Demonstrating the utility of the Mesoscale Model Evaluation Testbed (MMET) in a research environment

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Motivation: The Mesoscale Model Evaluation Testbed (MMET) was established by the Developmental Testbed Center (DTC) to assist the research community in efficiently demonstrating the merits of a new technique by providing datasets to utilize for testing in a common framework in order to effectively transition promising new advances into operations.

MMET & DTC Baseline Testing

- MMET is hosted by the DTC, with data served through Repository for Archiving, Managing and Accessing Diverse Data (RAMADDa)
- The DTC provides the user community with:
  - Model input and observational datasets for testing
  - Baseline results established by the DTC for select Operational Configurations (OCs), allowing for direct comparisons between new innovations and OCs
  - Scripts to assist with post-processing, graphics generation, and model evaluation
- For further information on the testing protocol, case descriptions, access to RAMADDa or to nominate additional cases of interest to be included in MMET, please visit: http://www.dtcenter.org/eval/mmet

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User Case #1: 28 Apr – 4 May 2010 Flooding in TN Submitted by Pedro Jimenez & Jimy Dudhia

**Case Details**
- Forecasts: All simulations: 15-km grid length
  1. WRF v3.4 ARW baseline configuration namelist from DTC (MMET Baseline Configuration)
  2. WRF v3.4 ARW namelist w/ topo wind=1 activated
- Model Initialization: Utilized IC/BC files from DTC

**Verification**
- Wind Speed 6-day Average Error

**Case Summary**
- Overall 6-day domain average with topo wind=1 smaller than default
- Reduces diurnal mean bias but does not capture full diurnal amplitude
- **Future work:** reduce the effect of topo wind=1 in daytime convective planetary boundary layer

User Case #2: 17 Dec 2009 “Snowpocalypse” Submitted by Gary Lackmann

**Case Details**
- Forecasts: All simulations: 15-km grid length
  1. WRF v3.4 ARW baseline configuration namelist from DTC (MMET Baseline Configuration w/ WSM5 microphysics)
  2. WRF v3.4 ARW namelist w/ Milbrandt-Yau microphysics
- Model Initialization: 12 UTC 17 Dec, utilized IC/BC files from DTC

**48-h WRF Forecast**
- 1. MMET Baseline - WSM5
- 2. Milbrandt-Yau

**72-h Total Precip Accumulation**
- 1. MMET Baseline - WSM5
- 3. Milbrandt-Yau

**Case Summary**
- Both forecasts captured main features
  - Axis of precipitation over coastal Carolinas and VA
  - Precipitation minimum over FL
  - Significant over-prediction over NC, SC, and VA and issues with cessation of precipitation
- **Future work:** perform verification of simulations with MET

User Case #3: 1 – 3 May 2010 Flooding in TN Submitted by Kelly Mahoney

**Case Details**
- Forecasts: Simulations #1-3: 15-km grid length; Simulation #4: 4-km grid length
  1. WRF v3.5 ARW baseline configuration namelist from DTC (MMET Baseline Configuration w/ WSM5)
  2. WRF v3.4 ARW namelist w/ Thompson microphysics
  3. WRF v3.5 ARW namelist w/ Thompson MP and no CP scheme
  4. WRF v3.5 ARW namelist w/ #3 physics and 4-km/1.3-km grid length
- Model Initialization: Utilized IC/BC files from DTC for simulations #1–3, NAM 00 UTC 20100501 forecast from DTC to produce IC/BCs for #4

**48-h Total Precip Accumulation**
- 1. MMET Baseline
- 2. Thompson MP
- 3. Thompson MP + no CP

**Case Summary**
- Strong synoptic-scale dynamical forcing; all simulations generate precipitation maxima > 150 mm in 48-h period
- Significant over-forecast of precip found in LA and TN in all runs; timing error vs. location error? Need longer simulation to test
- KF CP scheme generates NW-SE-oriented precip banding not seen in explicit convection (no CP) runs
- Increased horizontal resolution increases precipitation maxima
- Relative to less strongly-forced cases (e.g., Atlanta, GA Sept 2009 flooding) sensitivity to model resolution, physics is reduced
- **Future work:** perform verification of simulations with MET; couple forecast output files to WRF-Wydro and compare to observed streamflow; compare to sensitivity tests altering model topography and upstream moisture.

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