ISSUE 1

INSIDE THIS ISSUE

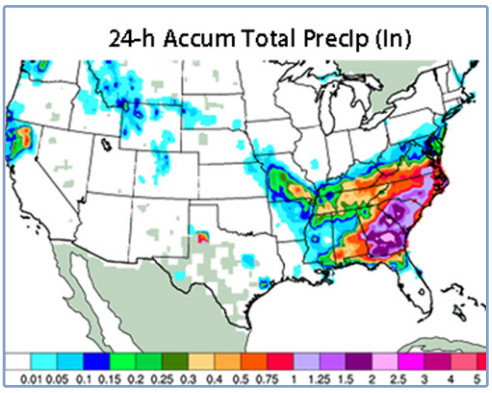
Transitions

Newsletter April 2013

ASSISTING WITH THE TRANSITION OF PROMISING NWP TECHNIQUES FROM RESEARCH TO OPERATIONS

Mesoscale Model Evaluation Testbed

The DTC provides a common framework for researchers to demonstrate the merits of new developments through the Mesoscale Model Evaluation Testbed (MMET).



Established in the Fall of 2012, MMET provides initialization and observation data sets for several case studies and week-long extended periods that can be used by the entire numerical weather prediction (NWP) community for testing and evaluation. The MMET data sets also include baseline results generated by the DTC for select operational configurations.

To date, MMET includes nine cases that are of interest for the National Centers for Environmental Prediction/Environmental Modeling Center (NCEP/EMC). A brief description of each case, along with access to the full data sets is available at ***http://www.dtcenter.org/eval/mmet***. Researchers are encouraged to run several case studies spanning multiple weather regimes to illustrate the versatility of this new innovation for operational use.

> "Researchers are encouraged to run several case studies to illustrate the versatility of the system."

One particular case available in MMET is 28 February 2009, when nearly 7 inches of snow fell in Memphis, TN. A squall line marched through the Southeast along the leading edge of a cold front, prompting three tornado and several high-wind reports. The next two days (1-2 March), snow fell from Atlanta to New York, dropping up to a foot of snow in some areas. The figure above shows the two day precipitation accumulation. This case is of interest to NCEP/EMC because the North American Mesoscale (NAM) model quantitative precipitation forecast valid 1 March shifted precipitation too far north,

Welcome

Dear Colleagues,

Welcome to the first issue of a quarterly newsletter for the Developmental Testbed Center (DTC). The research to operations (R2O) transition in numerical weather prediction (NWP) is a major challenge facing the U.S. meteorological community. It has been recognized that the U.S. has the largest community around the world working on weather research and numerical modeling. Yet, most of these research results do not directly benefit operational NWP. The DTC was established in 2003 with a mission to facilitate the transition of research innovations in regional modeling into operations.

An effective R2O process requires active participation of research and operational communities. With this quarterly newsletter, we hope to provide a forum for discussion of important issues facing the NWP community. We will also provide updates on DTC activities that are of interest to the community.

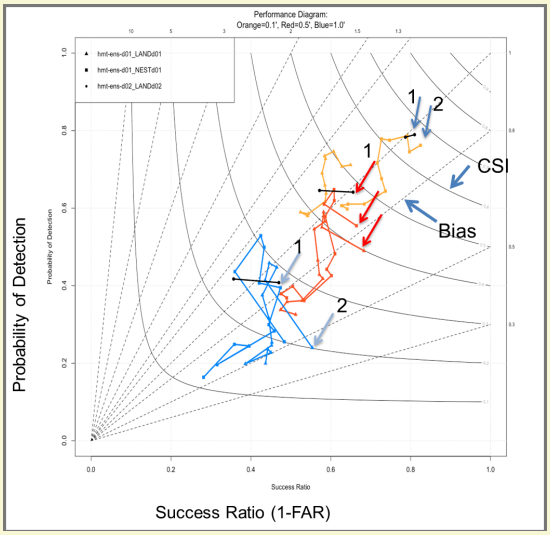
We welcome articles submitted for consideration for publication in upcoming issues.■

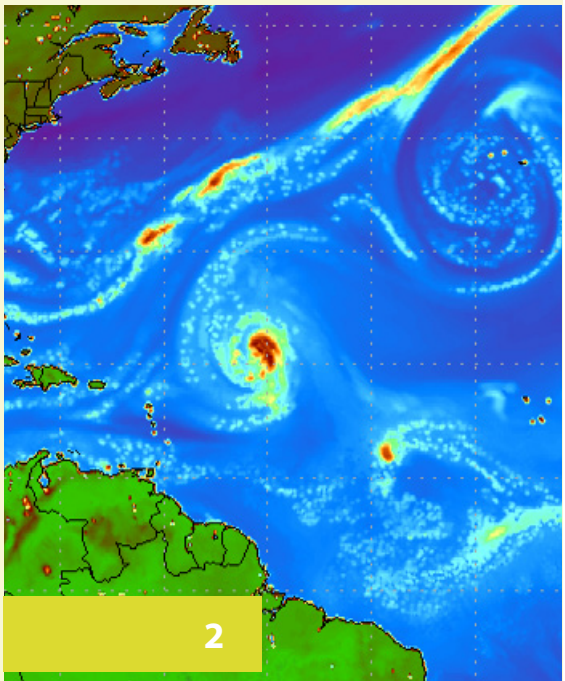
Bill Kuo
DTC Director

Did you know…

For several winter seasons, the DTC has worked with the Hydrometeorology Testbed (HMT) to develop effective verification techniques for ensemble forecasts of heavy winter precipitation associated with atmospheric rivers in California.

For example, the performance diagram below displays the impact of model resolution. See additional HMT information and links on the DTC website. See http://www.dtcenter.org/eval/hmt/2012/. ■





missing a rain/snow mix in Georgia and falsely predicting snow in western parts of the Carolinas.

If improved forecast accuracy is demonstrated through objective verification results with MMET cases, the technique can be submitted for further extensive testing by the DTC.

Community users can nominate innovations for more extensive DTC testing by filling out the nomination form (***http://www.dtcenter.org/eval/mmet/candidates/form_submission.php***).

As MMET continues to mature, additional cases will be made available to broaden the variety of available events in the collection. Submissions for additional cases to be included in MMET are accepted at: ***http://www.dtcenter.org/eval/mmet/cases/form_submission.php***. For more information on the testing protocol process defined to accelerate the transition of mesoscale modeling techniques from research to operations, please see ***http://www.dtcenter.org/eval/mmet/testing_protocol.pdf***.

Comments and questions regarding MMET or any stage of the testing protocol process can be directed to Jamie Wolff (*jwolff@ucar.edu*).

Contributed by J. Wolff, C. Phillips. ■

BRIDGES TO OPERATIONS

Innovation in HWRF 2013 Baseline

One of the regional numerical weather prediction models used operationally by the National Weather Service is the Hurricane WRF (HWRF), a coupled model with atmospheric and ocean components that exchange fluxes of short- and long-wave radiation, momentum, moisture, and heat. The momentum flux is particularly important because the strong winds in tropical cyclones cause turbulence and upwelling in the ocean, which can lead to transport of cold water from deep in the ocean towards the surface, reducing the storm's energy source and causing it to weaken.

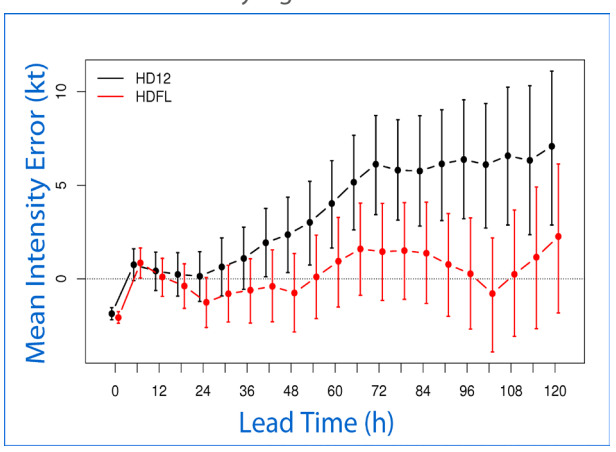
Comparison

A comparison between the ocean cooling in HWRF against observational buoy data, performed by the Hurricane Research Division of NOAA's Atlantic Oceanographic and Meteorological Laboratory, showed that the ocean surface cooling in HWRF is too small. The DTC worked with the NOAA Environmental Modeling Center and oceanographers from the University of Rhode Island to formulate a test in which the momentum flux in the ocean model was altered to be more physically consistent. The figure below shows the mean intensity error as a function of lead time for 2012. The black curve is the control and the red curve is the forecast with modified fluxes with 95% confidence intervals.

Results

Results aggregated over all 2012 Atlantic storms showed the more physical flux reduced the 5-kt positive intensity bias of the operational model to near-zero. This change has been incorporated by EMC into the 2013 HWRF baseline, and is expected to be adopted operationally for the 2013 hurricane season.

Contributed by Ligia Bernardet. ■



NEWS FROM THE DTC

Announcements and Publications

Six new members have been selected for the DTC Science Advisory Board (SAB) .

The new members are: **David Novak**, Chief of the Development and Training Branch of NOAA/NCEP's Weather Prediction Center (WPC). **S. G. Gopalakrishnan**, Meteorologist and Modeling Team Lead at the NOAA/ AOML/ Hurricane Research Division. **Carolyn A. Reynolds**, Head of the Global Modeling Section, Naval Research Laboratory, Monterey, CA. **Gary Lackmann**, Professor at the Dept. of Marine, Earth, and Atmospheric Sciences of North Carolina State University. **Evan Kuchera**, Team lead for Fine Scale and Ensemble Modeling at the Air Force Weather Agency (AFWA). **Robert J. Trapp**, Professor at the Dept. of Earth and Atmospheric Sciences of Purdue University.

The other members of the SAB are **Harold Brooks,** NSSL, **Shu-Hua Chen,** UC Davis, **Shuyi Chen,** U. of Miami, **Chris Davis,** NCAR/NESL, **Geoff DiMego,** NCEP/EMC, **Jenni Evans,** Penn State, **Josh Hacker,** Navy Postgrad School, **Mark Stoelinga,** 3Tier and **Jeff Whitaker,** NOAA/ESRL. ■

WORKSHOP ANNOUNCEMENT

The ***3rd Joint DTC-EMC-JCSDA Gridpoint Statistical Interpolation (GSI) Data Assimilation Sys Tutorial and 2nd GSI Workshop*** (week of August 5-9) will be held at the NCWCP, College Park, MD. See http://www.dtcenter.org/com-GSI/users/tutorials/2013.php ■

DTC PUBLICATIONS

Jamie Wolff, B. Ferrier, and C. Mass: Establishing Closer Collaboration to Improve Model Physics for Short Range Forecasts. BAMS, July 2012.

Edward Tollerud, et al.: The DTC Ensemble Task: A New Testing and Evaluation Facility for Mesoscale Ensembles, BAMS, March 2013 ■

Who's who

John Halley Gotway

If you've submitted a question to the MET help desk, or attended a MET tutorial, there's a very good chance that you already know John Halley Gotway. John joined NCAR's Research Applications Laboratory (RAL) as a software developer in 2004 and has been contributing to the verification efforts within RAL and the DTC. John's background is in mathematics.

He worked in Los Angeles at Northrop Grumman, before NCAR and the Rockies drew him to Colorado. His expertise is in numerical verification techniques. In particular, his fingerprint is on much of the internal workings of the MET code. He has also played several roles in applying MET to many testing and evaluation projects.

Outside of work, John's children, Otis (7), Robin (4), and Cate (1) keep him very busy. One thing you may not know is that besides computing expertise, John contributes directly to critical RAL protein intake by providing fresh eggs from his 'gentlemen's farm' near Longmont. Next time you call or email him with a C++ question, ask him how his chickens are doing. ■

COMMUNITY CONNECTION

Ensemble Design Workshop

In September 2012 , DTC cosponsored an Ensemble Design Workshop with the National Unified Operational Prediction Capability (NUOPC). Scott Sandgathe, UW Applied Physics Lab, teamed with DTC's Brian Etherton and Barb Brown to organize the workshop.

The workshop was very useful in that it started us down the path of treating ensembles as credible forecast systems that need to be evaluated and formulated in a controlled manner in order to provide the most benefit. I believe Lenny Smith's keynote speech provided an eye-opening expose of our incorrect assumptions about ensembles and challenged us to be more specific on our goals. There are several key observations from the workshop. First, almost all existing ensembles have been formulated based on legacy models and available computational resources. There have been few if any carefully formulated experiments to determine the optimal configuration for an operational ensemble or to establish a set of metrics for trading resolution, number of members, length of forecast, etc., given an operational framework. Second, as Lenny Smith and Jim Hansen pointed out, before you can evaluate ensemble performance, you must establish a target and assign a value to achieving that target. Besides establishing a target and assigning a value, it is clear we must also know when to stop, i.e., when the forecast is no longer useful.

Details of the workshop will be published in the BAMS Meeting Report section. The NUOPC Executive Steering Group gave the go ahead to hold a small meeting to formulate what that experimental framework would look like. There will be a joint Earth System Prediction Capability (ESPC)/ NUOPC workshop on ensembles at Scripps either the end of July or the first week of September.

> "If I had to capture a message from the workshop, it would be that we need to establish a clear experimental framework and targets for evaluating and formulating ensembles."
>
> —Scott Sandgathe

Contributed by S. Sandgathe. ■

OPPORTUNITIES

DTC and Our Community

There are several ways to connect with the DTC. Here are a few.

1 Meet us at an event

Winter-Spring 2013 events

AMS Annual Meeting (TX)	Jan 6-10
DTC Management Board Mtg (CO)	Jan 24-25
Joint WRF Tutorial (CO)	Jan 8-Feb 1
MET Tutorial (CO)	Feb 4-5
DTC Executive Committee Mtg (MD)	Feb 12
Interdepartment Hurricane Conf (MD)	Mar 5-7
NOAA Testbeds Workshop (MD)	April 2-4
HFIP Annual Meeting (FL) *tentative*	May 14-16
WRF Users Workshop (CO)	June 24-28

2 Ask a question

For this first issue, we address a question submitted by Gary Lackmann, NCSU. **Q:** What computing facilities are utilized by the DTC?

A: DTC projects utilize a variety of computing resources depending on the scale of the work. The NCAR and NOAA research supercomputing resources (NCAR: yellowstone; NOAA: jet, zeus) are used for large test cases and routine testing of NWP systems. In addition, the DTC maintains a small number of Linux servers which are used for data analysis, website hosting, etc.

3 Become part of the visitor program

The DTC Visitor Program supports visitors to work with the DTC to test new forecasting and verification techniques, models and model components for numerical weather prediction (NWP).

DTC Visitors and Projects awarded funding in 2013

Thomas Galarneau, NCAR: Diagnosing Tropical Cyclone Motion Forecast Errors in HWRF

Robert Fovell / Chu-Chun Huang, UCLA: Improving HWRF Track and Intensity Forecasts Via Model Physics Evaluation and Tuning

Man Zhang, CSU: Impact Assessment of Cloud-Affected AMSU-A Radiance Assimilation in TC Inner-Core Region using Hybrid Data Assimilation Approaches

Marion Mittermaier, UKMET: Incorporating Observations Uncertainty to a Spatial Probabilistic Verification Framework for km-scale Models

Adam Clark, U. Oklahoma: Object-based Time-Domain Diagnostics for High-resolution Ensemble Forecasting and Evaluation in NOAA/HWT Spring Forecasting Experiments

Q & A

Get Involved! *Help us identify and communicate information that we may not have thought of — ask a question about the DTC and its activities, a few of which we will provide answers to in this section.*

4 Visit the website

See ***www.dtcenter.org*** for news on the DTC. There you will find DTC-related AMS presentations, DTC Visitor Program, the DTC newsletter archive, DTC directory listing and more.

5 Submit an article for the Newsletter

Please contact ***dtc-editor@noaa.gov*** to send ideas for articles. We also welcome comments/reactions/questions about information in this newsletter at the same email address. ■

In the next issue

- *The 2013 Hurricane WRF Model*
- *Questions from our readers*
- *In depth article on a project within the DTC Visitor program*
- *More DTC news you can use*

Sponsors

DTC primary sponsors are the National Oceanic & Atmospheric Administration (NOAA), the Air Force Weather Agency (AFWA), the National Center for Atmospheric Research (NCAR), and the National Science Foundation.

The DTC is a distributed facility where the NWP community can test and evaluate new models and techniques for use in research and operations.

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