

Hurricane WRF: Testing Activities and Community Support by the DTC

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External collaborators:

NOAA Environmental Modeling Center

NOAA Geophysical Fluid Dynamics Laboratory

NOAA Atlantic Oceanographic and Meteorological Laboratory

NCAR Mesoscale and Microscale Meteorology Division

University of Rhode Island

12th WRF Users' Workshop, June 21, 2011

Goal: Increase Tech Transfer to Operations

Current focus in HWRF

1. **Code Management**

- Create a framework for NCEP and the research community to collaborate

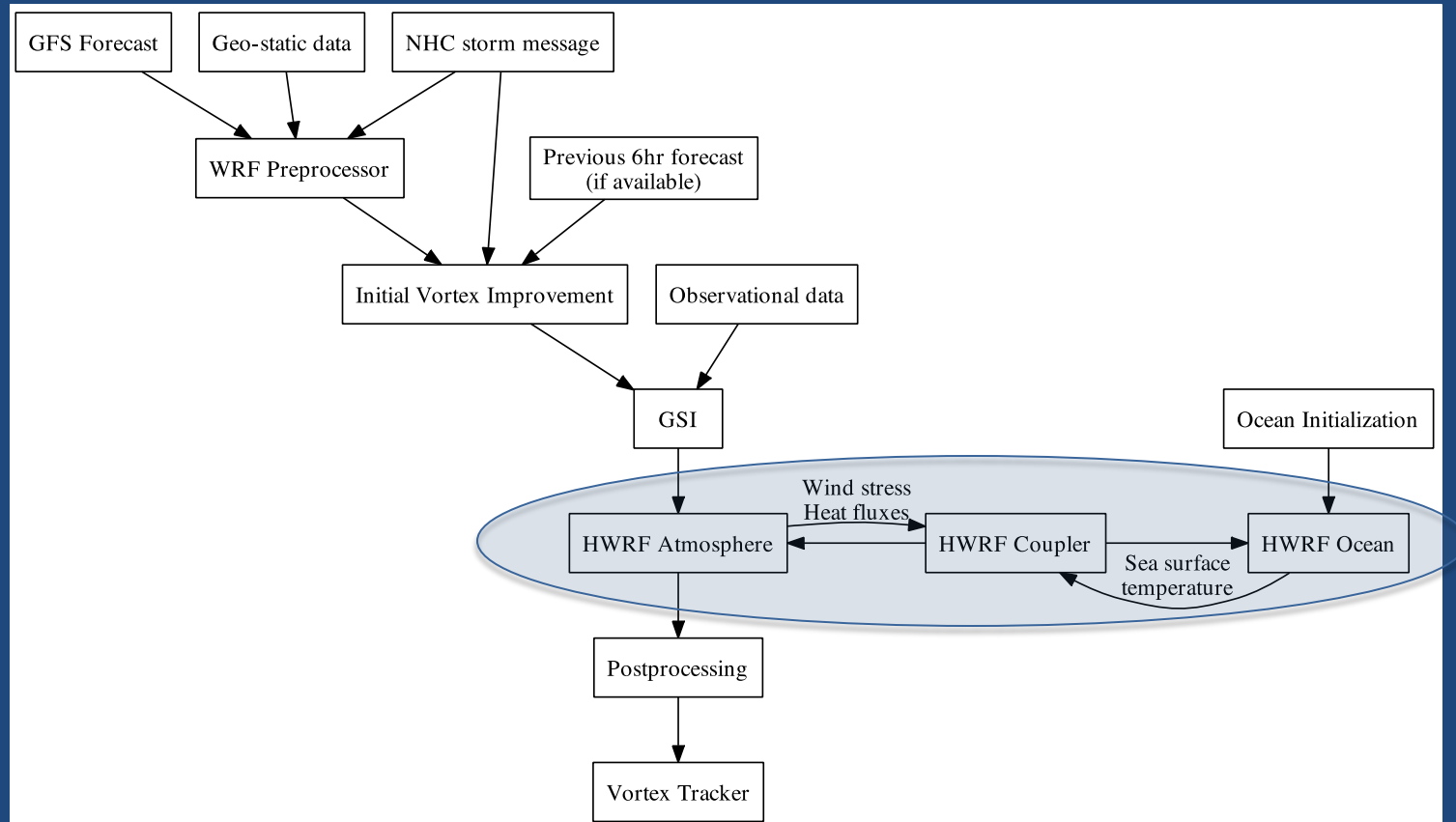
2. **Testing and Evaluation**

- Perform tests to assure integrity of community code and evaluate new developments for potential operational implementation

3. **User Support**

- Support the community in using an operational hurricane model

Community HWRF Overview



HWRF Domains



- Atmos outer Domain
 - $75 \times 75^\circ$
 - ~ 27 km
 - 42 levels
- Atmos nest
 - $6 \times 6^\circ$
 - ~ 9 km
 - 42 levels
- Ocean United domain
 - $1/6^\circ$

HWRF Code Management

Goal: maintain a single code base for research and operation

Components with existing community code repository in 2009	Components without existing community code repository in 2009
WRF, WPS, GSI, WPP	Vortex, POM, coupler, tracker
DTC established operational capability in community repository	DTC created community code repositories
DTC keeps community code updated with operational developments	
Code for 2011 operations taken from community repository	

Functionally-Similar T&E Suite

- Pre-processing (including ability to read binary GFS in spectral coordinates)
- Cycled HWRF vortex initialization and relocation
- GSI Data Assimilation
- Coupled (POM + WRF) model
- Post-processing
- Tracking
- NHC Verification, confidence intervals
- Display
- Archival

The Developmental Testbed Center HWRF 2011 Baseline Test Plan

Point of Contact: Ligia Bernardet
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Introduction

The DTC will be performing testing and evaluation for the Hurricane WRF system, known as HWRF (Gopalakrishnan et al. 2010). HWRF will be configured as close as possible to the operational HWRF model, employing the same domains, physics, coupling, and initialization procedures as the model used at the NOAA NCEP Central Operations and by the model developers at NCEP EMC. The configuration to be tested matches the 2011 HWRF Baseline, which is the configuration that served as control for all developments at EMC geared towards the 2011 operational implementation.

 Developmental Testbed Center  Developmental Testbed Center DTC HWRF Project 	
HWRF R2 Final Model Runs	
2008	
HWRF R2 Final Atlantic	HWRF R2 Final East Pacific
FAY (06L)	ELIDA (06E)
GUSTAV (07L)	FAUSTO (07E)
HANNA (08L)	GENEVIEVE (08E)
IKE (09L)	MARIE (14E)
	NORBERT (15E)
2009	
HWRF R2 Final Atlantic	HWRF R2 Final East Pacific
BILL (03L)	FELICIA (08E)
CLAUDETTE (04L)	GUILLERMO (10E)
DANNY (05L)	HILDA (11E)
ERIKA (06L)	IGNACIO (12E)
FRED (07L)	JIMENA (13E)
HENRI (10L)	LINDA (15E)
IDA (11L)	OLAF (16E)

http://verif.rap.ucar.edu/eval/hwrf_hnr2_hr20/

HWRF 2011 Operational Baseline

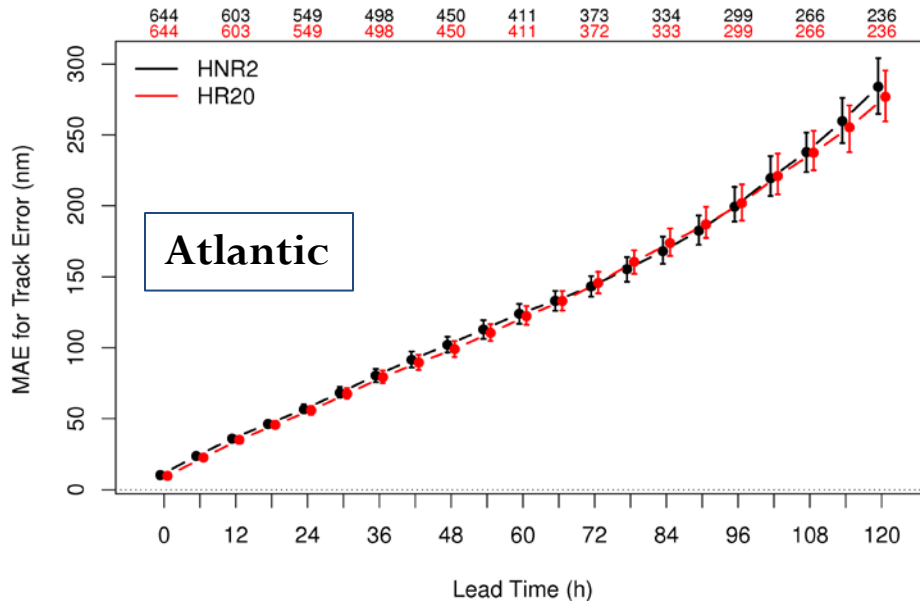
See RC talk 6.4 by M. Harrold
on Wednesday morning

- Goals
 - Benchmark the community code (DTC Reference Configuration)
 - Compare average skill against similar test done by EMC to qualify DTC's testing suite (exact match not expected)

DTC (HNR2)	EMC (HR20)
Linux (HFIP machine)	IBM (NCEP)
Community tracker	Operational Tracker
NetCDF I/O format	Binary I/O format

DTC ran 1190 cases, 53 storms, over 3 seasons, Atl and EP

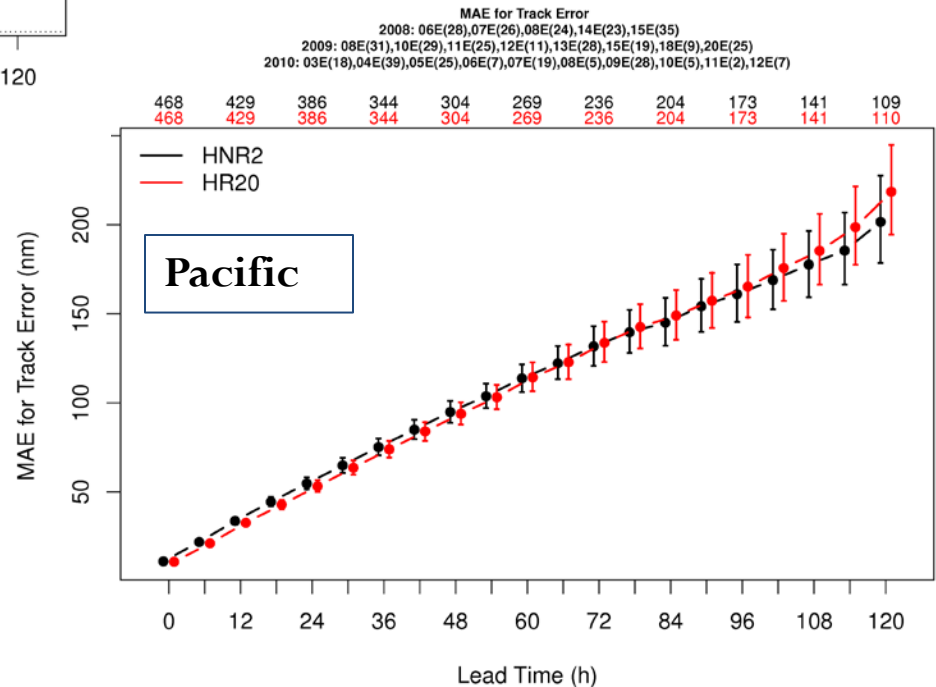
Track Errors – 2011 Baseline



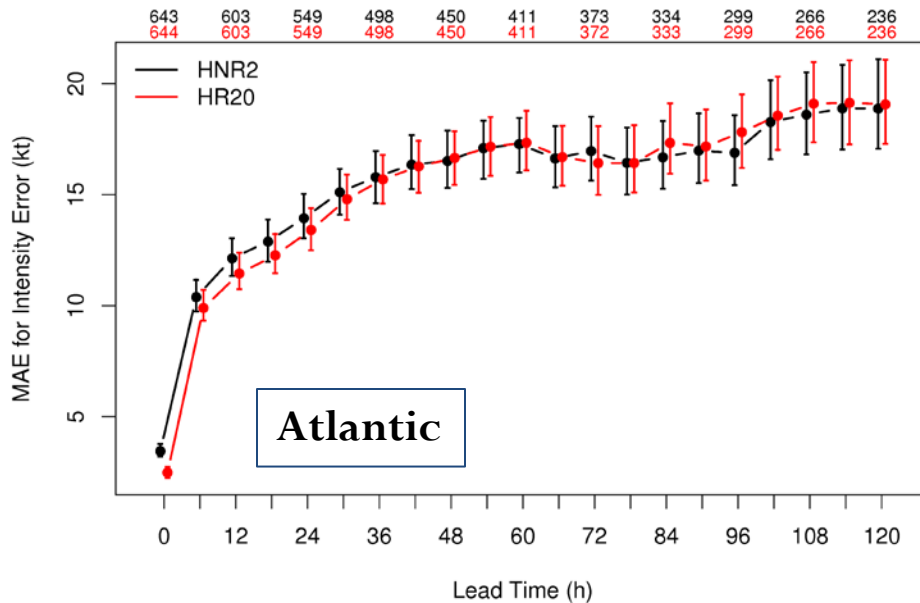
DTC Reference Configuration

EMC run

- Community code benchmarked
- Errors similar to equivalent runs performed at EMC
- DTC testing suite qualified



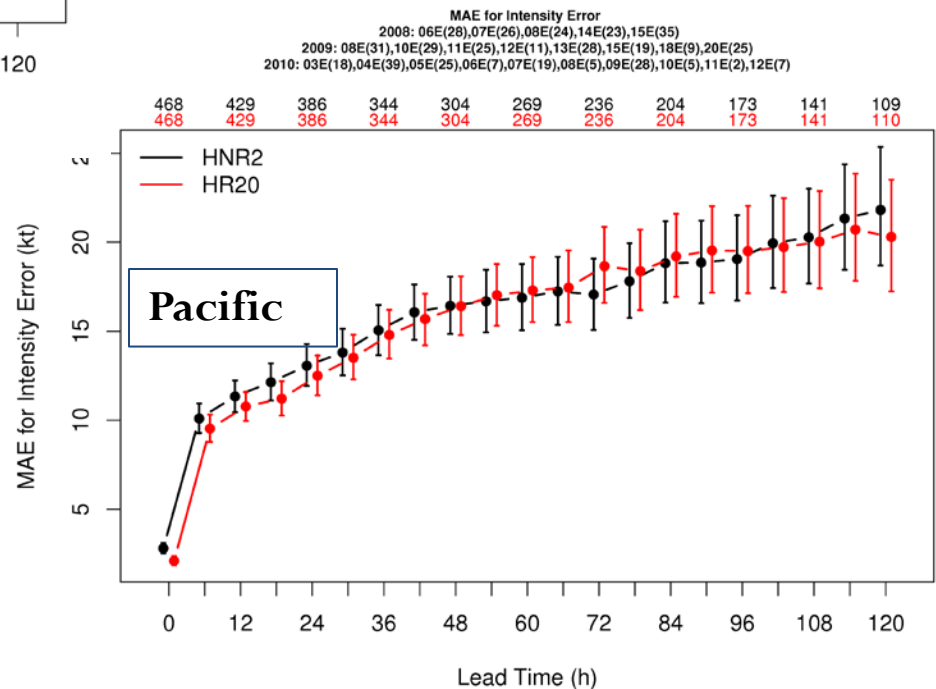
Intensity Errors – 2011 Baseline



DTC Reference Configuration


EMC run

- Errors similar to equivalent runs performed at EMC
- Only statistical significant difference is at initial time



WRF for Hurricanes User Support

www.dtcenter.org/HurrWRF/users



WRF for Hurricanes

You are here: DTC • Hurricane WRF Users Page

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Welcome to the users page on WRF for Hurricanes. The [Weather Research and Forecasting \(WRF\)](#) Model is designed to serve both operational forecasting and atmospheric research needs. It features two dynamic cores, multiple physical parameterizations, a variational data assimilation system, ability to couple with an ocean model, and a software architecture allowing for computational parallelism and system extensibility. WRF is suitable for a broad spectrum of applications, including tropical storms.

Two robust configurations of WRF for tropical storms are the NOAA operational model [Hurricane WRF \(HWRF\)](#) and the National Center for Atmospheric Research (NCAR) [Advanced Research Hurricane WRF \(AHW\)](#). In this website users can obtain codes, datasets, and information for running both HWRF and AHW.

The [Developmental Testbed Center](#) and the [Mesoscale and Microscale Meteorology \(MMM\)](#) Division of NCAR support the use of all components of AHW and HWRF to the community, including the WRF atmospheric model with its Preprocessing System (WPS), various vortex initialization procedures, the Princeton Ocean Model for Tropical Cyclones (POM-TC), the [NOAA National Centers for Environmental Prediction \(NCEP\)](#) coupler, the [NOAA Geophysical Fluid Dynamics Laboratory \(GFDL\)](#) Vortex Tracker, and various postprocessing packages and graphical utilities.

The effort to develop AHW has been a collaborative partnership, principally among NCAR, the [Rosenstiel School at the University of Miami](#), and the [Air Force Weather Agency \(AFWA\)](#).

The effort to develop HWRF has been a collaborative partnership, principally between NOAA (NCEP and GFDL) and the [University of Rhode Island](#).

Events

The EMC/MMM/DTC Joint WRF for Hurricanes Tutorial
04.26.2011 to 04.29.2011
Location: NCAR, Foothills Lab, Boulder, CO


Announcements

- 12 March 2010:
Beta V0.9 release of the HWRF system
- 31 March 2010:
WRF V3.2 release.


Organizations contributing to this website

Developmental Testbed Center (DTC)
NCAR's Mesoscale & Microscale Meteorology Division (MMM)

Sponsors of WRF for Hurricanes



NCAR
National Center for
Atmospheric Research
(NCAR)



NOAA
National Oceanic and
Atmospheric Administration
(NOAA)

Code
downloads,
datasets,
documentation,
email helpdesk

170 registered
users

Current release
is Beta based on
V3.2

Upcoming release
July 2011 based on
V3.3

Future Work: Code Management

- Work with research and operational communities to maintain a single code base
- Interface with community members to transition new capabilities onto HWRF system
 - 2011 operational capability
 - Idealized simulation capability
 - Three-nest capability
 - Ocean model choice (POM and HYCOM)
 - HFIP Announcement of Opportunity projects
 - Others! Keep DTC involved if you are working in developments for HWRF.
- Ascertain that non-HWRF changes to the community code do not affect operational HWRF answer

Future Work: Testing and Evaluation

- Test plan for 2011
 - Reference Configuration for the 2011 operational model
 - Higher resolution
 - Enhanced computational performance
 - Additional physics interoperability and testing of alternate physics configurations
- Enhanced diagnostic activities
 - EMC's HPLOT for forecast interrogation
 - Large scale comparison of model forecasts and observations/analyses