

# Building the HWRF Components

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# Outline

- HWRF system components
- Where to get the codes
- User directory structure
- Component directory structure
- Unpacking, setup, & build

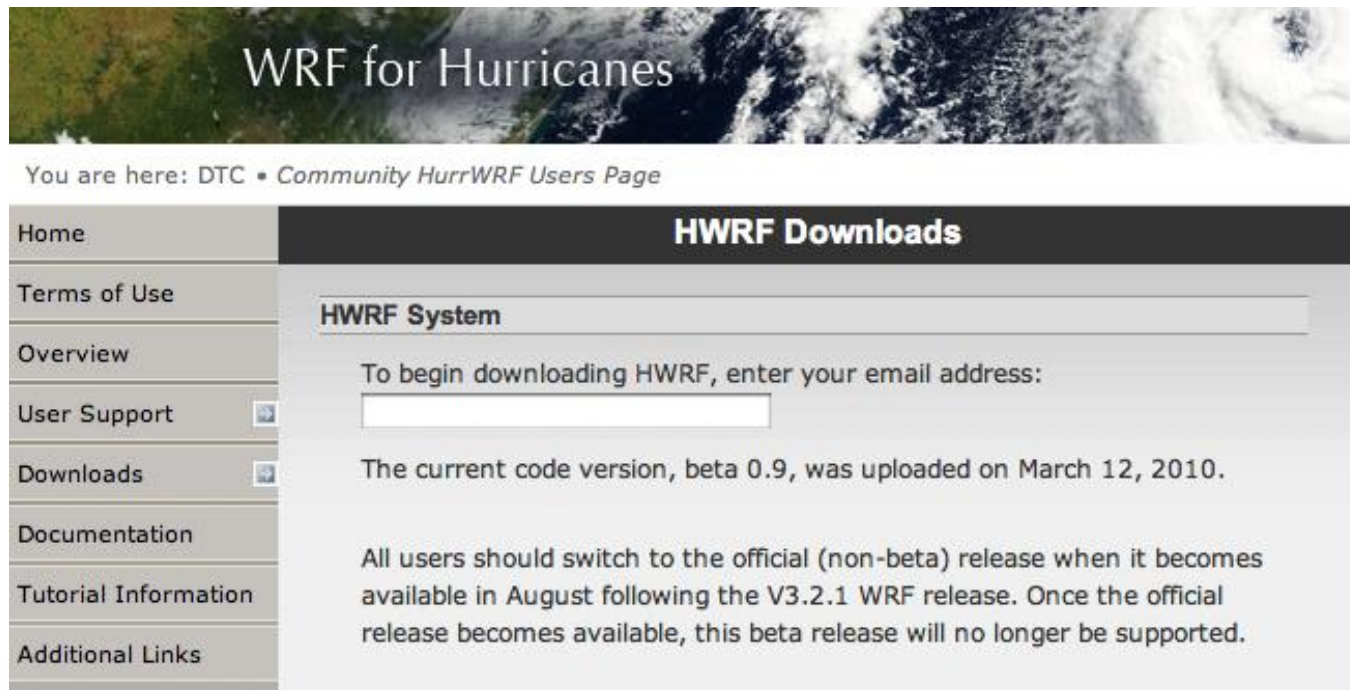
# HWRF System Components

- WRF: Weather Research & Forecast Model
- WPS: WRF Preprocessor
- WPP: WRF Post-processor
- GSI: Gridpoint Statistical Interpolation
- **HWRF-Utilities**: HWRF utilities & Vortex Init
- **POM-TC**: Tropical Cyclone version of the Princeton Ocean Model.
- **NCEP Coupler**: Couples WRF & POMTC
- **GFDL Vortex Tracker**: Storm tracker for post processing



# Downloading the Source Code

- All HWRF source code can be obtained from the WRF for Hurricanes web site:
  - [www.dtcenter.org/HurrWRF/users/downloads/index.php](http://www.dtcenter.org/HurrWRF/users/downloads/index.php)



The screenshot shows the 'WRF for Hurricanes' website. At the top, there is a banner image of a hurricane with the text 'WRF for Hurricanes'. Below the banner, a breadcrumb trail reads 'You are here: DTC • Community HurrWRF Users Page'. The main content area is titled 'HWRF Downloads' and features a sidebar on the left with navigation links: Home, Terms of Use, Overview, User Support, Downloads, Documentation, Tutorial Information, and Additional Links. The main content area contains the following text: 'HWRF System', 'To begin downloading HWRF, enter your email address:' followed by an empty input field, 'The current code version, beta 0.9, was uploaded on March 12, 2010.', and 'All users should switch to the official (non-beta) release when it becomes available in August following the V3.2.1 WRF release. Once the official release becomes available, this beta release will no longer be supported.'

# Setting up the HWRF Directory

- HWRF component code consists of the tar files:
  - WRFV3.3a.tar.gz
  - WPSV3.3.TAR.gz
  - WPPV3.2.tar.gz
  - comGSI\_v2.5.tar.gz
  - HWRF-UTILITIES.tar.gz
  - POMTC.tar.gz
  - NCEP-COUPLER.tar.gz
  - GFDL-VORTEXTRACKER.tar.gz
- Create a working directory and move the src into it:
  - *mkdir*  $\${HOME}/HWRF/src/$
  - *mv* \*.gz  $\${HOME}/HWRF/src/$
  - *cd*  $\${HOME}/HWRF/src/$



# System Requirements

- C compiler
- Perl
- netCDF V3.6+ (for WRF, WPS, WPP & HWRF-Utilities)
- Linear algebra library (ESSL or LAPACK/BLAS)
- MPI V1.2+
- FORTRAN 90/95 compiler
  - IBM AIX
  - PGI pgf90
  - Intel ifort
- GrADS (visualization)
- wgrib (decode grib files)



# Building the Components

- Code dependencies
  - WRF
    - WPS
    - WPP
    - GSI
    - HWRF-Utilities
  - HWRF Utilities
    - POM-TC
    - GFDL Vortex Tracker
- Order of build
  1. WRF
  2. WPS or WPP or GSI
  3. HWRF-Utilities
  4. Rest (POM-TC & Vortex Tracker & Coupler)



# Build Infrastructure

- Uses DTC Build system based on WRF's.
- **/arch** directory contains rules & scripts for build.
  - **/arch/preamble**: uniform requirements for the code, such as word size, etc.
  - **/arch/configure.defaults** default platform settings
  - **/arch/postamble**: standard make rules & dependencies
- **./clean** script to clean the build.
- **./configure** script to create configuration file *configure.xxx*; contains info on compiler, MPI, & paths.
- **./compile** script to compile executable(s).



# Building the Components

- Build sequence
  - ./clean -a
  - Set necessary environment variables & library paths
  - ./configure
    - Customize file *configure.component* if necessary
  - ./compile



# Clean Compilation

- To remove all object files and executables, type:  
*clean*
- To remove **all** built files, including the configure file, type: *clean -a*
  - A clean all needed if
    - Compilation failed
    - Want to change configuration file



# Building WRF NMM

- Type `cd ./WRFV3`
- Type `./clean -a`
- Set library paths and system variables, for csh
  - `setenv HWRF 1`
  - `setenv NETCDF /path_to_netcdf_lib/`
  - `setenv WRF_NMM_CORE 1`
  - `setenv WRF_NMM_NEST 1`
- For full details, see the WRF-NMM Users' Guide
  - <http://www.dtcenter.org/wrf-nmm/users/downloads/index.php>



# Building WRF NMM (continued)

- Type *./configure*
  - Multiple options for Linux
    - For PGI, select option 3 (**dmpar**)
    - For Intel, select option 11 (**dmpar**)
  - For IBM, select option 3 (**dmpar**)
  - Creates configuration file *configure.wrf*
- To compile type (for csh)
  - *./compile nmm\_real |& tee wrf.log*
- Successful compilation will produce:
  - Two executables, *real\_nmm.exe* & *wrf.exe*, in */main*



# Building HWRF utilities

- Type `cd ./hwrp-utilities`
- Type `./clean -a`
- Set path to WRF (`WRF_DIR`) & check that netCDF library path `NETCDF` is set.
  - `setenv WRF_DIR ${HOME}/HWRF/src/WRFV3`
- Type `./configure`
  - Select compiler used to build WRF in previous step.
  - Creates file `configure.hwrp`
- For csh type `./compile |& tee hwrp-util.log`
- Successful compilation will produce:
  - 10 libraries in `hwrp-utilities/libs`
  - 20 executables in `hwrp-utilities/exec`



# Building POMTC

- Type `cd ./pomtc`
- Type `./clean -a`
- Set library paths for **W3, SP, & SFCIO**.
  - `setenv LIB_SFCIO_PATH ${HOME}/HWRF/src/hwrf-utilities/libs/`
  - `setenv LIB_SP_PATH ${HOME}/HWRF/src/hwrf-utilities/libs/`
  - `setenv LIB_W3_PATH ${HOME}/HWRF/src/hwrf-utilities/libs/`
- And for LINUX, the **BLAS** library
  - `setenv LIB_BLAS_PATH ${HOME}/HWRF/src/hwrf-utilities/libs/`



# Building POMTC (continued)

- Type *./configure*
  - Select compiler used to build WRF.
  - Creates configure file *configure.pom*
- For csh type *./compile |& tee pomtc.log*
- Successful compilation produces 9 executables:
  - in *pomtc/ocean\_exec*.



# Building GFDL Vortex Tracker

- Type *cd ./gfdl-vortextracker*
- Type *./clean -a*
- Set library paths for **W3, SP, & BACIO**.
  - *setenv LIB\_BACIO\_PATH \${HOME}/HWRF/src/hwrf-utilities/libs/*
  - *setenv LIB\_SP\_PATH \${HOME}/HWRF/src/hwrf-utilities/libs/*
  - *setenv LIB\_W3\_PATH \${HOME}/HWRF/src/hwrf-utilities/libs/*



# Building GFDL Vortex Tracker

- Type *./configure*
  - Select compiler used to build WRF.
  - Creates configuration file *configure.trk*
- Type *./compile |& tee tracker.log*
- Successful compilation produces one executable:
  - */trk\_exec/hwrf\_gettrk.exe*



# Building NCEP Coupler

- Type *cd ./ncep-coupler*
- Type *./clean -a*
- Type *./configure*
  - Select compiler used to build WRF.
  - Creates configure file *configure.cpl*
- For csh type *./compile |& tee cpl.log*
- Successful compilation produces:
  - */cpl\_exec/hwrf\_wm3c.exe*



# Building GSI

- Type `cd ./comGSI_v2.5`
- Type `./clean -a`
- Set library paths and system variables, for csh
  - `setenv HWRF 1`
  - `setenv WRF_DIR ${HOME}/HWRF/src/WRFV3`
- On some systems (see Ch. 2 of the HWRF User's Guide for Details)
  - `setenv LAPACK_PATH /location of LAPACK library/`



# Building GSI (continued)

- Type *./configure*
  - Select compiler used to build WRF in previous step.
  - Creates file *configure.gsi*
- For csh type *./compile |& tee gsi.log*
- Successful compilation will produce:
  - *comGSI\_v2.5/run/gsi.exe*



# Building WPS

- Requires WRF, must be compiled first.
- Type *cd ./WPSV3*
- Type *./clean -a*
- Type *./configure* and choose the serial option
  - Choose option 2 for Intel
  - Choose option 6 for PGI
  - Choose option 2 for IBM
  - Creates configuration file *configure.wps*
- For csh type *./compile |& tee wps.log*
- Successful compilation produces 3 executables:
  - In WPS/ *geogrid.exe*, *ungrib.exe*, & *metgrid.exe*



# Building WPP

- Type `cd ./WPPV3`
- Type `./clean -a`
- Set library paths
  - `setenv WRF_DIR /path_to_WRF_dir/`
  - `setenv HWRF 1`
- Type `./configure`
  - Select serial option
  - Creates configuration file `configure.wpp`
- For csh type `./compile |& tee wpp.log`
- Successful compilation produces 3 executables:
  - In exec/ `wrfpost.exe`, `ndate.exe`, & `copygb.exe`.



# Support

- For more detailed information on installation, please see:
  - HWRF Users' Guide
    - [www.dtcenter.org/HurrWRF/users](http://www.dtcenter.org/HurrWRF/users)
  - WRF NMM Users' Guide
    - [www.dtcenter.org/wrf-nmm/users/downloads/index.php](http://www.dtcenter.org/wrf-nmm/users/downloads/index.php)
  - GSI User's Guide
    - [www.dtcenter.org/com-GSI/users/index.php](http://www.dtcenter.org/com-GSI/users/index.php)
- For further assistance contact:
  - [wrfhelp@ucar.edu](mailto:wrfhelp@ucar.edu)



# Summary

- Download the tar files from the HWRF site.
- Don't mix components from different releases.
- Build components in proper order
  - i.e. WRF before HWRF-Utilities, WPS, WPP, & GSI.
  - i.e. HWRF-Utilities before POM-TC, coupler, & Vortex Tracker.
- Set necessary environment paths before running configure.
- When all else fails, read the Users' Guide.



# HWRF Evolution

- Tutorial
  - WRF v3.3 released March 2011
  - WPP (WRF Post-Processor)
    - Contains HWRF 2011 operational baseline
- HWRF release v3.3a (Spring 2011)
  - WRF v3.3 + updates in deep convection and surface fluxes
    - Contains HWRF 2011 operational capability
  - UPP (Unified Post-Processor)
    - Very similar to WPP, same procedures to run
  - 2011 Scientific Documentation and Users Guide



# HWRF Community Code Evolution

	HWRF Beta release (03/10)	This Tutorial	Spring HWRF release v3.3a
WRF	V3.2+ (~ 2009 operational )	V3.3 (~ 2011 operational baseline)	V3.3+ (~ 2011 operational)
WPS	V3.2	V3.3	V3.3
Postprocessor	WPP V3.2	WPP V3.2	UPP V1
GSI	None	V2.5	V2.5
HWRF-Utilities	Beta	Beta+ (matches 2011 operational baseline)	V3.3a (similar to Beta+)
POM-TC	Beta	Beta+ (matches 2011 operational baseline)	TBD
NCEP Coupler	Beta	Beta+ (matches 2011 operational baseline)	V3.3a (similar to Beta+)
GFDL Vortex Tracker	Beta	Beta+ (matches 2011 operational baseline)	V3.3a (similar to Beta+)

