Transitioning Community Research Innovations into the Operational HWRF system: Successes and Lessons Learned

Kathryn Newman

National Center for Atmospheric Research/Research Applications Laboratory

Developmental Testbed Center

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HWRF community code contributors

DTC

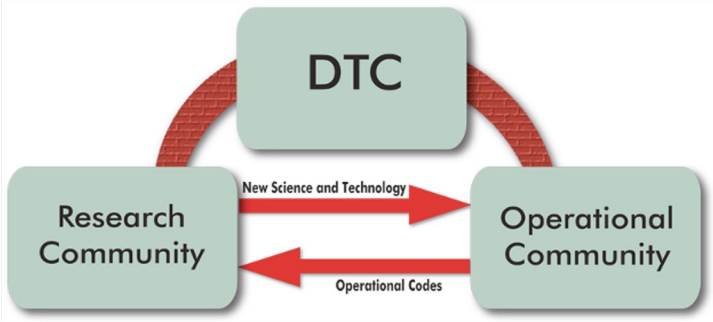
Shaowu Bao
Ligia Bernardet
Mrinal Biswas
Timothy Brown
Laurie Carson
James Frimel
Evelyn Grell
Christina Holt
Evan Kalina
Bill Kuo
Louisa Nance
Kathryn Newman
Linlin Pan
Donald Stark

NOAA/EMC
NOAA/HRD
NOAA/GFDL
HFIP
University of Rhode Island
AER
SUNY-Albany
UCLA
Purdue University
Coastal Carolina University
NCAR
OU

Overview of the DTC

DTC purpose:
Facilitate the interaction and transition of NWP technology between research & operations

The DTC is a collaborative facility between NCAR & NOAA/GSL



Strong partnerships with operational partners & model developers is critical

O2R: Support operational NWP systems to the **community**

R2O:

Partner with developers to get innovations into **centralized code**

Perform diagnostics and **T&E on promising NWP innovations** for possible operational implementation

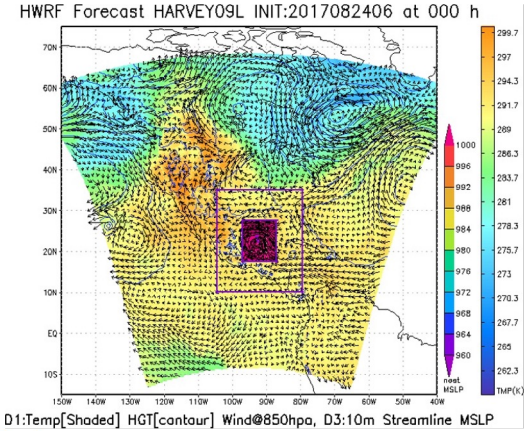
Interaction between R&O: Workshops, **visitor program**, newsletter

DTC activities funded by NOAA, Air Force, NSF, and NCAR

HWRF System Overview

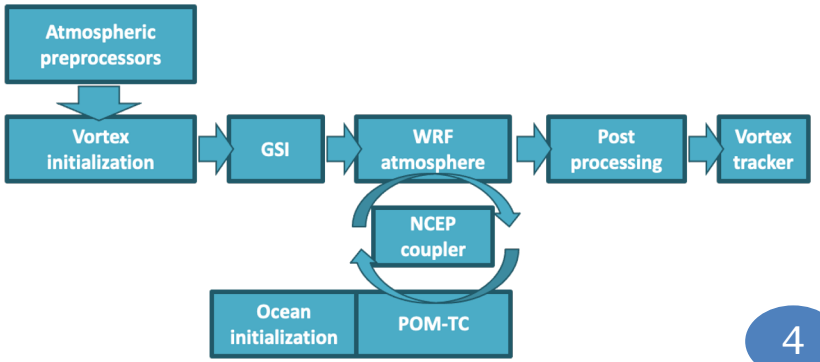
Operational HWRF

- NCEP operational hurricane model providing global tropical cyclone guidance to NHC.
  - WRF-NMM dynamical core
  - Triple nested vortex following domains
  - High resolution inner-core data assimilation
  - 2-way coupled with ocean, 1-way coupled with waves

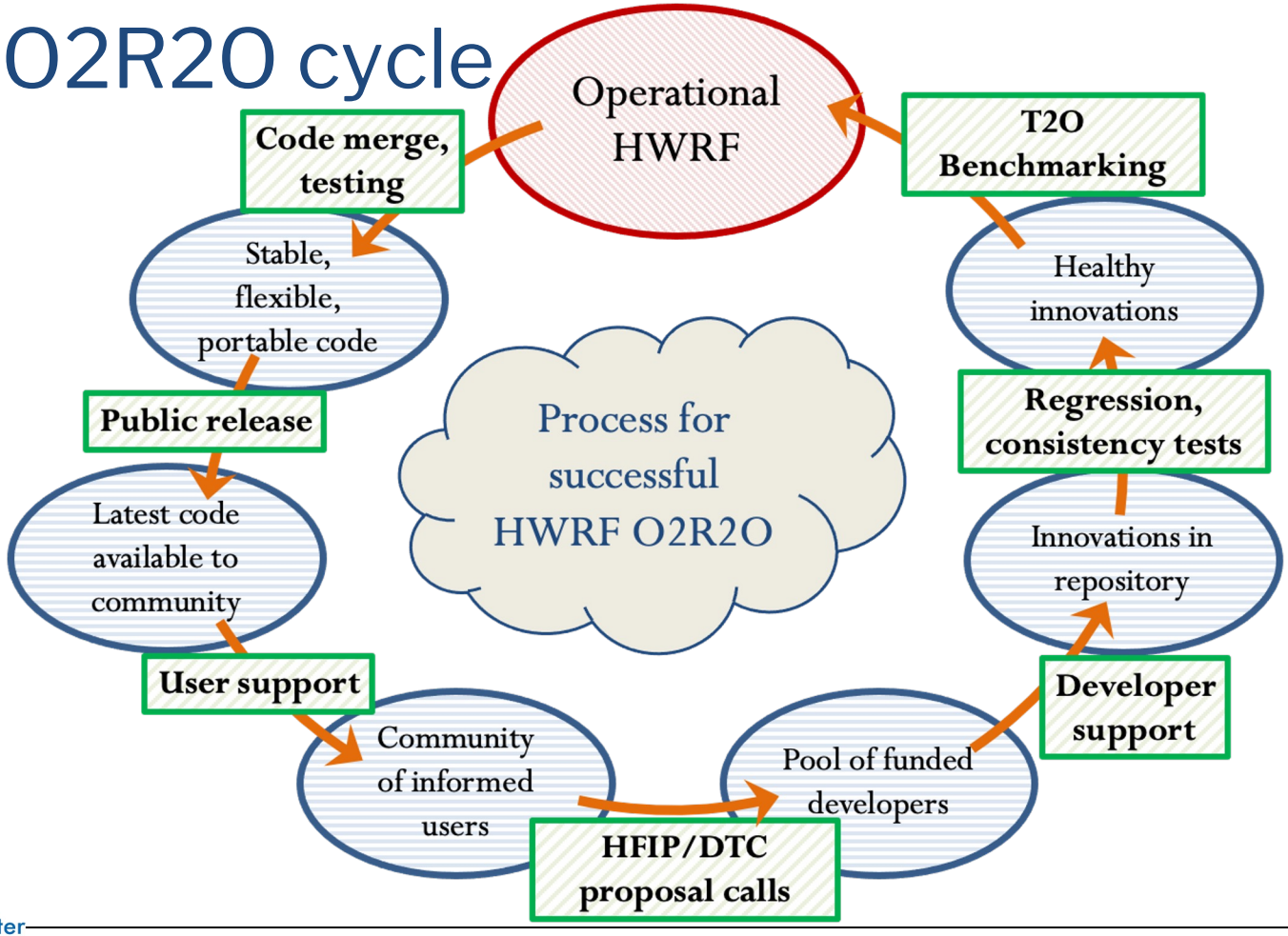


Community HWRF

- End-to-end coupled HWRF system fully supported to the community
- Repository access for developers enables access to latest code developments
- Public release provides stable version of code
  - Operational + research capabilities

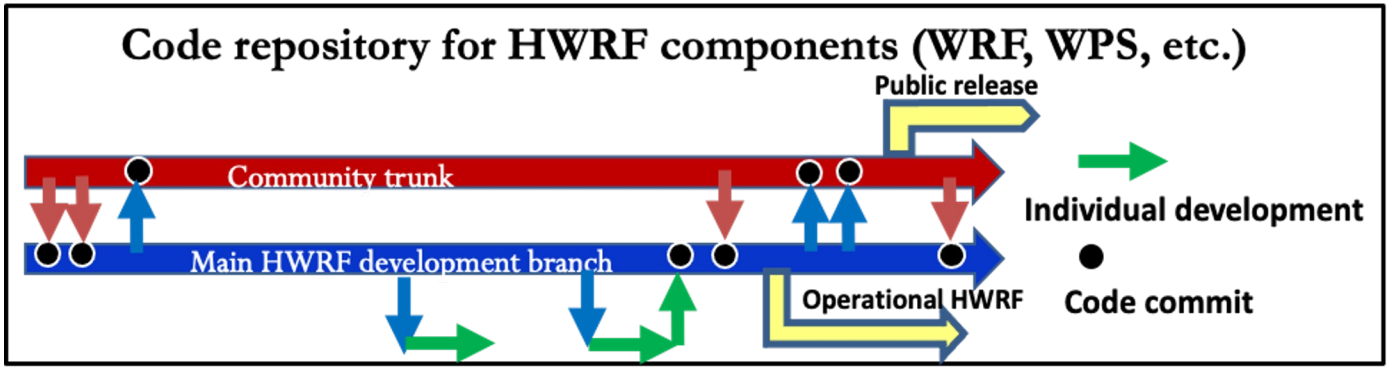


Annual O2R2O cycle



Centralized HWRF repository

- Mutually agreed upon code management plan
- Automated build system, end-to-end python scripts, tools for automation, source for components
- Fully supported unified scripts that run all components
- DTC support for integration of code into trunk
- Maintain integrity of code, avoid divergence



HWRF Community Support

- O2R enabled through HWRF public releases
  - Code download, datasets, documentation
  - Residential and online tutorials
  - Helpdesk/User forum

- R2O streamlined through developer support
  - DTC/EMC collaboration to provide support for HWRF developers/subject matter experts
  - Support for inter-developer communication
  - Training, assistance with developments, specialized helpdesk
  - Oversight of code integration
  - Communication and coordination through bi-weekly developer committee meetings

www.dtcenter.org/HurrWRF/users
www.dtcenter.org/HurrWRF/developers

DTC Visitor Program

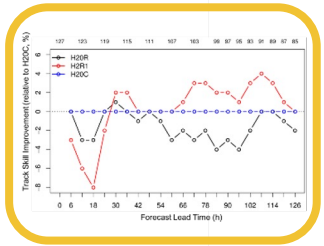
Providing support for visitors to work w/ the DTC to test new forecasting & verification techniques, models & model components for NWP

DTC Visitor Program supported research implemented into operational HWRF

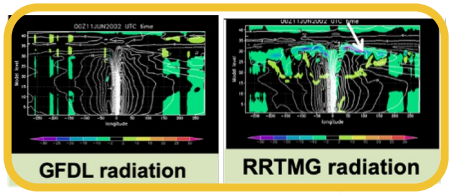
Innovation	Developer (Institution)	Year
Remove cap on air-sea fluxes in POM-TC	Richard Yablonsky (Univ. of Rhode Island)	2013
Replace GFDL radiation scheme with RRTMG Wind speed dependent adjustment to eddy viscosity	Robert Fovell (UCLA)	2015
Exponential cloud overlap in RRTMG Exponential random cloud overlap in RRTMG	Mike Iacono John Henderson (AER)	2018 2020

https://dtcenter.org/visitor-program/announcement-opportunity

HWRF R2O: bundled development and iterative testing



2020 HWRF implementation

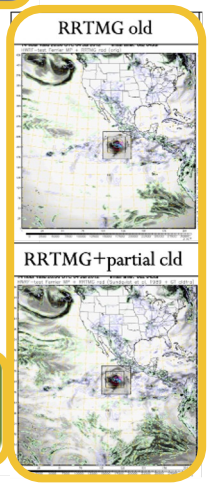


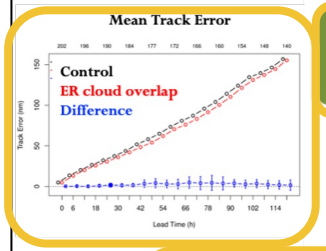
DTC evaluation

Visitors Fovell/Bu – UCLA
Identify shortcomings in HWRF radiation (GFDL)

Visitors Iacono/ Henderson – AER
Further develop cloud overlap method

DTC/EMC test RRTMG scheme



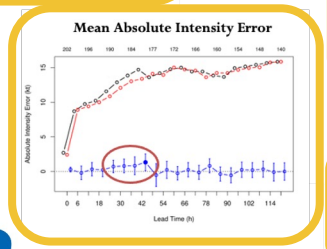


2018 HWRF implementation

DTC Evaluation

Forecast degradation

DTC develops and T&E partial cloudiness scheme



Visitors Iacono/Henderson - AER
Improve cloud overlap method

Environmental Modeling Center Evaluation

2015 HWRF implementation

2016 & 2017 HWRF implementation

Wrap-up

Lessons learned - keys to community HWRF success

1. Code accessibility and strong governance
2. Stable versions available to community (with available documentation, training, support) and specialized support available to developers
3. Dedicated funding to support R2O
4. Operational timeline well communicated for research innovations
5. Engagement of appropriate subject matter experts in an iterative process with sustained multi-year testing

Questions?

knewman@ucar.edu