

Investigating Warm Season Rainfall Using Convective Parameterization Schemes in the Workstation Eta Model

Michael J. Bodner
 NOAA/NWS/NCEP/Hydrometeorological Prediction Center
 Camp Springs, Maryland
 Email mike.bodner@noaa.gov

Faye E. Barthold
 Department of Earth and Atmospheric Sciences
 Cornell University
 Ithaca, New York

Patrick H. Wilson
 Department of Earth and Atmospheric Sciences
 The University of Albany
 State University of New York
 Albany, New York

Hypothesis

Since the Kain-Fritsch convective parameterization scheme has a better CAPE closure function than other convective schemes, and does not depend upon horizontal displacements and advection, it will show more skill in generating convection and its QPF by-product in warm sector environments than the Betts-Miller-Janjic scheme.

Experiment

- Workstation ETA model run in parallel using both the Kain-Fritsch and Betts-Miller-Janjic convective schemes for the CONUS and South America

- 24 hour QPF values were compared with 24 hour observed rainfall

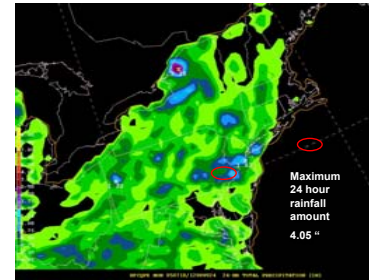
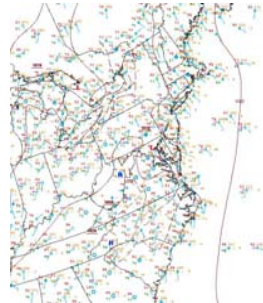
Workstation ETA

- Initialized using the GFS
- 50km grid over the CONUS
- 32km grid over South America
- 45 vertical levels

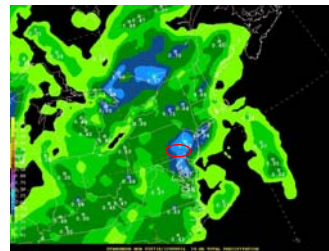
Methodology

- Rainfall events from May through July (November through January) were classified as warm sector, cold sector, or frontal
- The 36 hour forecast from each model run was compared with both QPE and observed rainfall data
- Over the CONUS, events with over 3 inches of rain were chosen based on 12Z observed rainfall data (20 events in 2004, 17 in 2005)
- Over South America, 12 events with over 2 inches of rain were chosen from the 12Z synoptic charts (2005 only)
- Spatial errors were determined using the distance tool in NMAP
 - CONUS spatial error was found by comparing RFC QPE data to QPF output from the model
 - South America spatial error was found by comparing the estimated location of the rainfall from the synoptic charts to QPF output from the model
- Shape and synoptic orientation of the convection were not accounted for

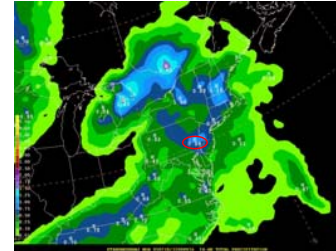
Sample Cases



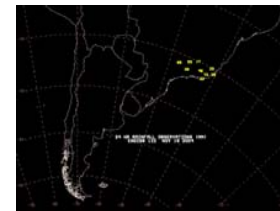
Eastern Pennsylvania/New Jersey - Heavy rainfall 18 July 2005



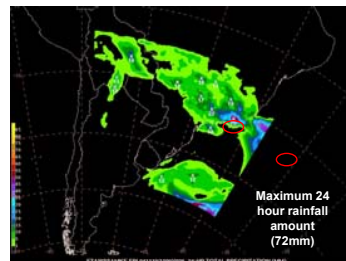
KF
24 HR
QPF



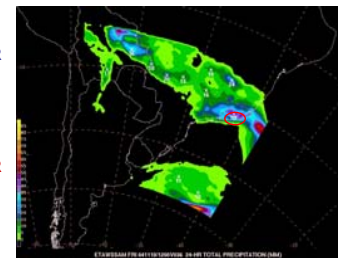
←
BMJ
24 HR
QPF
→



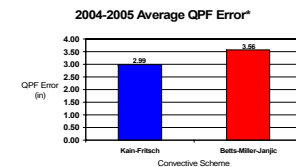
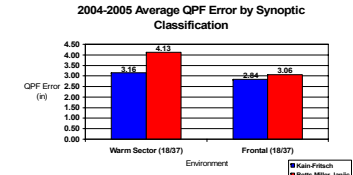
South America Case - 19 November 2004



KF
24 HR
QPF



←
BMJ
24 HR
QPF
→



Conclusions

- QPF output from the Kain-Fritsch runs depicts slightly more skill than the Betts-Miller-Janjic runs in the warm sector environment
- Little to no discernable difference was found with convection immediately along frontal boundaries
- Betts-Miller-Janjic QPF output may indicate more skill on the cold side of fronts, but more cases need to be studied
- Similar results were found for South America, but more cases need to be evaluated
- Similar results were found in both the 2004 and 2005 warm seasons in spite of different climate regimes

References

- Kain, J.S., and J.M. Fritsch, 1993: Convective parameterization for mesoscale models: The Kain-Fritsch scheme. *The Representation of Cumulus Convection in Numerical Models*. Meteor. Monogr., No. 46, Amer. Meteor. Soc., 165-170.
- Wang, W., and N.L. Seaman, 1997: A comparison of convective parameterization schemes in a meso-scale model. *Mon. Wea. Rev.*, 125, 252-278.