** | POST | Extract just time-series by running post |
| **km_mom4** | POST | Number of MOM4 levels |
| **ko_1** | FCST | Forecast pgb output lev resolution, 1st segment |
| **ko_2** | FCST | Forecast pgb output lev resolution, 2nd segment |
| **ko_3** | FCST | Forecast pgb output lev resolution, 3rd segment |
| **ko_a** | ANAL | Analysis pgb output lev resolution |
| **kto_1** | FCST | Forecast IPV (isentropic potential vorticity) output resolution, if kto is set to 0, then no IPV output |
| **kto_2** | FCST | Vertical levels for segment 2, post step |
| **kto_3** | FCST | Same as kto_2 but for segment 3 |
| **l_hyb_ens** | ENKF | TRUE = turn on hybrid ensemble option |
| **LANLSH** | ANAL | Land analysis script name and location |
| **LATA** | ANAL | Grid used by hurricane relocation, analysis grid lat dimension (typically linear gaussian grid) |
| **LATA_ENKF** | ENKF | ensemble analysis grid lat dimension (typically linear gaussian grid) |
| **LATB** | FCST | Model grid lat dimension (aka quadratic grid) |
| **LATB_D3D** | FCST | 3D diagnostic output grid parameter |
| **LATB_ENKF** | ENKF | ensemble forecast grid lat dimension (aka quadratic grid) |
| **LATB2** | FCST | Same as $LATB but for segment 2 |
| **LATB3** | FCST | Same as $LATB but for segment 3 |
| **LATCH** | FCST | Integer number of latitudes to process at one time in global_chgres; defaults to 8 in the code; defaults to 48 in branch parallel scripts; set to 8 in configuration file if you must match production when moving from the 1st to 2nd fcst segment; otherwise, go with the branch parallel script default of 48 to save resources (check current version of global_chgres.fd/chgres.f to confirm the code default; check fcst.sh and reconcile for script default) |
| **ld3d_1** | FCST | Write out 3D diagnostics, .false.: no 3D diagnostics |
| **ld3d_2** | FCST | 3D diagnostic for segment 2 |
| **ld3d_3** | FCST | 3D diagnostic for segment 3 |
| **ldas_cyc** | ANAL | 0: no ldas cycles (default=0) |
| **LDIAG3D** | FCST | Switch for 3D diagnostics (default=false) |
| **LEVS** | FCST | Number of atmospheric model vertical levels |
| **LEVS_ENKF** | ENKF | Number of levels in Hybrid EnKF forecasts; similar to LEVS |
| **lg3d_1** | FCST | GOCART option segment 1 (default=false) |
| **lg3d_2** | FCST | GOCART option segment 2 (default=false) |
| **lin_xy** | FCST | TRUE = when the advected and nonlinear fields of the mass-continuity equation are separated into two parts so that a different interpolation can be used for each part. Only use with herm_x = herm_y = herm_z = cont_eq_opt1= false, and lin_xyz = true. |
| **lingg_a** | FCST | Semilag option |
| **lingg_b** | FCST | Semilag option |
| **LINKFILESH** | GENERAL | Link file script |
| **liope** | FCST | Atmospheric variable for io pes (default=.true.) |
| **LISEXEC** | ANAL | GLDAS (aka LIS) executable |
| **LISSH** | ANAL | GLDAS (aka LIS) script |
| **LONA** | FCST | Grid used by hurricane relocation, analysis grid lon dimension (typically linear gaussian grid) |
| **LONA_ENKF** | ENKF | ensemble analysis grid lon dimension (typically linear gaussian grid) |
| **LONB** | FCST | Model grid lon dimension (aka quadratic grid) |
| **LONB_D3D** | FCST | 3D diagnostic output grid parameter |
| **LONB_ENKF** | ENKF | ensemble forecast grid lon dimension (aka quadratic grid) |
| **LONB2** | FCST | Same as $LONB but for segment 2 |
| **LONB3** | FCST | Same as $LONB but for segment 3 |
| **LONSPERLAT** | FCST | Forecast step, global_lonsperlat text file |
| **lsm** | FCST | Land surface model, 1: NOAH land model, 0: OSU land model |
| **LSOIL** | FCST | Number of soil layers |
| **MAKEPREPBUFRSH** | PREP | Makeprepbufr script, created prepbufr |
| **mdlist** | VRFY | Exps (up to 10) to compare in maps |
| **MEANDIR** | AVRG | Directory for monthly means |
| **MFCST00GFS** | GENERAL | Starting number for dayfile iterations |

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|---|---|---|
| **mkEvNc4r** | ANAL | GODAS executable |
| **MODIS_ALB** | FCST | To use MODIS based albedo product |
| **MON_AVG** | AVRG | CFS option, monthly averages for long integrations, starts 00z first day of month |
| **MP_PULSE** | COMP | IBM computing resource variable |
| **mppnccombine** | FCST | Location and name of cfs_mppnccombine executable |
| **mstrat** | FCST | Switch to turn on/off Moorthi stratus scheme |
| **MTNDIR** | FCST | See $FIXGLOBAL |
| **MTNVAR** | FCST | The global_mtnvar fortran code |
| **NARRSNO** | ANAL | How snow assimilation is performed, North American Reanalysis |
| **NCEPPOST** | POST | Switch to use NCEP post (default=YES) |
| **NCP** | GENERAL | Location of ncp utility |
| **ncw** | FCST | For Ferrier microphysics |
| **n_ens** | ENKF | number of ensemble members |
| **NEW_DAYFILE** | GENERAL | To create new dayfile for every rerun |
| **newoz_nrl** | FCST | YES: use NRL ozone production and loss coefficients (default=YES) |
| **NGPTC** | FCST | For operational GFS, not reproducible with different NGPTC; number of horizontal points computed in the same call inside radiation and physics (defaults to JCAP/10) |
| **nknd_fcst** | FCST | For hindcasts from segment 2 only |
| **NLAT_A** | ANAL | Analysis grid parameter, JCAP > 574 |
| **NLAT_ENS** | ENKF | `expr $LATA_ENKF + 2`; Project T254 ensemble into linear grid (512x256) |
| **NLON_A** | ANAL | Analysis grid parameter, JCAP > 574 |
| **NLON_ENS** | ENKF | $LONA_ENKF; Project T254 ensemble into linear grid (512x256) |
| **NMEM_ENS** | ENKF | $ENS_NUM_ENKF; Project T254 ensemble into linear grid (512x256) |
| **NOANAL** | ANAL | NO: run analysis and forecast, YES: no analysis (default=NO) |
| **NOFCST** | FCST | NO: run analysis and forecast, YES: no forecast (default=NO) |
| **npe_node_a** | ANAL | Number of PEs/node for atmospheric analysis with GSI |
| **npe_node_ang** | ANGU | Number of PEs/node for global_angupdate |
| **npe_node_av** | AVRG | Number of PEs/node for avrg |
| **npe_node_f** | FCST | Number of PEs/node for AM forecast |
| **npe_node_o** | ANAL | Number of PEs/node for ocean analysis |
| **npe_node_po** | POST | Number of PEs/node for post step (default=16) |
| **npe_node_pr** | PREP | Number of PEs/node for prep step (default=32 for dew/mist/haze) |
| **nproco_1** | FCST | Number of processors for ocean model 1st segment |
| **nproco_2** | FCST | Number of processors for ocean model 2nd segment |
| **nproco_3** | FCST | Number of processors for ocean model 3rd segment |
| **NRLACQC** | PREP | NRL aircraft QC, if="YES" will quality control all aircraft data |
| **nsout** | FCST | Outputs every AM time step when =1 (default=0) |
| **NSST_ACTIVE** | FCST | NST_FCST, 0: AM only, no NST model, 1: uncoupled, non-interacting, 2: coupled, interacting |
| **nth_f1** | FCST | Threads for AM 1st segment |
| **nth_f2** | FCST | Threads for AM 2nd segment |
| **nth_f3** | FCST | Threads for AM 3rd segment |
| **NTHREADS_GSI** | ANAL | Number of threads for anal |
| **NTHSTACK** | FCST | Stacks for fcst step (default=128000000) |
| **NTHSTACK_GSI** | ANAL | Stack size for anal (default=128000000) |
| **NUMPROCANAL** | ANAL | Number of tasks for GDAS anal |
| **NUMPROCANALGDAS** | ANAL | Number of tasks for GDAS anal |
| **NUMPROCANALGFS** | ANAL | Number of tasks for GFS anal |
| **NUMPROCAVRGGDAS** | ANAL | Number of PEs for GDAS average |
| **NUMPROCAVRGGFS** | ANAL | Number of PEs for GFS average |
| **NWPROD** | GENERAL | Option to point executable to nwprod versions |
| **O3CLIM** | FCST | Location and name of global_o3clim text file |
| **O3FORC** | FCST | Location and name of global_o3prdlos fortran code |
| **OANLSH** | ANAL | Ocean analysis script |
| **OBSQC** | ENKF | GSI namelist for observation quality control variables |
| **OCN2GRIBEXEC** | POST | Ocean to grib executable |
| **OCNMEANDIR** | AVRG | Directory for ocn monthly means |
| **ocnp_delay_1** | POST | OM post delay time |
| **ocnp_delay_2** | POST | OM post delay time |
| **OCNPSH** | POST | Ocean post script |
| **OIQCT** | PREP | Prep step prepobs_oiqc.oberrs file |
| **oisst_clim** | ANAL | Ocean analysis fix field |
| **OM_EXEC** | FCST | Ocean model executable |
| **omres_1** | FCST | Ocean 1st segment model resolution (0.5 x 0.25) and number of processors |
| **omres_2** | FCST | Ocean 2nd segment model resolution (0.5 x 0.25) and number of processors |
| **omres_3** | FCST | Ocean 3rd segment model resolution (0.5 x 0.25) and number of processors |

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| **OPANAL_06** | ANAL | For old ICs without LANDICE, only applicable for starting from existing analysis |
| **OPREPSH** | PREP | Ocean analysis prep script |
| **opt1_3d_qcubic** | FCST | See cont_eq_opt1 variable for more information |
| **OROGRAPHY** | FCST | Global orography grib file |
| **OUT_VIRTTEMP** | FCST | Output into virtual temperature (true) |
| **OUTTYP_GP** | POST | 1: gfsio, 2: sigio, 0: both |
| **OUTTYP_NP** | POST | 1: gfsio, 2: sigio, 0: both |
| **OVERPARMEXEC** | POST | CFS overparm grib executable |
| **oz_univ_static** | ENKF | TRUE = decouple ozone from other variables and defaults to static B (ozone only) |
| **OZINFO** | ANAL | Ozone info file |
| **PARATRKR** | TRAK | Script location |
| **PARM_GODAS** | PREP | GODAS parm file |
| **PARM_OM** | PREP | Ocean model parm files |
| **PARM_PREP** | PREP | Prep step parm files |
| **PCONFIGS** | GENERAL | For running in real-time, configuration file |
| **PCPINFO** | ANAL | PCP info files |
| **PEND** | GENERAL | Location of pend script |
| **pfac** | FCST | Forecasting computing variable |
| **pgb_typ4prep** | PREP | Type of pgb file for prep step (default=pgbf) |
| **pgbf_gdas** | POST | GDAS pgbf file resolution, 4: 0.5 x 0.5 degree, 3: 1 x 1 degree |
| **PMKR** | GENERAL | Needed for parallel scripts |
| **polist_37** | POST | Output pgb (pressure grib) file levels |
| **polist_47** | POST | Output pgb (pressure grib) file levels |
| **post_delay_1** | POST | AM post delay time |
| **post_delay_2** | POST | AM post delay time |
| **POST_SHARED** | POST | Share nodes (default=YES) |
| **POSTGPEXEC_GP** | POST | Post executable, for enthalpy version |
| **POSTGPEXEC_NP** | POST | Post executable, ncep post |
| **POSTGPSH_GP** | POST | $POSTGPEXEC_GP script |
| **POSTGPSH_NP** | POST | $POSTGPEXEC_NP script |
| **POSTGPVARSNP** | POST | Similar to FCSTVARS but for post variables |
| **POSTSH** | POST | Post script |
| **POSTSPL** | POST | Special CFSRR analysis file created for CPC diagnostics |
| **PRECIP_DATA_DELAY** | ANAL | Delay for precip data in hours (for global lanl) |
| **PREPDIR** | PREP | Location of prep files/codes/scripts, usually $HOMEDIR |
| **PREPFIXDIR** | PREP | Location of prep fix files |
| **PREPQFITSH** | PREP | Name and location of a prep script |
| **PREPSH** | PREP | Name and location of main prep script |
| **PREX** | PREP | Prevents executable |
| **PROCESS_TROPCY** | PREP | Switch, if YES: run QCTROPCYSH script (default ush/syndat_qctropcy.sh) |
| **PRPC** | PREP | Prep parm file |
| **PRPT** | PREP | Prep bufr table |
| **PRPX** | PREP | Prepdata executable |
| **PRVT** | PREP | Global error table for prep |
| **PSLOT** | GENERAL | Experiment ID |
| **PSTX** | PREP | Prep step, global_postevents executable |
| **PSUB** | GENERAL | Location of psub script |
| **q2run_1** | FCST | Additional queue for fcst segment 1 |
| **q2run_2** | FCST | Additional queue for fcst segment 2 |
| **QCAX** | PREP | Prep step, prepobs_acarsqc executable |
| **r2ts_clim** | ANAL | Ocean analysis fix field |
| **ras** | FCST | Convection parameter, relaxed |
| **readfi_exec** | FCST | CFS sea ice executable |
| **readin_localization** | ENKF | TRUE = read external localization information file |
| **readsst_exec** | FCST | CFS sea ice executable |
| **RECONCILE** | GENERAL | Location of reconcile script |
| **REDO_POST** | POST | Default=NO |
| **regrid_exec** | FCST | CFS sea ice executable |
| **RELOCATESH** | PREP | Name and location of relocation script |
| **RELOX** | PREP | Name and location of relocation executable |
| **RESDIR** | GENERAL | Restart directory |
| **RESUBMIT** | GENERAL | To resubmit a failed job (default=NO) |
| **RLIST** | GENERAL | List that controls input and output of files for each step |
| **RM_G3DOUT** | FCST | For GOCART related special output |
| **RM_ORIG_G3D** | FCST | For GOCART related special output |

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|---|---|---|
| **ROTDIR** | GENERAL | Experiment rotating/working directory, for large data and output files |
| **RTMAERO** | ANAL | Location of CRTM aerosol coefficient bin file |
| **RTMCLDS** | ANAL | Location of CRTM cloud coefficient bin file |
| **RTMEMIS** | ANAL | Location of CRTM emissivity coefficient bin file |
| **RTMFIX** | ANAL | Location of CRTM fix file(s) |
| **RUN_ENTHALPY** | FCST | Control the forecast model (default=NO) |
| **RUN_OPREP** | PREP | YES: run ocean prep to get tmp.prf and sal.prf |
| **RUN_PLOT_SCRIPT** | AVRG | Script location |
| **RUN_RTDUMP** | ANAL | YES: archived tmp.prf and sal.prf used |
| **rundir** | GENERAL | Verification run directory |
| **RUNLOG** | GENERAL | The experiment runlog |
| **SALTSFCRESTORE** | ANAL | GODAS script |
| **SATANGL** | ANAL | Name and location of satangbias file |
| **SATINFO** | ANAL | Name and location of satinfo file |
| **SAVEFITS** | VRFY | Fit to obs scores |
| **SBUVBF** | ANAL | Location and naming convention of osbuv8 data file |
| **SCRDIR** | GENERAL | Scripts directory (typically underneath $HOMEDIR) |
| **scrubtyp** | GENERAL | Scrub or noscrub |
| **semilag** | FCST | Semilag option |
| **SEND2WEB** | VRFY | Whether or not to send maps to webhost |
| **s_env_h** | ENKF | homogeneous isotropic horizontal ensemble localization scale (km) |
| **s_env_v** | ENKF | vertical localization scale (grid units for now) |
| **SET_FIX_FLDS** | COPY | Only useful wit copy.sh; create orographic and MODIS albedo related fix fields if they don't exist |
| **settls_dep3dg** | FCST | Set settls_dep3ds and settls_dep3dg to true for the SETTLS<br><br>departure-point calculation |
| **settls_dep3ds** | FCST | Set settls_dep3ds and settls_dep3dg to true for the SETTLS<br><br>departure-point calculation |
| **SETUP** | ANAL | GSI setup namelist |
| **SHDIR** | GENERAL | Similar to SCRDIR, just a directory setting |
| **sice_rstrt_exec** | FCST | Sea ice executable |
| **SICEUPDATESH** | FCST | Sea ice update script |
| **SIGGESENV** | ENKF | template for ensemble member sigma guess files |
| **SLMASK** | FCST | Global slmask data file, also see $FNMASK |
| **snoid** | ANAL | Snow id (default=snod) |
| **SNOWNC** | ANAL | NetCDF snow file |
| **SSMITBF** | ANAL | SSM/I bufr radiace dataset |
| **sst_ice_clim** | ANAL | Fix fields for ocean analysis |
| **SSTICECLIM** | ANAL | Ocean analysis fix field |
| **SUB** | GENERAL | Location of sub script |
| **SYNDATA** | PREP | Switch (default=YES) |
| **SYNDX** | PREP | Syndat file, prep step |
| **tasks** | FCST | Number of tasks for 1st segment of forecast |
| **tasks2** | FCST | Number of tasks for 2nd segment of forecast |
| **tasks3** | FCST | Number of tasks for 3rd segment of forecast |
| **tasksp_1** | POST | Number of PEs for 1st segment of post |
| **tasksp_2** | POST | Number of PEs for 2nd segment of post |
| **tasksp_3** | POST | Number of PEs for 3rd segment of post |
| **thlist_16** | POST | Output theta levels |
| **time_extrap_etadot** | FCST | TRUE = with settls_dep3ds and settls_dep3dg =false, when a second-order accuracy of the vertical displacements are desired |
| **TIMEAVGEXEC** | AVRG | Executable location |
| **TIMEDIR** | GENERAL | Directory for time series of selected variables |
| **TIMELIMANAL** | ANAL | Wall clock time for AM analysis |
| **TIMELIMAVRG** | AVRG | CPU limit (hhmmss) for averaging |
| **TIMELIMPOST00GDAS** | POST | CPU limit for 00z GDAS post |
| **TIMELIMPOST00GFS** | POST | CPU limit for 00z GFS post |
| **TIMELIMPOST06GFS** | POST | CPU limit for 06z GFS post |
| **TIMELIMPOST12GFS** | POST | CPU limit for 12z GFS post |
| **TIMELIMPOST18GFS** | POST | CPU limit for 18z GFS post |
| **TIMEMEANEXEC** | AVRG | Executable location |
| **TOPDIR** | GENERAL | Top directory, defaults to '/global' on CCS or '/mtb' on Vapor if not defined |
| **TOPDRA** | GENERAL | Top directory, defaults to '/global' on CCS or '/mtb' on Vapor if not defined |
| **TOPDRC** | GENERAL | Top directory, defaults to '/global' on CCS or '/mtb' on Vapor if not defined |

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| **TOPDRG** | GENERAL | Top directory, defaults to '/global' on CCS or '/mtb' on Vapor if not defined |
| **TRACKERSH** | TRAK | Tracker script location |
| **TSER_FCST** | FCST | Extract time-series of selected output variables |
| **USE_RESTART** | GENERAL | Use restart file under ROTDIR/RESTART if run is interrupted |
| **USHAQC** | PREP | See $USHDIR |
| **USHCQC** | PREP | See $USHDIR |
| **USHDIR** | GENERAL | Ush directory (typically underneath HOMEDIR) |
| **USHGETGES** | PREP | Directory location of getges.sh script |
| **USHICE** | PREP | See $USHDIR |
| **USHNQC** | PREP | See $USHDIR |
| **USHOIQC** | PREP | See $USHDIR |
| **USHPQC** | PREP | See $USHDIR |
| **USHPREV** | PREP | See $USHDIR |
| **USHQCA** | PREP | See $USHDIR |
| **USHSYND** | PREP | Directory, usually "$PREPDIR/ush" |
| **USHVQC** | PREP | See $USHDIR |
| **usrdir** | GENERAL | See $LOGNAME |
| **uv_hyb_ens** | ENKF | TRUE = ensemble perturbation wind variables are u,v; FALSE = ensemble perturbation wind variables are stream function and velocity potential |
| **VBACKUP_PRCP** | VRFY | Hours to delay precip verification |
| **VDUMP** | VRFY | Verifying dump |
| **vlength** | VRFY | Verification length in hours (default=384) |
| **VRFY_ALL_SEG** | VRFY | NO: submit vrfy only once at the end of all segments, YES: submit for all segments (default=YES) |
| **vrfy_delay_1** | VRFY | AM verification delay time (in hhmm) for segment 1 |
| **vrfy_delay_2** | VRFY | AM verification delay time for segment 2 |
| **VRFYPRCP** | VRFY | Precip threat scores |
| **VRFYSCOR** | VRFY | Anomaly correlations, etc. |
| **VRFYTRAK** | VRFY & TRAK | Hurricane tracks |
| **VSDB_START_DATE** | VRFY | Starting date for vsdb maps |
| **VSDB_STEP1** | VRFY | Compute stats in vsdb format (default=NO) |
| **VSDB_STEP2** | VRFY | Make vsdb-based maps (default=NO) |
| **vsdbhome** | VRFY | Script home (default=$HOMEDIR/vsdb) |
| **vsdbsave** | VRFY | Place to save vsdb database |
| **VSDBSH** | VRFY | Default=$vsdbhome/vsdbjob.sh |
| **WEBDIR** | VRFY | Directory on web server (rzdm) for verification output |
| **webhost** | VRFY | Webhost (rzdm) computer |
| **webhostid** | VRFY | Webhost (rzdm) user name |
| **yzdir** | VRFY | Additional verification directory, based on personal directory of Yuejian Zhu |
| **zflxtvd** | FCST | Vertical advection scheme |
| **zhao_mic** | FCST | TRUE: Zhao microphysics option, FALSE: Ferrier microphysics |