Developmental Testbed Center: Engaging the community in operationally relevant research and development

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WRF Users Workshop 27 June - 1 July 2016
What is the DTC?

- **Purpose**: Facilitate the interaction & transition of NWP technology between research & operations
  - **O2R**: Support operational NWP systems to the community
  - **R2O**: Perform T&E on promising NWP innovations for possible operational implementation
- **Interaction between R & O**: Workshops, Visitor Program, Newsletter
- Jointly sponsored by NOAA, Air Force, NSF, & NCAR
Model Evaluation Group (MEG)

- Tasked with verifying and evaluating daily performance of EMC’s forecast/analysis systems from a synoptic and mesoscale perspective
- Weekly webinar: MEG, model developers, NCEP service centers, NWS regional and field offices, DTC staff, academic community and private sector
- Forum for EMC to reach out to forecast and user community

Interested in participating? Contact
Glenn White (Glenn.White@noaa.gov) or Geoff Manikin (Geoffrey.Manikin@noaa.gov)
Issues MEG is currently evaluating

- **Global Forecast System**
  - 2-m T, particularly the early evening cool bias
  - High low-level T<sub>d</sub>, maximized at 00 UTC
  - Light (convective) QPF in regimes supporting shallow (non-precipitating) convection
  - Difficulties generating and maintaining inversions
  - Difficulties forecasting MJO - tied to challenges in predicting ascent in the west equatorial Pacific

- **NMMB**
  - Generates spurious moist absolutely unstable layers
  - Ability to generate cold pools
  - Too much cloudiness

- **ARW**
  - Too little cloudiness

- **All NCEP models**
  - High T<sub>d</sub> & instability this spring in the upper midwest where soil is wet

- **Ensemble systems**
  - SREF: Clustering by dynamic core in the SREF
  - GEFS: Insufficient spread
Spike in low-level $T_d$ at 00 UTC
Examples of DTC engaging the research community

In the context of

- T&E feedback loop, including new/modified capabilities and diagnostic tools
- Facilitating diagnostic evaluation of operational models and advancing capability of MET
DTC’s role in HWRF development: connecting the pieces

Forecast improvement

2015 HWRF implementation

Cloud top cooling due to radiation

EMC tested partial cloudiness together with other innovations

GFDL radiation

RRTMG old

RRTMG+partial cld

RRTMG radiation

DTC/EMC tested RRTMG scheme

Forecast degradation

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DTC visitors: Otkin, Griffin, Rozoff – U of Wisconsin
HRRR evaluation using observed & simulated GOES IR brightness temperature

Standard grid-to-grid metrics

Object-based - MODE

Spin-up issue:
Too few high (cold) clouds - quickly transitions to too many high clouds

Neighborhood method – Fraction Skill Score

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DTC Focus Areas

Data Assimilation
• Lead: Hui Shao
• Software: GSI & EnKF
• T&E: 4D hybrid EnVar for HRRR

Regional Ensembles
• Lead: Isidora Jankov
• Software: ARW, NMMB, UPP
• T&E: Stochastic physics within HRRR ensemble

Hurricanes
• Lead: Kathryn Newman
• Software: HWRF, GFDL vortex tracker
• T&E: HWRF physics advancement

Global Model Test Bed
• Lead: Ligia Bernardet
• Software: Physics (IPD/CCPP)
• T&E: Physics Testbed, GFS physics advancement

Verification
• Lead: Tara Jensen
• Software: MET, MET-TC, METViewer
• T&E: Verification expertise for other focus areas

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Facilitating R2O using Mesoscale Model Evaluation Testbed (MMET)

Stage I: Proving ground for research community
Stage II: Extensive T&E by the DTC or community
Stage III: Pre-implementation testing at Operational Center

Hierarchical testing

GMTB/EMC Testing Hierarchy

- Parameterization Simulator
- Single Column Model
- Limited Area Domain
- LR/MR Global Reforecast/Forecast
- HR Global Forecast Mode
- LR/MR Global DA Mode
- Global Tuning Test
- LR Global Climate Mode
- LR Global Coupled Mode
- EMC Pre-Implementation
- NCO Pre-Implementation

Individual PPs
Many Interacting PPs
Detailed Phenomenological
Mechanical, Global PP
Interactions, First
Verification

EMC "Level 2"
Preliminary Testing

GMTB is developing a test harness (initial tiers) the research community can use for conducting tests of physical parameterizations.

Physical parameterizations that pass initial tests can be transferred to EMC for further testing.

LR/MR/HR=low/medium/high-resolution
DTC Visitor Program

- Supports visitors to work w/ the DTC to test new data assimilation, forecasting & verification techniques, models & model components for NWP
  - PI project – up to 2 months salary & travel & per diem
  - Graduate student project - up to 1 year temporary living per diem stipend & travel expenses for student to work w/ DTC &/or one of its partners + travel & per diem for up to 2 2-week visits to the location of the student by project PI
- Looking for subject-matter-experts to collaborate with DTC on T&E activities
- Welcome projects that add new capabilities to supported software
- Currently accepting proposals – funding is available!

http://www.dtccenter.org/visitors/