

**Monthly Report
of the WRF Program Coordinator
to
Executive Oversight Board**

April-May 2005

1. **WRF Development and Implementation:**

- **Next WRF operational implementations:**
 - (a) **NCEP – 30 June 2005:** Due to rapid advances in testing and evaluation of experimental high-resolution versions of WRF (by NCAR, NCEP, DTC, NSSL and SPC), NCEP has decided to implement two WRF cores in the operational **High-Resolution Window domains** without convective parameterizations at **5.2 km (WRF-NMM) and 5.8 km (WRF-ARW)**. Consequently, NCEP has cancelled plans to implement a six-member WRF ensemble system in these domains. Plans also are underway to make products from the two WRF models available on NCEP's public website.
 - (b) **AFWA – summer 2005: First operational implementation of WRF-ARW** in AFWA's classified domains remains on track.
- **NCEP** has announced it will add **six WRF-based ensemble members** to its 32-km operational multi-model Short Range Ensemble Forecast (**SREF**) system by 30 September 2005. Three new members will be based on the WRF-ARW and three on the WRF-NMM, bringing the total members to 21. SREF is scheduled to become based fully on WRF in FY07.
- **NCEP** remains on track for operational implementation of the **North American Mesoscale (NAM) WRF-NMM** in March 2006. The WRF-NMM forecast system with fully cycled GSI data assimilation began running over the North American domain in late May and will be evaluated over the coming year.
- **Infrastructure Development:** NCAR continues to introduce **upgrades** to top levels (driver and mediation layers) of the **WRF software infrastructure to conform to ESMF** "init/run/finalize" calling interface protocols for coupled applications. NCAR/MMM has also written a **white paper** describing its proposed approach to make the current advanced software framework conformable to ESMF. WRF Working Group 2 (Software Architecture, Standards and Implementation) is expected to review and advise on WRF-ESMF integration plans.
- **ESMF testing and evaluation:** NRL has built an ESMF conformable driver and coupler to run its NOGAPS global model with the POP ocean model. The ESMF-based system runs with ~2% computational overhead and no discernible impact

on scalability. About ¼ FTE was required to recode and perform this test. A similar test of ESMF is being performed by NRL for COAMPS, which will be coupled to the NCOM ocean model. Meanwhile NCEP continues work that will establish an ESMF driver to run its GFS (Global Forecast System).

- **Automated vortex tracking:** NCAR has added to WRF an algorithm developed by U. Miami for automatically tracking the central vortex of a tropical cyclone. This algorithm is used in WRF to allow a moveable nested grid to follow hurricanes, even when they behave erratically.
- **Grid nesting for WRF-NMM:** NCEP has completed development of **moveable one-way nested-grid version of WRF-NMM**, with help from NCAR. The nested WRF-NMM will undergo testing and evaluation during the 2005 hurricane season, forming the developmental basis for the NCEP Hurricane WRF, expected to become operational in 2007. Two-way interfaces for the moveable nested WRF-NMM are expected to be ready before the end of 2005.
- **Data Assimilation:** Dr. John LeMashall, director of Joint Center for Satellite Data Assimilation (JCSDA), visited NCAR in March to discuss closer collaboration between NCAR and the JCSDA on data assimilation development. Beginning with adoption of the same radiative transfer scheme, the two groups agreed to expand collaborations over the coming years.
- **WRF High-Resolution Spring Forecast Experiment:** SPC and NSSL are running the 2005 Spring Forecast Experiment (late April-early June), based on high-resolution versions of the WRF-ARW and WRF-NMM. NCAR is running the ARW at 4-km and NCEP is running the NMM at 4.5-km, both over ~80% of the CONUS. Pittsburgh Supercomputing Center is providing resources for U.OK to run a 2-km version of ARW. The 2005 Spring Exp. builds on BAMEX ('03) and the 2004 Spring Exp., and is aimed at evaluating models applied without convective parameterizations. Strong participation by operational forecasters and model developers in a realistic real-time environment contributes to making this an excellent training and evaluation opportunity.

2. WRF Management

- At its April 13, 2005, meeting the WRF Executive Oversight Board approved Army Research Lab to become a new member. Modifications of the WRF Agreement in Principle to accommodate ARL's membership were adopted and are being forwarded for signatures.
- The next meeting of the WRF Executive Oversight Board is scheduled for August 11, 2005, at AFWA.

- FNMOC, NRL, NCAR and NCEP have begun discussions that will establish protocols for planning the merger of WRF and ESMF software frameworks. Other WRF partners will be entrained into the discussions as soon as possible. Managers of model development teams and user groups will collaborate to write a charge to guide technical people in designing the infrastructure merger. A WRF-ESMF integration workshop is being planned (probably in September 2005) to bring together technical experts to begin the process of deciding to what extent and how the WRF infrastructure should take advantage of ESMF functionality.

3. WRF and DTC – OTC

- The **DTC Winter Forecast Experiment (DWFE)** ended March 31, 2005. DTC personnel have continued to analyze results of the experiment. Two verification systems are currently used at DTC: the FSL Real Time Verification System (RTVS) and the NCEP QPF Verification System. These two systems use different approaches to precipitation verification (grid-to-grid for the NCEP system and grid-to-point for the RTVS), so exact agreement between the two is not expected. However, work during the last two months has established that the RTVS and NCEP precipitation verification systems provide results that are very consistent with each other. Full DWFE verification results for both systems are nearing completion. Dr. Steven Koch will review these results with NCEP before they are widely disseminated.
- **DTC Visitor Program:** An original **Announcement of Opportunity (AO)** was sent in mid-February inviting the WRF community to participate in the DTC visitor program and eight responses were received. Since this response was lower than expected, another AO was released in mid-April and 24 new submissions were received for this second round. The first round proposals were evaluated by an ad hoc review committee (Geoff DiMego, Naomi Surgi, Jerry Wegiel, Chris Davis, Rich Hodur, John Brown) since the DTC Advisory Board had not yet been constituted. The committee recommended three of the original 8 proposals be accepted (Bill Gallus from Iowa State, Paul Roebber, U WISCM, and Hsiao-Ming Hsu, NCAR). The same ad hoc committee will review and make decisions on the second-round proposals by early June.
- The WRF-SI for NMM, WRF-Real for NMM, and WRF-NMMv2 have been compiled and run on the NCAR IBM bluesky computer and on a linux PC at DTC. User documentation for setting up and running WRF-NMMv2 are being developed. These are necessary steps expected to lead to formal **release of WRF-NMMv2** for community use by summer.
- Activities are well underway to prepare the first DTC **tutorial on the WRF-NMM core** for new users, currently scheduled for August 23-25, 2005. A decision will be made on June 15, 2005 to determine whether DTC has made sufficient progress in the tutorial preparations to ensure that date can be met. If

so, an announcement of the tutorial will be released on or about June 15, 2005. Progress on preparing documentation and porting the model to run on various platforms suggests we are on track for the August dates. NCEP and COMET have collaborated with DTC to develop the tutorial and documentation.

- The **DTC Terms of Reference** was approved by the WRF ExOB in April and has been forwarded to agency administrators for final signatures.
- The **DTC Advisory Board** has been nominated and approved.

4. **WRF and COPC**

- The COPC Directors met on 28 March 2005 and requested that the draft of a **WRF Joint Implementation Plan** for operations be expanded to include a plan for developing, testing and implementing a joint ensemble system within 5 years.
- The COPC Directors are preparing memos that will be provided to the WRF ExOB, stating their commitment to a WRF framework that is compatible with the broader global approach of ESMF, is compatible with community global and regional prediction systems and supports the construction of efficient multi-model ensemble forecast systems. The Directors also desire to articulate the need for a common modeling infrastructure that cuts across all models (atmosphere, ocean, land, cryosphere).