WRF & WPS: COMPILATION PROCESS

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INSTALLING STEPS

- ***Check system requirements***
- Installing libraries
- Obtain source data
- Compile WRF
- Compile WPS
- Download initial/BC datasets

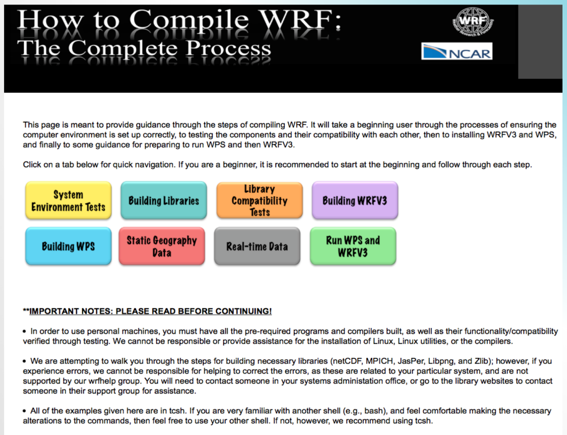
SYSTEM REQUIREMENTS

- On what kinds of systems will WRF run?
  - Generally any 32- or 64-bit hardware, running a UNIX-like operating system
  - You may also use dual-booting into a UNIX-like OS (e.g., Windows with Linux built parallel)
- Examples of acceptable systems:
  - Laptops, desktops, and clusters running Linux
  - Laptops and desktops running MacOS X
  - Clusters running Unix-like: Linux, AIX

CHECK SYSTEM REQUIREMENTS

- Webpage:

http://www2.mmm.ucar.edu/wrf/OnLineTutorial/compilation_tutorial.php



How to Compile WRF:
The Complete Process

This page is meant to provide guidance through the steps of compiling WRF. It will take a beginning user through the processes of ensuring the computer environment is set up correctly, to testing the components and their compatibility with each other, then to installing WRFV3 and WPS, and finally to some guidance for preparing to run WPS and then WRFV3.

Click on a tab below for quick navigation. If you are a beginner, it is recommended to start at the beginning and follow through each step.

****<u>IMPORTANT NOTES: PLEASE READ BEFORE CONTINUING!</u>**

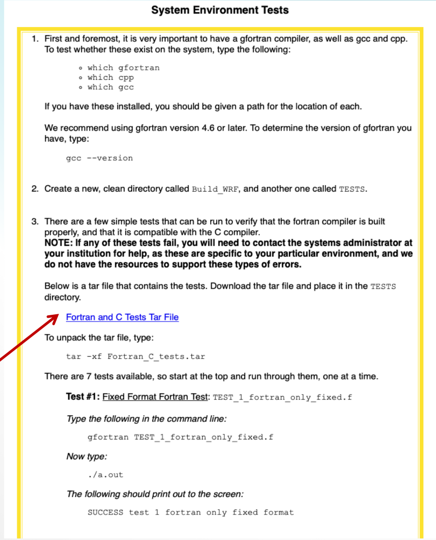
- In order to use personal machines, you must have all the pre-required programs and compilers built, as well as their functionality/compatibility verified through testing. We cannot be responsible or provide assistance for the installation of Linux, Linux utilities, or the compilers.
- We are attempting to walk you through the steps for building necessary libraries (netCDF, MPICH, JasPer, Libpng, and Zlib); however, if you experience errors, we cannot be responsible for helping to correct the errors, as these are related to your particular system, and are not supported by our wrfhelp group. You will need to contact someone in your systems administation office, or go to the library websites to contact someone in their support group for assistance.
- All of the examples given here are in tcsh. If you are very familiar with another shell (e.g., bash), and feel comfortable making the necessary alterations to the commands, then feel free to use your other shell. If not, however, we recommend using tcsh.

CHECK SYSTEM REQUIREMENTS

- It is mandatory to have a Fortran (e.g., gfortran) compiler, a C compiler, and cpp on your system. To test whether these exist on your system, type:
  - `which gfortran`
  - `which cpp`
  - `which gcc`
  - If installed, you will be given a path for each
- Fortran compiler should be version that supports Fortran2003 standard (at least v4.6)
  - Check this by typing (csh e.g.):

```
gcc --version
```

- Tests available for checking that your fortran compiler is built properly, and that it is compatible with the C compiler.



System Environment Tests

1. First and foremost, it is very important to have a gfortran compiler, as well as gcc and cpp. To test whether these exist on the system, type the following:

   ```
   ∘ which gfortran
   ∘ which cpp
   ∘ which gcc
   ```

   If you have these installed, you should be given a path for the location of each.

   We recommend using gfortran version 4.6 or later. To determine the version of gfortran you have, type:

   ```
   gcc --version
   ```

2. Create a new, clean directory called `Build_WRF`, and another one called `TESTS`.

3. There are a few simple tests that can be run to verify that the fortran compiler is built properly, and that it is compatible with the C compiler.
   NOTE: If any of these tests fail, you will need to contact the systems administrator at your institution for help, as these are specific to your particular environment, and we do not have the resources to support these types of errors.

   Below is a tar file that contains the tests. Download the tar file and place it in the `TESTS` directory.

   Fortran and C Tests Tar File

   To unpack the tar file, type:

   ```
   tar -xf Fortran_C_tests.tar
   ```

   There are 7 tests available, so start at the top and run through them, one at a time.

   Test #1: Fixed Format Fortran Test: `TEST_1_fortran_only_fixed.f`

   Type the following in the command line:

   ```
   gfortran TEST_1_fortran_only_fixed.f
   ```

   Now type:

   ```
   ./a.out
   ```

   The following should print out to the screen:

   ```
   SUCCESS test 1 fortran only fixed format
   ```

ADDITIONAL NECESSARY REQUIREMENTS

- Scripting languages (testing available in test package):
  - csh
  - perl
  - sh
- UNIX Commands

ar	awk	head	sed	hostname	sleep
cat	ls	sort	tar	cd	cp
make	touch	mkdir	tr	expr	mv
wc	uname	grep	rm	file	printf
nm	which				

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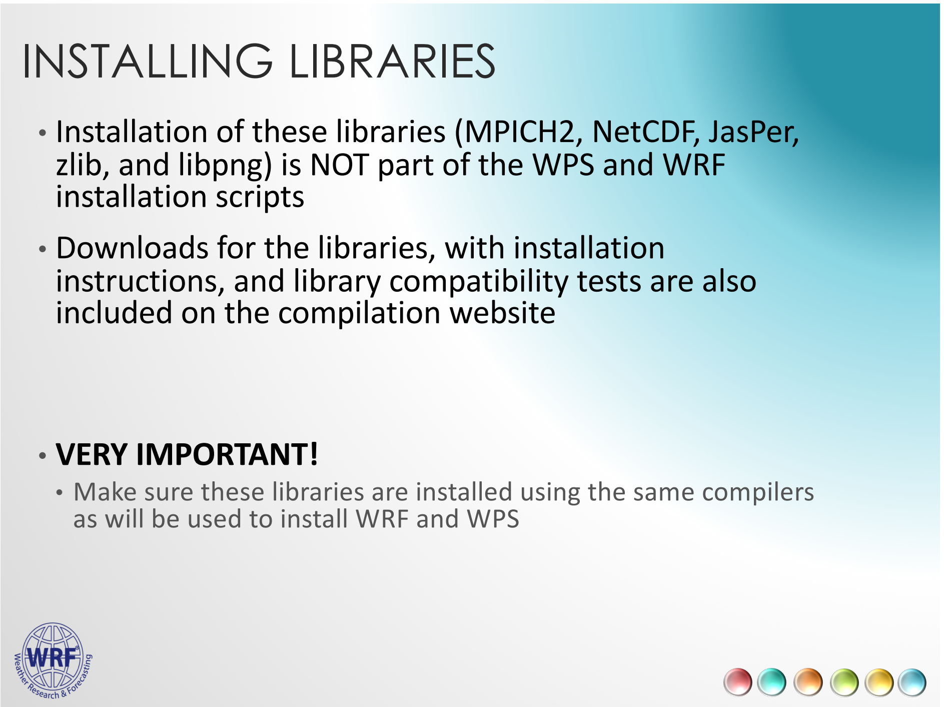
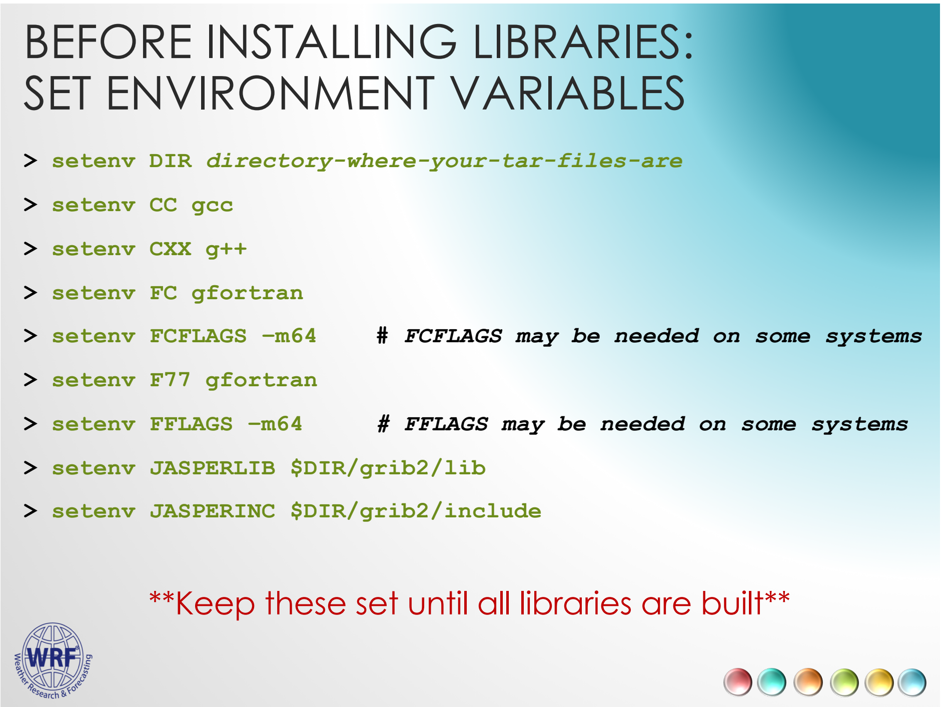
INSTALLING LIBRARIES

- NetCDF (needed by WRF and WPS)
  - netCDF Version 3 or 4 are acceptable
  - If using netCDF4 capabilities http://www2.mmm.ucar.edu/wrf/users/building_netcdf4.html
- Optional libraries for GRIB2 meteorological data support
  - JasPer (JPEG 2000 “lossy” compression library)
  - PNG (“lossless” compression library)
  - Zlib (compression library used by PNG)
- Optional MPI library (for building in parallel):
  - MPICH2
  - OpenMPI



INSTALLING LIBRARIES

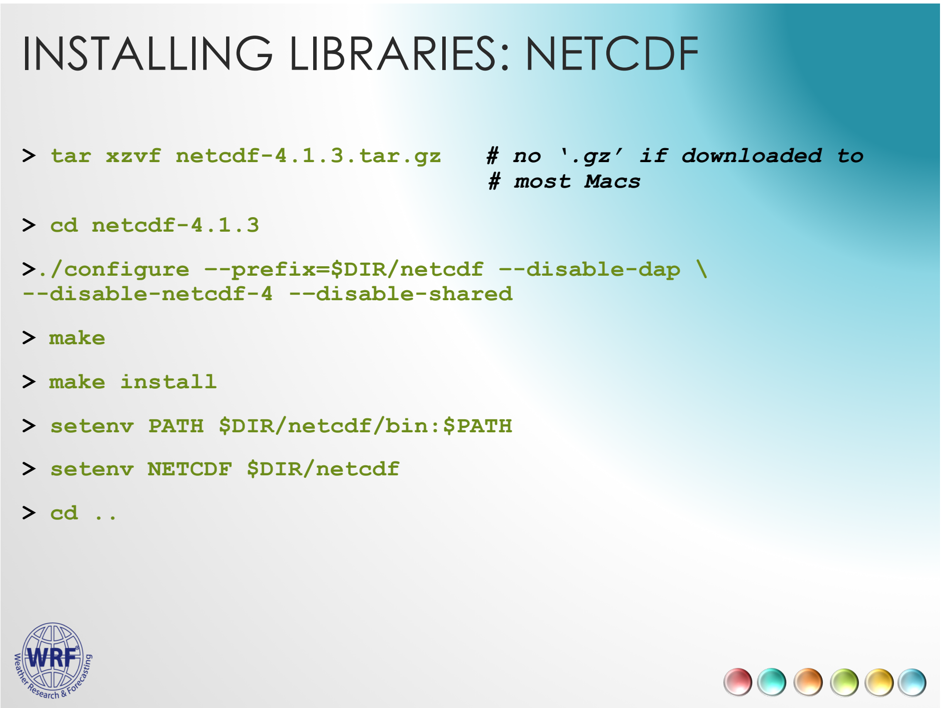
- Installation of these libraries (MPICH2, NetCDF, JasPer, zlib, and libpng) is NOT part of the WPS and WRF installation scripts
- Downloads for the libraries, with installation instructions, and library compatibility tests are also included on the compilation website
- **VERY IMPORTANT!**
  - Make sure these libraries are installed using the same compilers as will be used to install WRF and WPS



BEFORE INSTALLING LIBRARIES: SET ENVIRONMENT VARIABLES

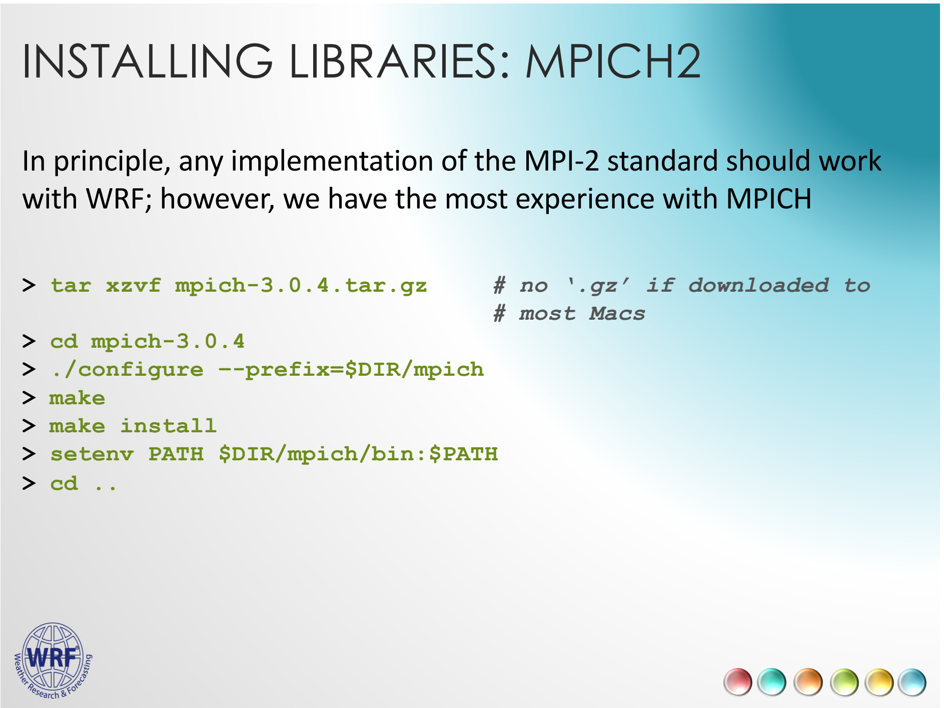
```
> setenv DIR directory-where-your-tar-files-are
> setenv CC gcc
> setenv CXX g++
> setenv FC gfortran
> setenv FCFLAGS –m64     # FCFLAGS may be needed on some systems
> setenv F77 gfortran
> setenv FFLAGS –m64      # FFLAGS may be needed on some systems
> setenv JASPERLIB $DIR/grib2/lib
> setenv JASPERINC $DIR/grib2/include
```

Keep these set until all libraries are built



INSTALLING LIBRARIES: NETCDF

```
> tar xzvf netcdf-4.1.3.tar.gz     # no '.gz' if downloaded to
                                   # most Macs
> cd netcdf-4.1.3
>./configure --prefix=$DIR/netcdf --disable-dap \
--disable-netcdf-4 --disable-shared
> make
> make install
> setenv PATH $DIR/netcdf/bin:$PATH
> setenv NETCDF $DIR/netcdf
> cd ..
```



INSTALLING LIBRARIES: MPICH2

In principle, any implementation of the MPI-2 standard should work with WRF; however, we have the most experience with MPICH

```
> tar xzvf mpich-3.0.4.tar.gz     # no '.gz' if downloaded to
                                  # most Macs
> cd mpich-3.0.4
> ./configure --prefix=$DIR/mpich
> make
> make install
> setenv PATH $DIR/mpich/bin:$PATH
> cd ..
```

INSTALLING LIBRARIES: ZLIB

```
> tar xzvf zlib-1.2.7.tar.gz          # no '.gz' if downloaded to
                                      # most Macs
> cd zlib-1.2.7
>./configure --prefix=$DIR/zlib
> make
> make install
> cd ..
```

INSTALLING LIBRARIES: LIBPNG

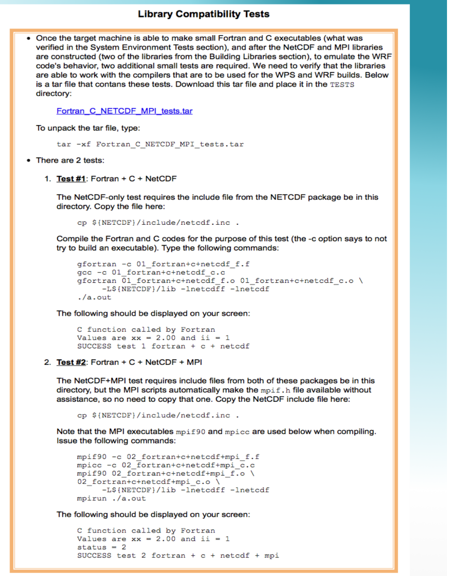
```
> tar xzvf libpng-1.2.50.tar.gz   # no '.gz' if downloaded to
                                  # most Macs
> cd libpng-1.2.50
>./configure --prefix=$DIR/libpng
> make
> make install
> cd ..
```

INSTALLING LIBRARIES: JASPER

```
> tar xzvf jasper-1.900.1.tar.gz  # no '.gz' if downloaded to
                                  # most Macs
> cd jasper-1.900.1
> ./configure --prefix=$DIR/jasper
> make
> make install
> cd ..
```

INSTALLING LIBRARIES: COMPATIBILITY

- Make sure libraries are compatible with compilers
- Test 1
  - Fortran + C + netCDF
- Test 2
  - Fortran + C + netCDF + MPI



Library Compatibility Tests

- Once the target machine is able to make small Fortran and C executables (what was verified in the System Environment Tests section), and after the NetCDF and MPI libraries are constructed (two of the libraries from the Building Libraries section), to emulate the WRF code's behavior, two additional small tests are required. We need to verify that the libraries are able to work with the compilers that are to be used for the WPS and WRF builds. Below is a tar file that contans these tests. Download this tar file and place it in the `TESTS` directory:

  Fortran_C_NETCDF_MPI_tests.tar

  To unpack the tar file, type:

  ```
  tar -xf Fortran_C_NETCDF_MPI_tests.tar
  ```

- There are 2 tests:

  1. **Test #1**: Fortran + C + NetCDF

     The NetCDF-only test requires the include file from the NETCDF package be in this directory. Copy the file here:

     ```
     cp ${NETCDF}/include/netcdf.inc .
     ```

     Compile the Fortran and C codes for the purpose of this test (the -c option says to not try to build an executable). Type the following commands:

     ```
     gfortran -c 01_fortran+c+netcdf_f.f
     gcc -c 01_fortran+c+netcdf_c.c
     gfortran 01_fortran+c+netcdf_f.o 01_fortran+c+netcdf_c.o \
          -L${NETCDF}/lib -lnetcdff -lnetcdf
     ./a.out
     ```

     The following should be displayed on your screen:

     ```
     C function called by Fortran
     Values are xx = 2.00 and ii = 1
     SUCCESS test 1 fortran + c + netcdf
     ```

  2. **Test #2**: Fortran + C + NetCDF + MPI

     The NetCDF+MPI test requires include files from both of these packages be in this directory, but the MPI scripts automatically make the `mpif.h` file available without assistance, so no need to copy that one. Copy the NetCDF include file here:

     ```
     cp ${NETCDF}/include/netcdf.inc .
     ```

     Note that the MPI executables `mpif90` and `mpicc` are used below when compiling. Issue the following commands:

     ```
     mpif90 -c 02_fortran+c+netcdf+mpi_f.f
     mpicc -c 02_fortran+c+netcdf+mpi_c.c
     mpif90 02_fortran+c+netcdf+mpi_f.o \
     02_fortran+c+netcdf+mpi_c.o \
          -L${NETCDF}/lib -lnetcdff -lnetcdf
     mpirun ./a.out
     ```

     The following should be displayed on your screen:

     ```
     C function called by Fortran
     Values are xx = 2.00 and ii = 1
     status = 2
     SUCCESS test 2 fortran + c + netcdf + mpi
     ```

INSTALLING STEPS

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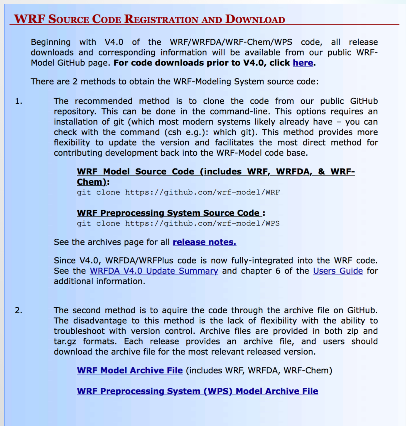
OBTAIN WRF & WPS CODE

- WRF & WPS source code from:

http://www2.mmm.ucar.edu/wrf/users/download/get_source.html

- Click 'New User,' and then register, or
- Click 'Returning User,' enter your email, and go to the information page.



WRF Source Code Registration and Download

Beginning with V4.0 of the WRF/WRFDA/WRF-Chem/WPS code, all release downloads and corresponding information will be available from our public WRF-Model GitHub page. **For code downloads prior to V4.0, click here.**

There are 2 methods to obtain the WRF-Modeling System source code:

1. The recommended method is to clone the code from our public GitHub repository. This can be done in the command-line. This options requires an installation of git (which most modern systems likely already have – you can check with the command (csh e.g.): which git). This method provides more flexibility to update the version and facilitates the most direct method for contributing development back into the WRF-Model code base.

   WRF Model Source Code (includes WRF, WRFDA, & WRF-Chem):
   `git clone https://github.com/wrf-model/WRF`

   WRF Preprocessing System Source Code :
   `git clone https://github.com/wrf-model/WPS`

   See the archives page for all **release notes.**

   Since V4.0, WRFDA/WRFPlus code is now fully-integrated into the WRF code. See the WRFDA V4.0 Update Summary and chapter 6 of the Users Guide for additional information.

2. The second method is to aquire the code through the archive file on GitHub. The disadvantage to this method is the lack of flexibility with the ability to troubleshoot with version control. Archive files are provided in both zip and tar.gz formats. Each release provides an archive file, and users should download the archive file for the most relevant released version.

   WRF Model Archive File (includes WRF, WRFDA, WRF-Chem)

   WRF Preprocessing System (WPS) Model Archive File

All Code now available From GitHub!

2 Methods to obtain code:

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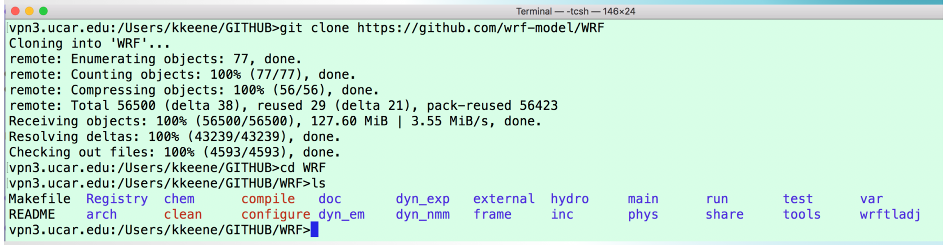
- Download archived tar file from GitHub

OBTAIN WRF & WPS CODE

- Cloning WRF from GitHub repository:



Terminal — -tcsh — 146×24

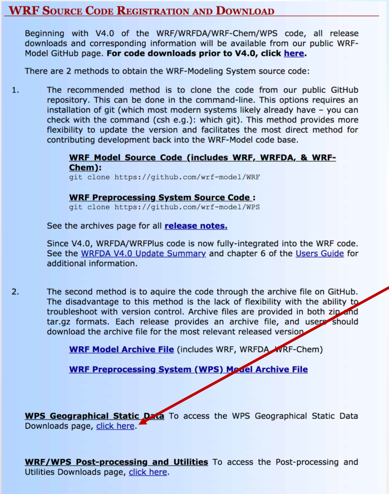
```
vpn3.ucar.edu:/Users/kkeene/GITHUB>git clone https://github.com/wrf-model/WRF
Cloning into 'WRF'...
remote: Enumerating objects: 77, done.
remote: Counting objects: 100% (77/77), done.
remote: Compressing objects: 100% (56/56), done.
remote: Total 56500 (delta 38), reused 29 (delta 21), pack-reused 56423
Receiving objects: 100% (56500/56500), 127.60 MiB | 3.55 MiB/s, done.
Resolving deltas: 100% (43239/43239), done.
Checking out files: 100% (4593/4593), done.
vpn3.ucar.edu:/Users/kkeene/GITHUB>cd WRF
vpn3.ucar.edu:/Users/kkeene/GITHUB/WRF>ls
Makefile  Registry  chem      compile   doc       dyn_exp   external  hydro     main      run       test      var
README    arch      clean     configure dyn_em    dyn_nmm   frame     inc       phys      share     tools     wrftladj
vpn3.ucar.edu:/Users/kkeene/GITHUB/WRF>
```

**Must have 'git' installed on your system!

DOWNLOAD STATIC GEOGRAPHICAL DATA

- From the WRF Download page:

http://www2.mmm.ucar.edu/wrf/users/download/get_sources_new.php



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   WRF Model Archive File (includes WRF, WRFDA, WRF-Chem)

   WRF Preprocessing System (WPS) Model Archive File

WPS Geographical Static Data To access the WPS Geographical Static Data Downloads page, click here.

WRF/WPS Post-processing and Utilities To access the Post-processing and Utilities Downloads page, click here.

Click Here

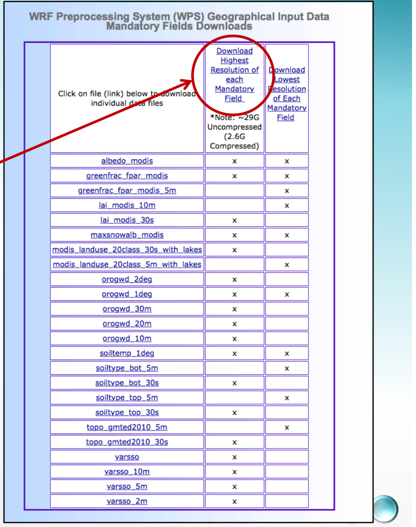
DOWNLOAD STATIC GEOGRAPHICAL DATA

- Geographical Input and Data Download Page:

http://www2.mmm.ucar.edu/wrf/users/download/get_sources_wps_geog.html

`geog_high_res_mandatory.tar.gz`
~ 29 GB when uncompressed

This is the one you want



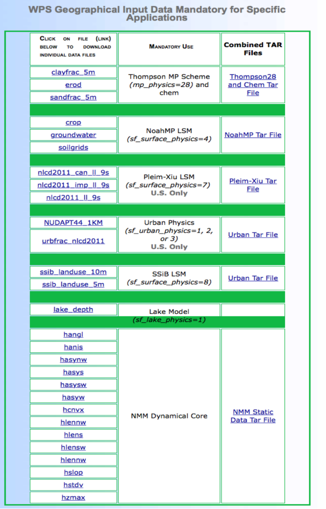
WRF Preprocessing System (WPS) Geographical Input Data Mandatory Fields Downloads

Click on file (link) below to download individual data files	Download Highest Resolution of each Mandatory Field *Note: ~29G Uncompressed (2.6G Compressed)	Download Lowest Resolution of Each Mandatory Field
albedo_modis	x	x
greenfrac_fpar_modis	x	x
greenfrac_fpar_modis_5m		x
lai_modis_10m		x
lai_modis_30s	x	
maxsnowalb_modis	x	x
modis_landuse_20class_30s_with_lakes	x	
modis_landuse_20class_5m_with_lakes		x
orogwd_2deg	x	
orogwd_1deg	x	x
orogwd_30m	x	
orogwd_20m	x	
orogwd_10m	x	
soiltemp_1deg	x	x
soiltype_bot_5m		x
soiltype_bot_30s	x	
soiltype_top_5m		x
soiltype_top_30s	x	
topo_gmted2010_5m		x
topo_gmted2010_30s	x	
varsso	x	
varsso_10m	x	
varsso_5m	x	
varsso_2m	x	

STATIC GEOGRAPHICAL DATA: OTHER OPTIONS

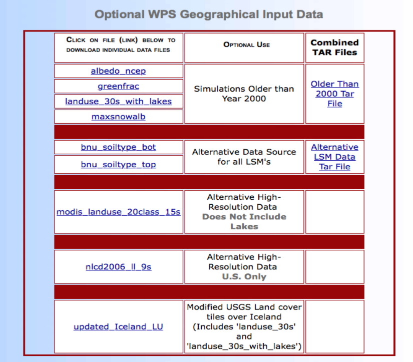
- Geographical Input and Data Download Page:

http://www2.mmm.ucar.edu/wrf/users/download/get_sources_wps_geog.html



WPS Geographical Input Data Mandatory for Specific Applications

Click on file (link) below to download individual data files	Mandatory Use	Combined TAR Files
clayfrac_5m	Thompson MP Scheme *(mp_physics=28)* and chem	Thompson28 and Chem Tar File
erod		
sandfrac_5m		
crop	NoahMP LSM *(sf_surface_physics=4)*	NoahMP Tar File
groundwater		
soilgrids		
nlcd2011_can_ll_9s	Pleim-Xiu LSM *(sf_surface_physics=7)* **U.S. Only**	Pleim-Xiu Tar File
nlcd2011_imp_ll_9s		
nlcd2011_ll_9s		
NUDAPT44_1KM	Urban Physics *(sf_urban_physics=1, 2, or 3)* **U.S. Only**	Urban Tar File
urbfrac_nlcd2011		
ssib_landuse_10m	SSiB LSM *(sf_surface_physics=8)*	Urban Tar File
ssib_landuse_5m		
lake_depth	Lake Model *(sf_lake_physics=1)*	
hangl	NMM Dynamical Core	NMM Static Data Tar File
hanis		
hasynw		
hasys		
hasysw		
hasyw		
hcnvx		
hlennw		
hlens		
hlensw		
hlennw		
hslop		
hstdv		
hzmax		



Optional WPS Geographical Input Data

Click on file (link) below to download individual data files	Optional Use	Combined TAR Files
albedo_ncep	Simulations Older than Year 2000	Older Than 2000 Tar File
greenfrac		
landuse_30s_with_lakes		
maxsnowalb		
bnu_soiltype_bot	Alternative Data Source for all LSM's	Alternative LSM Data Tar File
bnu_soiltype_top		
modis_landuse_20class_15s	Alternative High-Resolution Data **Does Not Include Lakes**	
nlcd2006_ll_9s	Alternative High-Resolution Data **U.S. Only**	
updated_Iceland_LU	Modified USGS Land cover tiles over Iceland (Includes 'landuse_30s' and 'landuse_30s_with_lakes')	

INSTALLING STEPS

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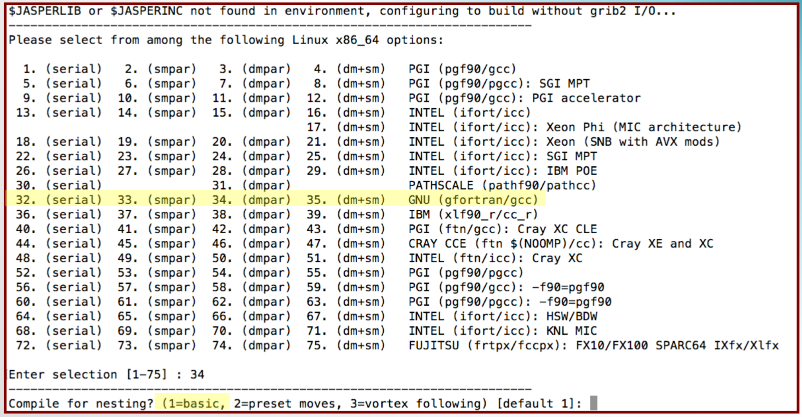
CHOOSING A COMPILER

- Compile
  - WRF V4.0
  - dmpar/nesting
  - 4 processors
- Run
  - Single domain
  - Small domain (75x70), 30km resolution
  - 12 hours
  - 8 processors

Compiler	Compile Time	Run Time
GNU 6.3.0 **FREE**	6.82 Mins	3.92 Mins
Intel 17.0.1	46.77 Mins	2.20 Min
PGI 17.9	28.35 Mins	1.95 Min

STEP 1: CONFIGURE FOR WRF

- Inside the WRF/ directory, type: `./configure`



```
$JASPERLIB or $JASPERINC not found in environment, configuring to build without grib2 I/O...
------------------------------------------------------------------------
Please select from among the following Linux x86_64 options:

  1. (serial)   2. (smpar)   3. (dmpar)   4. (dm+sm)   PGI (pgf90/gcc)
  5. (serial)   6. (smpar)   7. (dmpar)   8. (dm+sm)   PGI (pgf90/pgcc): SGI MPT
  9. (serial)  10. (smpar)  11. (dmpar)  12. (dm+sm)   PGI (pgf90/gcc): PGI accelerator
 13. (serial)  14. (smpar)  15. (dmpar)  16. (dm+sm)   INTEL (ifort/icc)
                                         17. (dm+sm)   INTEL (ifort/icc): Xeon Phi (MIC architecture)
 18. (serial)  19. (smpar)  20. (dmpar)  21. (dm+sm)   INTEL (ifort/icc): Xeon (SNB with AVX mods)
 22. (serial)  23. (smpar)  24. (dmpar)  25. (dm+sm)   INTEL (ifort/icc): SGI MPT
 26. (serial)  27. (smpar)  28. (dmpar)  29. (dm+sm)   INTEL (ifort/icc): IBM POE
 30. (serial)               31. (dmpar)                PATHSCALE (pathf90/pathcc)
 32. (serial)  33. (smpar)  34. (dmpar)  35. (dm+sm)   GNU (gfortran/gcc)
 36. (serial)  37. (smpar)  38. (dmpar)  39. (dm+sm)   IBM (xlf90_r/cc_r)
 40. (serial)  41. (smpar)  42. (dmpar)  43. (dm+sm)   PGI (ftn/gcc): Cray XC CLE
 44. (serial)  45. (smpar)  46. (dmpar)  47. (dm+sm)   CRAY CCE (ftn $(NOOMP)/cc): Cray XE and XC
 48. (serial)  49. (smpar)  50. (dmpar)  51. (dm+sm)   INTEL (ftn/icc): Cray XC
 52. (serial)  53. (smpar)  54. (dmpar)  55. (dm+sm)   PGI (pgf90/pgcc)
 56. (serial)  57. (smpar)  58. (dmpar)  59. (dm+sm)   PGI (pgf90/gcc): -f90=pgf90
 60. (serial)  61. (smpar)  62. (dmpar)  63. (dm+sm)   PGI (pgf90/pgcc): -f90=pgf90
 64. (serial)  65. (smpar)  66. (dmpar)  67. (dm+sm)   INTEL (ifort/icc): HSW/BDW
 68. (serial)  69. (smpar)  70. (dmpar)  71. (dm+sm)   INTEL (ifort/icc): KNL MIC
 72. (serial)  73. (smpar)  74. (dmpar)  75. (dm+sm)   FUJITSU (frtpx/fccpx): FX10/FX100 SPARC64 IXfx/Xlfx

Enter selection [1-75] : 34
------------------------------------------------------------------------
Compile for nesting? (1=basic, 2=preset moves, 3=vortex following) [default 1]:
```

- Output from configuration: a file called 'configure.wrf'

CONFIGURE OPTIONS FOR WRF

DEBUGGING OPTIONS

- `./configure -d`
  - No optimization
  - Extra debugging
- `./configure -D`
  - No optimization
  - Checks uninitialized variables, floating point traps, etc.
- `./configure -r8`
  - Double-precision
    - Works for GNU, Intel, & PGI compilers

OLDER VERSIONS

- **Large-file support**
  - For output files > 2GB
  - Default since V3.9
  - Before configuring, set (csh e.g.)

`setenv WRFIO_NCD_LARGE_FILE_SUPPORT 1`

- **Hybrid coordinate**
  - Default since V4.0
  - V3.9* Configure Option

    `./configure -hyb`

PARALLEL COMPILE OPTION FOR WRF

- To build WRF with multiple compilers, set (csh e.g.):

  `setenv J "-j2"`

  Before or after configure

# of Processors	Time to Compiler
1	17.25 Mins
2	9.95 Mins
3	8.05 Mins
4	6.82 Mins
5	6.32 Mins
6	6.12 Mins

Compiled with GNU V6.3.0

CONFIGURE.WRF FILE: USEFUL TIPS

- NETCDFPATH : internally set by build system based on $NETCDF
- PNETCDF = For users who have access to parallel netcdf, use the environment variable PNETCDF identically to how NETCDF is set (point to the PNETCDF top-level directory)

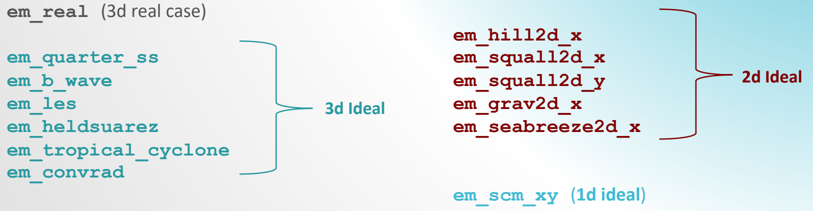
STEP 2: COMPILE WRF

- In the WRF/ directory, type:

```
./compile em_case >& log.compile
```

Where `em_case` is one of the following (type `./compile` to see all options)

`em_real` (3d real case)



```
em_quarter_ss
em_b_wave
em_les
em_heldsuarez
em_tropical_cyclone
em_convrad
```

3d Ideal

```
em_hill2d_x
em_squall2d_x
em_squall2d_y
em_grav2d_x
em_seabreeze2d_x
```

2d Ideal

`em_scm_xy` (1d ideal)

Compilation should take ~30 mins

SUCCESSFUL COMPILATION

- If the compilation is successful, you should find these executables in **`WRF/main`** (non-zero size):

Real data case:

`wrf.exe` – model executable

`real.exe` – real data initialization

`ndown.exe` – one-way nesting

`tc.exe` – for tc bogusing (can only be run serially)

Ideal case:

`wrf.exe` – model executable

`ideal.exe` – ideal case initialization

***Note: Each ideal case compile creates a different executable, but with the same name**

- These executables are linked to 2 different directories (**`WRF/run`** and **`WRF/test/em_real`**). You can go to either place to run WRF.

UNSUCCESSFUL COMPILATION

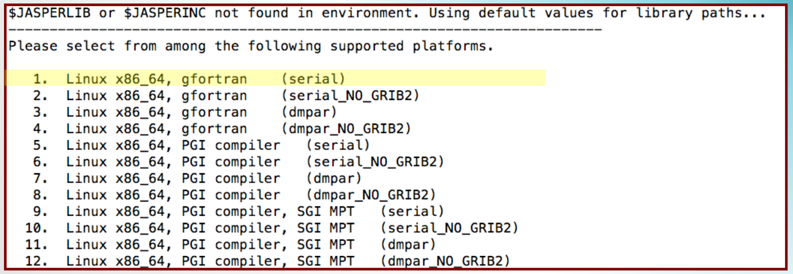
- Use your 'log.compile' file to search for errors!
  - Search for 'Error' with a capital 'E'
- Use our Frequently Asked Questions web page for help
  - www2.mmm.ucar.edu/wrf/users/FAQ_files/FAQ_wrf_intallation.html
- Visit the wrfhelp Forum:
  http://forum.mmm.ucar.edu/
- Before recompiling:
  - issue a '**`clean –a`**'
  - Reconfigure: If you need to make changes to the configure.wrf file, do this after issuing ./configure, and then save the edited file.
  - Recompile

INSTALLING STEPS

- Check system requirements
- Installing libraries
- Obtain source data
- Compile WRF
- ***Compile WPS***
- Download initial/BC datasets

STEP 1: CONFIGURE FOR WPS

- Inside the WPS/ directory, type:
  ./configure



```
$JASPERLIB or $JASPERINC not found in environment. Using default values for library paths...
------------------------------------------------------------------------
Please select from among the following supported platforms.

   1.  Linux x86_64, gfortran    (serial)
   2.  Linux x86_64, gfortran    (serial_NO_GRIB2)
   3.  Linux x86_64, gfortran    (dmpar)
   4.  Linux x86_64, gfortran    (dmpar_NO_GRIB2)
   5.  Linux x86_64, PGI compiler   (serial)
   6.  Linux x86_64, PGI compiler   (serial_NO_GRIB2)
   7.  Linux x86_64, PGI compiler   (dmpar)
   8.  Linux x86_64, PGI compiler   (dmpar_NO_GRIB2)
   9.  Linux x86_64, PGI compiler, SGI MPT   (serial)
  10.  Linux x86_64, PGI compiler, SGI MPT   (serial_NO_GRIB2)
  11.  Linux x86_64, PGI compiler, SGI MPT   (dmpar)
  12.  Linux x86_64, PGI compiler, SGI MPT   (dmpar_NO_GRIB2)
```

- Choose to compile WPS **serially**, even if you compile WRF with a parallel option (unless you have a very large domain)
  **NOTE: if you do compile WPS in parallel, ungrib.exe must run serially

- Output from configuration: a file called 'configure.wps'

STEP 2: COMPILE WPS

- In the WPS/ directory, type:
  `./compile >& log.compile`

- Compilation should only take a few minutes

- If successful, these executables should be in your WPS/ directory (and they are linked, respectively, from their source code directories):

```
geogrid.exe -> geogrid/src/geogrid.exe
ungrib.exe -> ungrib/src/ungrib.exe
metgrid.exe -> metgrid/src/metgrid.exe
```

UNSUCCESSFUL WPS COMPILATION

No `geogrid.exe` or `metgrid.exe`

- WPS makes use of the external I/O libraries in the *`WRF/external/`* directory - The libraries are built when WRF is installed

- Check that you used the same compiler (and version) as you used to compile WRF

- Check that you are using the same netCDF that you used to build WRF

- Have you changed the name or path of the WRF/ directory?
  - If so, you need to change the following line in the configure.wps file:
    `WRF_DIR = ../WRF`
  - Beginning V4.0: set WRF_DIR environment variable (prior to configure):
    `setenv WRF_DIR` *`path_to_WRF`*`/WRF`
  - Save the file and recompile

UNSUCCESSFUL WPS COMPILATION

No `ungrib.exe`

- Make sure you have installed your jasper, zlib, and libpng libraries correctly.

- Make sure that you are using the correct path and format for the following lines in the configure.wps file

```
 COMPRESSION_LIBS = -L/${DIR}/UNGRIB_LIBRARIES/lib -ljasper -lpng -lz
COMPRESSION_INC = -I/${DIR}/UNGRIB_LIBRARIES/include
```

Save configure.wps and recompile

./CLEAN -A

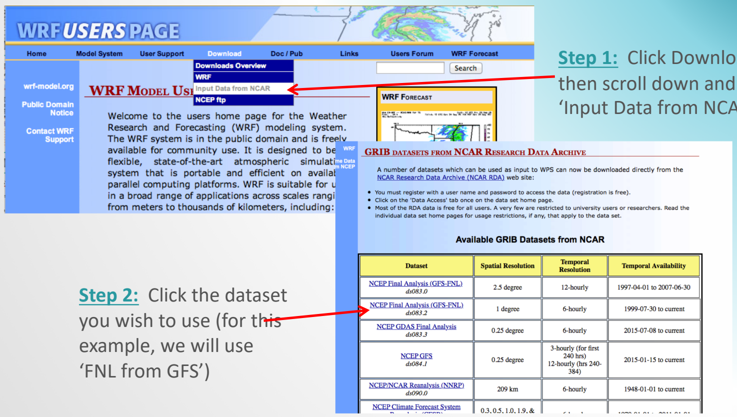
- The './clean –a' command is something that should be used when you have made corrections to your configure.wrf file, configure.wps file, or any changes to the registry. If you have made any of these changes, or if you plan to recompile your code from scratch, you must issue a 'clean –a' before recompiling.
- If you make any changes to any subroutines within the code, you will need to recompile your code, but you do NOT need to issue the 'clean –a' command, nor do you need to reconfigure. You will simply just recompile. This compilation should take a lot less time than a clean compile.

INSTALLING STEPS

- Check system requirements
- Installing libraries
- Obtain source data
- Compile WRF
- Compile WPS
- ***Download initial/BC datasets***

DOWNLOAD DATASETS

- From the WRF Users' page: **http://www2.mmm.ucar.edu/wrf/users/**



WRF MODEL USERS

Welcome to the users home page for the Weather Research and Forecasting (WRF) modeling system. The WRF system is in the public domain and is freely available for community use. It is designed to be flexible, state-of-the-art atmospheric simulati system that is portable and efficient on availat parallel computing platforms. WRF is suitable for u in a broad range of applications across scales rangi from meters to thousands of kilometers, including:

GRIB DATASETS FROM NCAR RESEARCH DATA ARCHIVE

A number of datasets which can be used as input to WPS can now be downloaded directly from the NCAR Research Data Archive (NCAR RDA) web site:

- You must register with a user name and password to access the data (registration is free).
- Click on the 'Data Access' tab once on the data set home page.
- Most of the RDA data is free for all users. A very few are restricted to university users or researchers. Read the individual data set home pages for usage restrictions, if any, that apply to the data set.

Available GRIB Datasets from NCAR

Dataset	Spatial Resolution	Temporal Resolution	Temporal Availability
NCEP Final Analysis (GFS-FNL) ds083.0	2.5 degree	12-hourly	1997-04-01 to 2007-06-30
NCEP Final Analysis (GFS-FNL) ds083.2	1 degree	6-hourly	1999-07-30 to current
NCEP GDAS Final Analysis ds083.3	0.25 degree	6-hourly	2015-07-08 to current
NCEP GFS ds084.1	0.25 degree	3-hourly (for first 240 hrs) 12-hourly (hrs 240-384)	2015-01-15 to current
NCEP/NCAR Reanalysis (NNRP) ds090.0	209 km	6-hourly	1948-01-01 to current
NCEP Climate Forecast System	0.3, 0.5, 1.0, 1.9, &		

Step 1: Click Download, then scroll down and click 'Input Data from NCAR'

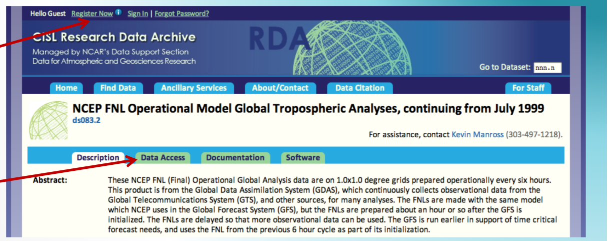
Step 2: Click the dataset you wish to use (for this example, we will use 'FNL from GFS')

*Note: The NOMADS site has several types of useful data: http://nomads.ncdc.noaa.gov

DOWNLOAD DATASETS (CONT'D)

Step 3: Register, or sign in, if you already have an account

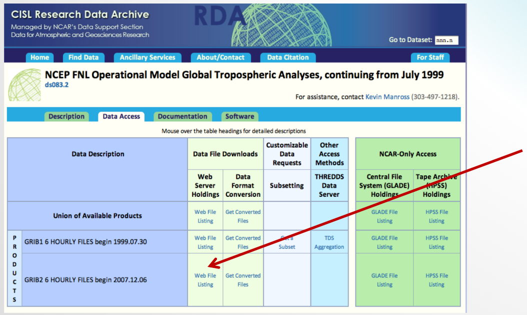
Step 4: Click 'Data Access'



NCEP FNL Operational Model Global Tropospheric Analyses, continuing from July 1999
ds083.2

For assistance, contact Kevin Manross (303-497-1218).

Abstract: These NCEP FNL (Final) Operational Global Analysis data are on 1.0x1.0 degree grids prepared operationally every six hours. This product is from the Global Data Assimilation System (GDAS), which continuously collects observational data from the Global Telecommunications System (GTS), and other sources, for many analyses. The FNLs are made with the same model which NCEP uses in the Global Forecast System (GFS), but the FNLs are prepared about an hour or so after the GFS is initialized. The FNLs are delayed so that more observational data can be used. The GFS is run earlier in support of time critical forecast needs, and uses the FNL from the previous 6 hour cycle as part of its initialization.



NCEP FNL Operational Model Global Tropospheric Analyses, continuing from July 1999
ds083.2

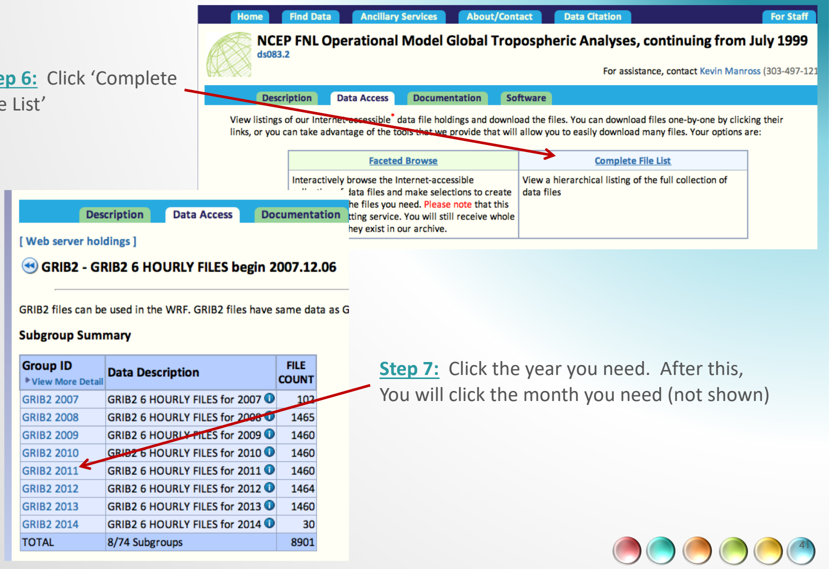
For assistance, contact Kevin Manross (303-497-1218).

Mouse over the table headings for detailed descriptions

Data Description		Data File Downloads		Customizable Data Requests	Other Access Methods	NCAR-Only Access	
		Web Server Holdings	Data Format Conversion	Subsetting	THREDDS Data Server	Central File System (GLADE) Holdings	Tape Archive (HPSS) Holdings
Union of Available Products		Web File Listing	Get Converted Files			GLADE File Listing	HPSS File Listing
PRODUCTS	GRIB1 6 HOURLY FILES begin 1999.07.30	Web File Listing	Get Converted Files	Get a Subset	TDS Aggregation	GLADE File Listing	HPSS File Listing
	GRIB2 6 HOURLY FILES begin 2007.12.06	Web File Listing	Get Converted Files			GLADE File Listing	HPSS File Listing

Step 5: Click 'Web File Listing' for the span of years you need

DOWNLOAD DATASETS (CONT'D)



Home | Find Data | Ancillary Services | About/Contact | Data Citation | For Staff

NCEP FNL Operational Model Global Tropospheric Analyses, continuing from July 1999
ds083.2

For assistance, contact Kevin Manross (303-497-121

Description | Data Access | Documentation | Software

View listings of our Internet-accessible* data file holdings and download the files. You can download files one-by-one by clicking their links, or you can take advantage of the tools that we provide that will allow you to easily download many files. Your options are:

Faceted Browse	Complete File List
Interactively browse the Internet-accessible … data files and make selections to create …he files you need. Please note that this …tting service. You will still receive whole …hey exist in our archive.	View a hierarchical listing of the full collection of data files

Description | Data Access | Documentation

[Web server holdings]

GRIB2 - GRIB2 6 HOURLY FILES begin 2007.12.06

GRIB2 files can be used in the WRF. GRIB2 files have same data as G

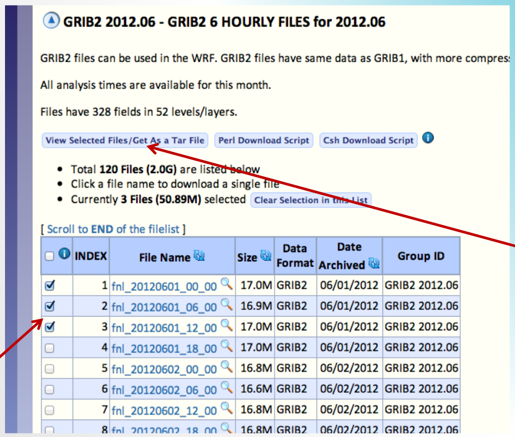
Subgroup Summary

Group ID View More Detail	Data Description	FILE COUNT
GRIB2 2007	GRIB2 6 HOURLY FILES for 2007	102
GRIB2 2008	GRIB2 6 HOURLY FILES for 2008	1465
GRIB2 2009	GRIB2 6 HOURLY FILES for 2009	1460
GRIB2 2010	GRIB2 6 HOURLY FILES for 2010	1460
GRIB2 2011	GRIB2 6 HOURLY FILES for 2011	1460
GRIB2 2012	GRIB2 6 HOURLY FILES for 2012	1464
GRIB2 2013	GRIB2 6 HOURLY FILES for 2013	1460
GRIB2 2014	GRIB2 6 HOURLY FILES for 2014	30
TOTAL	8/74 Subgroups	8901

Step 6: Click 'Complete File List'

Step 7: Click the year you need. After this, You will click the month you need (not shown)

DOWNLOAD DATASETS (CONT'D)



GRIB2 2012.06 - GRIB2 6 HOURLY FILES for 2012.06

GRIB2 files can be used in the WRF. GRIB2 files have same data as GRIB1, with more compres

All analysis times are available for this month.

Files have 328 fields in 52 levels/layers.

- Total **120 Files (2.0G)** are listed below
- Click a file name to download a single file
- Currently **3 Files (50.89M)** selected Clear Selection in this List

[Scroll to **END** of the filelist]

□	INDEX	File Name	Size	Data Format	Date Archived	Group ID
☑	1	fnl_20120601_00_00	17.0M	GRIB2	06/01/2012	GRIB2 2012.06
☑	2	fnl_20120601_06_00	16.9M	GRIB2	06/01/2012	GRIB2 2012.06
☑	3	fnl_20120601_12_00	17.0M	GRIB2	06/01/2012	GRIB2 2012.06
□	4	fnl_20120601_18_00	17.0M	GRIB2	06/01/2012	GRIB2 2012.06
□	5	fnl_20120602_00_00	16.8M	GRIB2	06/02/2012	GRIB2 2012.06
□	6	fnl_20120602_06_00	16.6M	GRIB2	06/02/2012	GRIB2 2012.06
□	7	fnl_20120602_12_00	16.8M	GRIB2	06/02/2012	GRIB2 2012.06
□	8	fnl_20120602_18_00	16.8M	GRIB2	06/02/2012	GRIB2 2012.06

Step 8: Click a box for each time span that you need

Step 9: Once you have chosen All your times, click on the 'View Selected Files/Get As a Tar File' button To download one tar file with all your Dates/times

QUESTIONS?