STANLEY G. BENJAMIN - Curriculum Vitae - January 2011

EDUCATION

Ph.D. Meteorology (1983),
The Pennsylvania State University, University Park, Pennsylvania
M.S. Meteorology (1980),
The Pennsylvania State University, University Park, Pennsylvania
B.A. Mathematics (1973),
Albion College, Albion, Michigan

EXPERIENCE:

Current position

- Chief, Assimilation and Modeling Branch (AMB), Global Systems Division, NOAA Earth Systems Research Laboratory, Boulder, Colorado
    - AMB is the development group for RUC (Rapid Update Cycle), Rapid Refresh, and HRRR (High-Resolution Rapid Refresh) regional models, and the FIM global model. All of these models are currently or planned to be operational models at NOAA/NWS/NCEP.
    - Various Branch Chief positions (5/92-present) and Research Meteorologist (4/90-present)

- Directing development of the global icosahedral isentropic atmospheric model (FIM – *Flow-following finite-volume Icosahedral Model*) at NOAA, 2005-present.
- Lead for Global Modeling Team for the NOAA HFIP (*Hurricane Forecast Improvement Project*)
- Directed development of the RUC, an operational data assimilation/numerical forecast system running at the NWS National Centers for Environmental Prediction (NCEP) that provides analyses and short-range forecasts at high frequency (every 1h) using asynoptic observations.
- Developed, with other scientists, objective analysis techniques and numerical prediction models for use in RUC, including radar assimilation technique implemented at NCEP (Nov 2008). Performed research on data assimilation methods (3DVAR and optimal interpolation) for in situ and remotely sense observations, model numerics and parameterizations. Directed projects on RUC applications for aviation, severe weather forecasting, regional climate simulations and land-surface modeling, wind energy forecasting.
- Co-directing development of HRRR model (3km *High-Resolution Rapid Refresh*, updated hourly with radar reflectivity assimilation over US)
- Directing development of WRF-based Rapid Refresh planned to replace RUC in 2011.
- Research scientist (6/83-4/90) employed by: National Center for Atmospheric Research, Boulder, Colorado working at NOAA, Boulder, CO (formerly PROFS). Performed research on the effects of terrain and soil

moisture distribution on short-range forecasts of the regional environment for severe convective storms using the Penn State/NCAR mesoscale model. Studied impact of terrain on local circulations using same model. Developed multivariate optimal interpolation schemes in isobaric and isentropic coordinates for use in earlier versions of MAPS (development version of RUC), and implemented first versions of MAPS intermittent data assimilation system.

AREAS OF INTEREST:

- Atmospheric model development, data assimilation development, observation impact experiments with NWP, applications of NWP to aviation, energy, and severe storm applications; use of isentropic and other quasi-Lagrangian coordinate systems, use of NWP to investigate atmospheric phenomena.

OTHER POSITIONS, HONORS:

- Fellow - American Meteorological Society (2004)
- U.S. Department of Commerce Bronze Medals: 1998, 2010
- U.S. Department of Commerce Gold Medal: 2006
- NOAA Research Paper of Year Awards, lead author – 2006, 1st co-author – 2008
- Lead for FAA Model Development and Enhancement Research Team (2006-present).
- Member of FAA Aviation Weather Forecasting Task Force, 1985-1987

REFEREED PUBLICATIONS:

1. Bleck, R., S. Benjamin, J.-L. Lee, A.E. MacDonald; **2010**: On the use of an adaptive, hybrid-isentropic vertical coordinate in global atmospheric modeling. *Mon. Wea. Rev.*, **138**, 2188-2210.

2. Benjamin, S.G., B.D. Jamison, W.R. Moninger, S. R. Sahm, B. Schwartz, T.W. Schlatter, **2010**: Relative short-range forecast impact from aircraft, profiler, radiosonde, VAD, GPS-PW, METAR, and mesonet sbservations via the RUC hourly assimilation cycle. *Mon. Wea. Rev.*, **138**, 1319-1343.

3. Moninger, W.R., S.G. Benjamin, B.D. Jamison, T.W. Schlatter, T.L. Smith, and E.J. Szoke, **2010**: Evaluation of regional aircraft observations using TAMDAR. *Wea. Forecasting*, **25**, 647-655.

4. Pondeca, M.S.F.V. de , G.S. Manikin, G. DiMego, S.G. Benjamin, D.F. Parrish, R.J. Purser, W.-S. Wu, J. Horel, Y. Lin, R.M. Aune, D. Keyser, L. Anderson, B. Colman, G. Mann, and J. Vavra, **2010**: The Real-Time Mesoscale Analysis at NOAA's National Centers for Environmental Prediction: Current Status and Development. Submitted to *Wea. Forecasting*

5. Stensrud, D., M. Xue, L. Wicker, K. Kelleher, M. Foster, J. Schaefer, R. Schneider, S. Benjamin, S. Weygandt, J. Ferree, J. Tuell, 2009: Convective-scale Warn-on-Forecast: A Vision for 2020. *Bull. Amer. Meteor. Soc.,* 90, 1487-1499. doi: 10.1175/2009BAMS2795.1

6. Smith, T.L., S.G. Benjamin, S.I. Gutman, and S. Sahm, **2007**: Short-range forecast impact from assimilation of GPS-IPW observations into the Rapid Update Cycle. *Mon. Wea. Rev.*, **135**, 2914-2930. (NOAA Research Paper of Year Award – 2008)
7. Lu, C., H. Yuan, B.E. Schwartz, and S.G. Benjamin, **2007**, Short-range numerical weather prediction using time-lagged ensembles, *Wea. Forecasting,* 22, 580-595.

8. Stensrud, D.J., N. Yussouf, M.E. Baldwin, J.T. McQueen, J. Du, B. Zhou, B. Ferrier, G. Manikin, F.M. Ralph, J.M. Wilczak, A.B. White, I. Djalalova, J. Bao, R. Zamora, S. Benjamin, P.A. Miller, T.L. Smith, T. Smirnova, M. F. Barth, **2006**: The New England High-Resolution Temperature Program. *Bull. Amer. Meteor. Soc.*, **87**, 491-498.

9. Benjamin, S.G., D. Devenyi, S.S. Weygandt, K.J. Brundage, J.M. Brown, G. Grell, D. Kim, B.E. Schwartz, T.G. Smirnova, T.L. Smith, G.S. Manikin, **2004**: An hourly assimilation/forecast cycle: the RUC. *Mon. Wea. Rev.,* **132**, 495-518. (NOAA Research Paper of Year Award – 2006).

10. Benjamin, S.G., G.A. Grell, J.M. Brown, T.G. Smirnova, and R. Bleck,

2004: Mesoscale weather prediction with the RUC hybrid isentropic/terrain-following coordinate model. *Mon. Wea. Rev.*, **132**, 473-494.

11. Benjamin, S.G., B.E. Schwartz, E.J. Szoke, and S.E. Koch, **2004**: The value of wind profiler data in U.S. weather forecasting. *Bull. Amer. Meteor. Soc.*, **85**, 1871-1886.

12. Benjamin, S.G., B.E. Schwartz, E.J. Szoke, and S.E. Koch, **2004**: The value of wind profiler data in U.S. weather forecasting. Case studies. (online supplement). *Bull. Amer. Meteor. Soc.*, **85**, E21-E29.

13. Devenyi, D., and S.G. Benjamin, **2003**: A 3-dimensional atmospheric variational assimilation technique in a hybrid isentropic-sigma coordinate. Meteor. and Atmospheric Physics , **82**, 245-257.

14. Gutman, S.I. and S.G. Benjamin, **2001**: The role of ground-based GPS meteorological observations in numerical weather prediction. *GPS Solutions,* **4**, 16-24.

15. Schwartz, B.E., S.G. Benjamin, S.M. Green, and M.R. Jardin, **2000**: Accuracy of RUC-1 and RUC-2 wind and aircraft trajectory forecasts by comparison with ACARS observations. *Wea. Forecasting*, **15**, 313-326.

16. Smirnova, T.G., J.M. Brown, S.G. Benjamin, and D. Kim, **2000**: Parameterization of cold-season processes in the MAPS land-surface scheme. *J. Geophys. Res.*, **105, D3,** 4077-4086.

17. Smith, T.L., S.G. Benjamin, B.E. Schwartz, and S.I. Gutman, **2000**: Using GPS-IPW in a 4-D data assimilation system. *Earth, Planets, and Space,* **52**, 951-956.

18. Berbery, E.H., K. Mitchell, S. Benjamin, T. Smirnova, H. Ritchie, R. Hogue, and E. Radeva, **1999**: Assessment of land-surface energy budgets from regional and global models. *J. Geophys. Res.*, **104,** , 19329-19348.

19. Benjamin, S.G., B.E. Schwartz, and R.E. Cole, **1999**: Accuracy of ACARS wind and temperature observations determined by collocation. *Wea. Forecasting,* **14**,1032-1038.

20. Smirnova, T.G., J.M. Brown, and S.G. Benjamin, **1997**: Performance of different soil model configurations in simulating ground surface temperature and surface fluxes. *Mon. Wea. Rev.*, **125**, 1870-1884.

21. Westphal, D.L., S. Kinne, J.M. Alvarez, P. Minnis, D.F. Young, S.G. Benjamin, W.L. Eberhard, R.A. Kropfli, S.Y. Matrosov, J.B. Snider, T.A.

Uttal, A.J. Heymsfield, G.G. Mace, S.H. Melfi, D.O`C. Starr, and J.J. Soden, **1996**: Initialization and validation of a simulation of cirrus using FIRE-II data. *J. Atmos. Sci.*, **53**, 3397-3429.

22. Schwartz, B., and S. G. Benjamin, **1995**: A comparison of temperature and wind measurements from ACARS-equipped aircraft and rawinsondes. *Wea. Forecasting*, **11**, 528-544.

23. Pan, Z.-T., S. G. Benjamin, J. M. Brown, and T. G. Smirnova, **1994**: Comparative experiments with MAPS on different parameterization schemes for surface moisture flux and boundary-layer processes. *Mon. Wea. Rev.*, **122**, 449-470.

24. Schlatter, T. W., and S. G. Benjamin, **1994**: A mesoscale data assimilation system adapted for trajectory calculations over Alaska. U.S. Geological Survey Bulletin, **2047**, 269-276.

25. Bleck, R., and S. G. Benjamin, **1993**: Regional weather prediction with a model combining terrain-following and isentropic coordinates. Part I: model description. *Mon. Wea. Rev.*,**121**, 1770-1785.

26. Benjamin, S. G., T. L. Smith, P. A. Miller, D. Kim, T. W. Schlatter, D. Dévényi, J.-M. Carrière, R. Bleck, **1993**: Recent developments in the MAPS isentropic-sigma data assimilation system. *Időjárás*, **97**, 1-19.

27. Smith, T. L., and S. G. Benjamin, **1993**: Impact of network profiler data on a 3-h data assimilation system. *Bull. Amer. Meteor. Soc.*, **74**, 801-807.

28. Miller, P.A., and S.G. Benjamin, **1992**: A system for the hourly assimilation of surface observations in mountainous and flat terrain. *Mon. Wea. Rev.*, **120**, 2342-2359.
29. Benjamin, S. G., K. A. Brewster, R. L. Brummer, B. F. Jewett, T. W. Schlatter, T. L. Smith, and P. A. Stamus, **1991**: An isentropic three-hourly data assimilation system using ACARS aircraft observations. *Mon. Wea. Rev.*, **119**, 888-906.
30. Benjamin, S. G., and P. A. Miller, **1990**: An alternate sea-level pressure reduction and a statistical comparison of surface geostrophic wind estimates with observed winds. *Mon. Wea. Rev.*, **118**, 2099-2116.
31. Benjamin, S. G., **1989**: An isentropic meso-alpha scale analysis system and its sensitivity to aircraft and surface observations. *Mon. Wea. Rev.*, **117**, 1586-1603.
32. Benjamin, S., **1987**: Family stormchasing. *StormTrack.*
33. Benjamin, S. G. and T. N. Carlson, **1986**: Some effects of surface heating and topography in the regional severe storm environment. Part I: three-dimensional simulations. *Mon. Wea. Rev.*, **114**, 307-329.
34. Benjamin, S. G., **1986**: Some effects of surface heating and topography

on the regional severe storm environment. Part II: two-dimensional idealized experiments. *Mon. Wea. Rev.*, **114**, 330-343.

35. Benjamin, S. G. and N. L. Seaman, **1985**: A simple scheme for objective analysis in curved flow. *Mon. Wea. Rev.*, **113**, 1184-1198.
36. Carlson, T. N., S. G. Benjamin, G. S. Forbes and Y.-F. Li, **1983**: Elevated mixed layers in the regional severe storm environment: Conceptual model and case studies. *Mon. Wea. Rev.*, **111**, 1453-1473.
37. Anthes, R. A. Y.-H. Kuo, S. G. Benjamin and Y.-F. Li, **1982**: The evolution of the mesoscale environment of severe local storms: preliminary modeling results. *Mon. Wea. Rev.*, **110**, 1187-1213.
38. Carlson, T. N., J. K. Dodd, S. G. Benjamin and J. N. Cooper, **1981**: Satellite estimation of the surface energy balance, moisture availability and thermal inertia. *J. Appl. Meteor.*, **20**, 67-87.
39. Carlson, T. N. and S. G. Benjamin, **1980**: Radiative heating rates for Saharan dust. *J. Atmos. Sci.*, **37**, 193-213.
40. Carlson, T. N., R. A. Anthes, M. Schwartz, S. G. Benjamin and D. G. Baldwin, **1980**: Analysis and prediction of severe storms environment. *Bull. Amer. Meteor. Soc.*, **61**, 1018-1032.

DISSERTATIONS AND THESES

1. Benjamin, S. G., 1983: Some effects of surface heating and topography in the regional severe storm environment. Ph.D. dissertation, the Pennsylvania State University, 265 pp.
2. Benjamin, S. G., 1980: Radiative effects of Saharan dust. M.S. thesis, the Pennsylvania State University, 99 pp.

NON-REFEREED PUBLICATIONS:

1. Lee, J.L., R. Bleck, A.E. MacDonald, J.W. Bao, S. Benjamin, J. Middlecoff, N. Wang, J. Brown, **2008**: FIM: A vertically flow-following, finite-volume icosahedral model.**,** Preprints, 22nd Conf. Wea. Analysis Forecasting / 18th Conf. Num. Wea. Pred., Park City, UT, Amer. Meteor. Soc.
2. Smith, T. L., S. G. Benjamin, J. M. Brown, S. Weygandt, T. Smirnova, B. Schwartz; **2008** Convection Forecasts from the Hourly Updated, 3-KM High Resolution Rapid Refresh (HRRR) Model *24th Conference on Severe Local Storms*, Savannah, GA, AMS PDF

3. Benjamin, S. S., S. S. Weygandt, J. M. Brown, T. Smirnova, D. Devenyi, K. Brundage, G. Grell, S. Peckham, W. R. Moninger, T. W. Schlatter, T. L. Smith, G. Manikin **2008** Implementation of the Radar-Enhanced RUC *13th Conf. Aviation, Range and Aerospace Meteorology, Amer. Meteor. Soc.,* New Orleans, LA

4. Benjamin, S. S., B. D. Jamison, W. R. Moninger, B. Schwartz, T. W. Schlatter **2008** Relative Forecast Impact from Aircraft, Profiler, Rawinsonde, VAS, GPS-PW, METAR, and Mesonet Observations for Hourly Assimilation in the RUC *12th Conference on IOAS-AOLS, Amer. Meteor. Soc.,* New Orleans, LA

5. Brown, J. M., T. G. Smirnova, S. G. Benjamin, B. Jamison, S. S. Weygandt **2008** Rapid-refresh testing: Examples of Forecast Performance *13th Conf. Aviation, Range and Aerospace Meteorology, Amer. Meteor. Soc.,* New Orleans, LA

6. Moninger, W. R., S. G. Benjamin, B. D. Jamison, T. W. Schlatter, T. L. Smith, E. J. Szoke **2008** New TAMDAR Fleets and their Impact on Rapid Update Cycle (RUC) Forecasts *Conf. Aviation, Range and Aerospace Meteorology, Amer. Meteor. Soc.,* New Orleans, LA

7. Szoke, E. J., S. Benjamin, R. S. Collander, B. D. Jamison, W. R. Moninger, T. W. Schlatter, B. Schwartz, T. L. Smith **2008** Effect of TAMDAR Data on RUC Short-Term Forecasts of Aviation-Impact Fields for Ceiling, Visibility, Reflectivity, and Precipitation *13th Conf. Aviation, Range and Aerospace Meteorology, Amer. Meteor. Soc.,* New Orleans, LA

8. Weygandt, S. S., S. G. Benjamin, T. G. Smirnova, J. M. Brown **2008** Assimilation of Radar Reflectivity Data Using a Diabatic Digital Filter Within the Rapid Update Cycle *12th Conference on IOAS-AOLS, Amer. Meteor. Soc.,* New Orleans, LA

9. Weygandt, S. S., S. G. Benjamin, M. Hu, T. G. Smirnova, J. M. Brown **2008** Use of Lightning Data to Enhance Radar Assimilation Within the RUC and Rapid Refresh Models *3rd Conf. Meteorological Applications of Lightning Data, Amer. Meteor. Soc.,* New Orleans, LA

10. Weygandt, S. S, S. G. Benjamin, T. G. Smirnova, J. M. Brown, K. Brundage **2008** Hourly Convective Probability Forecasts and Experimental High-Resolution Predictions Based on the Radar Reflectivity Assimilating RUC Model *13th Conf. Aviation, Range and Aerospace Meteorology, Amer. Meteor. Soc.,* New Orleans, LA

11. Benjamin, S. G., J. M. Brown, G. Manikin, G. Mann **2007** The RTMA

Background – Hourly Downscaling of RUC Data to 5-KM Detail *23rd Conference on IIPS, Amer. Met. Soc.,* San Antonio, TX; and *22nd Weather Analysis and Forecasting Conf. 18th Conf. Num. Wea. Pred., Amer. Meteor. Soc.,* Park City, UT

12. Benjamin, S.G., S.S. Weygandt, J.M. Brown, T.G. Smirnova, D. Devenyi, K. Brundage, G.A. Grell, S. Peckham, T. Schlatter, T.L. Smith, G. Manikin **2007**: From the radar-enhanced RUC to the WRF-based Rapid Refresh. *22nd Weather Analysis and Forecasting Conf. 18th Conf. Num. Wea. Pred., Amer. Meteor. Soc.,* Park City, UT

13. Benjamin, S. G., W. R. Moninger, S. R. Sahm, T. L. Smith, **2007** Mesonet Wind Quality Monitoring Allowing Assimilation in the RUC and Other NCEP Models *22nd Weather Analysis and Forecasting Conf. 18th Conf. Num. Wea. Pred., Amer. Meteor. Soc.,* Park City, UT

14. Benjamin, S. G., W. R. Moninger, T. L. Smth, B. D. Jamison, E. J. Szoke, T. W. Schlatter **2007** 2006 TAMDAR Impact experiment Results for RUC Humidity, Temperature, and Wind Forecasts *11th Symposum on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface (IOAS-AOLS), Amer. Meteor. Soc.,* San Antonio, TX

15. Brown, J.M., S. Benjamin, T. Smirnova, G. Grell, L. Bernardet, L. B. Nance, R. Collander, and C. Harrop. **2007** Rapid Refresh Core Test: Aspects of WRF-NMM and WRF-ARW Forecast Performance Relevant to the Rapid Refresh Application. *22nd Conf. Wea. Analysis Forecasting 18th Conf. Num. Wea. Pred., Amer. Meteor. Soc.,* Park City, UT

16. Devenyi, D., S. S. Weygandt, T. W. Schlatter, S. G. Benjamin, M. Hu **2007** Hourly Data Assimilation with the Gridpoint Statistical Interpolation for the Rapid Refresh *22nd Conf. Wea. Analysis Forecasting 18th Conf. Num. Wea. Pred., Amer. Meteor. Soc.,* Park City, UT

17. Lee, J. L., R. Bleck, A. E. MacDonald, J. –W. Bao, S. G. Benjamin, J. Middlecoff, N. Wang, J. Brown **2007** FIM: A Vertically Flow-Following, Finite-Volume Icosahedral Model *22nd Conf. Wea. Analysis Forecasting 18th Conf. Num. Wea. Pred., Amer. Meteor. Soc.,* Park City, UT

18. Moninger, W. R., S. G. Benjamin, B. D. Jamison, T. W. Schlatter, T. L. Smith, E. J. Szoke **2007** TAMDAR and its Impact on Rapid Update Cycle (RUC) Forecasts *22nd Conf. Wea. Analysis Forecasting 18th Conf. Num. Wea. Pred., Amer. Meteor. Soc.,* Park City, UT

19. Moninger, W. R., S. G. Benjamin, R. S. Collander, B. D. Jamison, T. W. Schlatter, T. L. Smith, E. J. Szoke **2007** TAMDAR/AMDAR Data Assessments Using the RUC at NOAA's Global Systems Division *11th*

Symposum on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface (IOAS-AOLS), Amer. Meteor. Soc., San Antonio, TX

20. Szoke, E. J., R. S. Collander, B. D. Jamison, S. G. Benjamin, W. R. Moninger, T. W. Schlatter, B. Schwartz **2007** Impact of TAMDAR Data on RUC Short-Range Forecasts *22nd Conf. Wea. Analysis Forecasting 18th Conf. Num. Wea. Pred., Amer. Meteor. Soc.,* Park City, UT

21. Szoke, E. J., S. G. Benjamin, R. S. Collander, B. D. Jamison, W. R. Moninger, T. W. Schlatter, T. L. Smith **2007** Impact of TAMDAR on the RUC Model: A Look Into Some of the Statistics *11th Symposum on Integrated Observing and Assimilation Systems for the Atmosphere, Oceans, and Land Surface (IOAS-AOLS), Amer. Meteor. Soc.,* San Antonio, TX

22. Weygandt, S. S., S. G. Benjamin **2007** Radar Reflectivity-based Initialization of Precipitation Systems using a Diabatic Digital Filter within the Rapid Update Cycle *22nd Conf. Wea. Analysis Forecasting 18th Conf. Num. Wea. Pred., Amer. Meteor. Soc.,* Park City, UT

23. Moninger, W.R., S.G. Benjamin, D. Devenyi, B.D. Jamison, B.E. Schwartz, T.L. Smith, and E. Szoke, **2006**: AMDAR optimization studies at the Global Systems Division. 10th Symposium on Integrated Observing and Assimilation Systems for Atmosphere, Oceans, and Land Surface (IOAS-AOLS), Atlanta, GA, Amer. Meteor. Soc., CD-ROM, 2.4a.
24. Moninger, W.R., M.F. Barth, S.G. Benjamin, R.S. Collander, B.D. Jamison, P.A. Miller, B.E. Schwartz, T.L. Smith, and E. Szoke, **2006**: TAMDAR evaluation work at the Forecast Systems Laboratory: An overview. 10th Symposium on Integrated Observing and Assimilation Systems for Atmosphere, Oceans, and Land Surface (IOAS-AOLS), Atlanta, GA, Amer. Meteor. Soc., CD-ROM, 9.7.
25. Smith, T.L., S.G. Benjamin, S.I. Gutman, S. Sahm, and K. Holub, **2006**: Operational assimilation of GPS-IPW observations in the 13-km RUC at NCEP. 10th Symposium on Integrated Observing and Assimilation Systems for Atmosphere, Oceans, and Land Surface (IOAS-AOLS), Atlanta, GA, Amer. Meteor. Soc., CD-ROM, 2.2.
26. Smith, W. L., Jr., P. Minnis, and S. G. Benjamin, **2006**: Comparison of RUC condensate analyses and forecasts with satellite-derived cloud properties. 12th Conf. on Aviation, Range, and Aerospace Meteorology (ARAM), Atlanta, GA, Amer. Meteor. Soc., CD-ROM, P5.21.
27. Szoke, E., R. Collander, B. Jamison, T. Smith, T. Schlatter, S. Benjamin, and W. Moninger, **2006**: An evaluation of TAMDAR soundings in severe storm forecasting. 23rd Conf. on Severe Local Storms, St. Louis, MO, AMS.

28. Szoke, E. J., B. D. Jamison, W. R. Moninger, S. G. Benjamin, B. E. Schwartz, and T. L. Smith, **2006**: Impact of TAMDAR on RUC forecasts: Case studies. 10th Symposium on Integrated Observing and Assimilation Systems for Atmosphere, Oceans, and Land Surface (IOAS-AOLS), Atlanta, GA, Amer. Meteor. Soc., CD-ROM, 9.9.
29. Weygandt, S. S,. S. G. Benjamin, D. Devenyi, J. M. Brown, and P. Minnis, **2006**: Cloud and hydrometeor analysis using METAR, radar, and satellite data within the RUC/Rapid Refresh Model. 12th Conf. on Aviation, Range, and Aerospace Meteorology (ARAM), Atlanta, GA, Amer. Meteor. Soc., CD-ROM, 5.3.

30. Benjamin, S.B., D. Devenyi, T. Smirnova, S. Weygandt, J.M. Brown, S. Peckham, K. Brundage, T.L. Smith, G. Grell, and T. Schlatter, **2006**: From the 13-km RUC to the Rapid Refresh. 12th Conf. on Aviation, Range, and Aerospace Meteorology (ARAM), Atlanta, GA, Amer. Meteor. Soc.
31. Benjamin, S.G., **2006**: From the 13km RUC to the Rapid Refresh. 12th Conf. on Aviation, Range, and Aerospace Meteorology (ARAM), Atlanta, GA, Amer. Meteor. Soc., CD-ROM, 9.1.
32. Benjamin, S. G., S. S. Weygandt, S. E. Koch, and J. M. Brown, **2006**: Assimilation of lightning data into RUC model convection forecasting. Second Conf. on Meteorological Applications of Lightning Data: Advances in Understanding of Lightning and Potential Economic and Societal Benefits, Atlanta, GA, Amer. Meteor. Soc., CD-ROM, 4.3.
33. Benjamin, S.G., W.R. Moninger, T.L. Smith, B.D. Jamison, and B.E. Schwartz, **2006**: Impact of TAMDAR humidity, temperature, and wind observations in RUC parallel experiments. 12th Conf. on Aviation, Range, and Aerospace Meteorology (ARAM), Atlanta, GA, Amer. Meteor. Soc., CD-ROM, 4.5.
34. Benjamin, S.G., W.R. Moninger, T.L. Smith, B.D. Jamison, and B.E. Schwartz, **2006**: TAMDAR aircraft impact experiments with the Rapid Update Cycle. 10th Symposium on Integrated Observing and Assimilation Systems for Atmosphere, Oceans, and Land Surface (IOAS-AOLS), Atlanta, GA, Amer. Meteor. Soc., CD-ROM, 9.8.
35. Brown, J.M., T.G. Smirnova, and S.G. Benjamin, **2006**: Performance of RUC13 forecasts for the AIRS-2 11 November 2003 icing case. 12th Conf. on Aviation, Range, and Aerospace Meteorology (ARAM), Atlanta, GA, Amer. Meteor. Soc., CD-ROM, 7B.6.
36. Herzegh, P., G. Wiener, R. Bankert, R. Bateman, S. Benjamin, J. Brown, J. Cowie, M. Hadimichael, M. Tryhand, and B. Weekley, **2006**: Development of FAA national ceiling and visibility products: Challenges, strategies, and progress. 12th Conf. on Aviation, Range, and Aerospace Meteorology (ARAM), Atlanta, GA, Amer. Meteor. Soc., CD-ROM, P1.17.

37. Benjamin, S.G., T.G. Smirnova, K.J. Brundage, S.S. Weygandt, D. Devenyi, B.E. Schwartz, T.L. Smith, **2004**: Application of the Rapid Update

Cycle at 10-13 km - Initial testing. Preprints 16th Conf. Num. Wea. Pred., Seattle.
38. Benjamin, S.G., T.G. Smirnova, K.J. Brundage, S.S. Weygandt, D. Devenyi, B.E. Schwartz, T.L. Smith, **2004**: Application of the Rapid Update Cycle at 10-13 km - Initial testing. Preprints 16th Conf. Num. Wea. Pred., Seattle.
39. Wilczak, J.M., R. Zamora, J.-W. Bao, I Djalalova, J. McQueen, B. Ferrier, Z. Janjic, H.-L. Pan, K. Mitchell, G. DiMego, J. Du, B. Zhou, and S. Benjamin, **2004**: Initial evaluation results of the Eta, NMM, GFS, SREF and RUC models during the 2003 New England High Resolution Temperature Forecast Program. Preprints 16th Conf. Num. Wea. Pred., Seattle.
40. Gutman, S.E., S.R., Sahm, S.G. Benjamin, and T.L. Smith, **2004**: GPS water vapor observation errors. Preprints 8th Symp. Integ. Obs. Assim. Systems.
41. Koch, S.E., S. Benjamin, J. McGinley, J. Brown, P. Schultz, E. Szoke, T. Smirnova, B. Shaw, D. Birkenheuer, S. Albers, S. Peckham, G. Grell, **2004**: Real-time applications of the WRF model at the Forecast Systems Laboratory. Preprints 16th Conf. Num. Wea. Pred., Seattle.
42. Benjamin, S.G., T.G. Smirnova, K.J. Brundage, S.S. Weygandt, D. Devenyi, B.E. Schwartz, T.L. Smith, **2004**: Application of the Rapid Update Cycle at 10-13 km - Initial testing. Preprints 16th Conf. Num. Wea. Pred., Seattle.
43. Benjamin, S.G., J.M. Brown, S.S. Weygandt, T.L. Smith, B. Schwartz, W.R. Moninger, **2004**: Assimilation of surface cloud, visibility, and current weather observations in the RUC Preprints 16th Conf. Num. Wea. Pred., Seattle.
44. Devenyi, D., S.G. Benjamin, and S.S. Weygandt, **2004**: The RUC 3DVAR: Operational performance and recent improvements. Preprints 16th Conf. Num. Wea. Pred., Seattle.
45. Schwartz, B., S. Benjamin, **2004**: Observation sensitivity experiments using the Rapid Update Cycle Preprints 16th Conf. Num. Wea. Pred., Seattle.
46. Smirnova, T.G., S.G. Benjamin, J.M. Brown and D. Kim, **2004**: Cycled snow state in RUC coupled data assimilation system (CDAS) Preprints 16th Conf. Num. Wea. Pred., Seattle. PDF
47. Smith, T.L., S.G. Benjamin, S.I. Gutman, and S. Sahm, **2004**: Ongoing assessment of GPS-IPW impact on RUC forecasts Preprints 20th Conf. Wea. Anal. Forecasting., Seattle. PDF
48. Weygandt, S.S., T.W. Schlatter, S. E. Koch, S.G. Benjamin, A. Marroquin, J. R. Smart, M. Hardesty, B. Rye, A. Belmonte, G. Feingold, D. M. Barker, Q. Zhang, and D. Devenyi, **2004**: Potential forecast impacts from space-based lidar winds: results from a regional observing system simulation experiments. Preprints 8th Symp. Integ. Obs. Systems., Seattle. PDF
49. Lu, C., S. Benjamin, J. Du, and S. Tracton, **2004**: RUC short-range ensemble forecast system. Preprints 16th Conf. Num. Wea. Pred., Seattle.

PDF
50. Gutman, S.I., K.L. Holub, S.R. Sahm, J.Q. Stewart, T.L. Smith, S.G. Benjamin, and B.E. Schwartz, **2004**: Rapid retrieval and assimilation of ground based GPS-Met observations at the NOAA Forecast Systems Laboratory: Impact on weather forecasts. J. Meteor. Society of Japan, **82**, 1-10.
51. Herzegh, P.H., G.E. Wiener, S.G. Benjamin, R.L. Bankert, and M. Tryhane, **2004**: Automated analysis and forecast products for ceiling and visibility on the national scale. Preprints 11th Conf. Aviation, Range, Aerospace Meteor. Hyannis.

52. Gutman, S.I., S. Sahm, J. Stewart, S. Benjamin, T. Smith, and B. Schwartz, **2003**: A composite observing system strategy for ground based GPS meteorology. 12th Symp. on Met. Obs. and Instr. Long Beach, CA, Amer. Meteor. Soc.
53. Herzegh, P.H., S. Benjamin, R. Rasmussen, T. Tsui, G. Wiener, and P. Zwack, **2003**: Development of automated analysis and forecast products for adverse ceiling and visibility conditions. Preprints 19th Conf. on IIPS.
54. Smith, T.L., S.G. Benjamin, S.I. Gutman, and B.E. Schwartz, **2003**: Impact of GPS-IPW data on RUC forecasts. 7th Symposium on Integrated Observing Systems: The Water Cycle, Long Beach, CA, Amer. Meteor. Soc..

55. Benjamin, S.G., J.M. Brown, K.J. Brundage, D. Devenyi, G.A. Grell, D. Kim, B.E. Schwartz, T.G. Smirnova, T.L. Smith, S. Weygandt, and G.S. Manikin, **2002**: RUC20 - The 20-km version of the Rapid Update Cycle. NOAA Technical Memorandum OAR FSL-28.
56. Benjamin, S.G., J.M. Brown, K.J. Brundage, D. Devenyi, G.A. Grell, D. Kim, B.E. Schwartz, T.G. Smirnova, T.L. Smith, S. Weygandt, and G.S. Manikin, **2002**: RUC20 - The 20-km version of the Rapid Update Cycle. NWS Technical Procedures Bulletin No. 490.
57. Benjamin, S.G., J.M. Brown, D. Devenyi, G.A. Grell, D. Kim, T.L. Smith, T.G. Smirnova, B.E. Schwartz, S. Weygandt, K.J. Brundage, and G.S. Manikin, **2002**: The 20-km Rapid Update Cycle--Overview and implications for aviation applications. 10th Conf. on Aviation, Range, and Aerospace Meteorology, Portland, OR, Amer. Meteor. Soc.
58. Benjamin, S.G., D. Kim, and J.M. Brown, **2002**: Cloud/hydrometeor initialization in the 20-km RUC with GOES and radar data. 10th Conf. on Aviation, Range, and Aerospace Meteorology, Portland, OR, Amer. Meteor. Soc.
59. Schwartz, B.E., and S.G. Benjamin, **2002**: Verification of RUC surface forecasts at major U.S. airport hubs. 10th Conf. on Aviation, Range, and Aerospace Meteorology, Portland, OR, Amer. Meteor. Soc.
60. Smith, T.L., and S.G. Benjamin, **2002**: Visibility forecasts from the RUC20. 10th Conf. on Aviation, Range, and Aerospace Meteorology, Portland, OR,

Amer. Meteor. Soc.
61. Benjamin, S.G., S.S. Weygandt, B.E. Schwartz, T.L. Smith, T.G. Smirnova, D. Kim, G. Grell, D. Devenyi, K.J. Brundage, J.M. Brown, and G.S. Manikin, **2002**: The 20-km RUC in operations. Preprints, 15th Conf. on Numerical Weather Prediction, San Antonio, TX, Amer. Meteor. Soc., 379-382.
62. Devenyi, D., S.G. Benjamin, and S.S. Weygandt, **2002**: A new version of RUC 3DVAR. 15th Conf. on Numerical Weather Prediction, San Antonio, TX, Amer. Meteor. Soc., 343-345.
63. Kim, D., and S. G. Benjamin, **2002**. Cloud/hydrometeor assimilation into the 20-km Rapid Update Cycle. ECMWF/GEWEX Workshop on Humidity Analysis, ECMWF, 8-11 July 2002.
64. Kim, D., S.G. Benjamin and J.M. Brown, **2002**: Cloud/hydrometeor initialization in the 20-km RUC using radar and GOES data. 15th Conf. on Numerical Weather Prediction, San Antonio, TX, Amer. Meteor. Soc., 335-338.
65. Benjamin, S.G., S.S. Weygandt, J. Lee, T.G. Smirnova, G.A. Grell, and B.L. Shaw, **2002**: A case study comparison of 10-km WRFRUC and RUC model forecasts from the IHOP experiment. 15th Conf. on Numerical Weather Prediction, San Antonio, TX, Amer. Meteor. Soc., 275-277.
66. Schwartz, B.E. and S.G. Benjamin, 2002: An assessment of 3- and 6-h RUC CAPE forecasts. 21th Conf. on Severe Local Storms, San Antonio, TX, Amer. Meteor. Soc.
67. Smith, T.L., S.G. Benjamin, S.I. Gutman, and B.E. Schwartz, **2002**: Impact of GPS water vapor data on RUC severe weather forecasts. 21st Conf. on Severe Local Storms, San Antonio, TX, Amer. Meteor. Soc., J43-J46.
68. Weygandt, S.S., S.G. Benjamin, C.S. Velden, J.E. Burks, and L.B. Nance, **2002**: High-resolution RUC forecasts for PACJET: Real-time NWS guidance and retrospective data impact tests. 15th Conf. on Numerical Weather Prediction, San Antonio, TX, Amer. Meteor. Soc., 300-303.
69. Herzegh, P., K. Petty, S. Benjamin, R. Rasmussen, T. Tsui, G. Wiener, and P. Zwack, **2002**: Development of automated national ceiling and visibility products: scientific and practical challenges, research strategies and first steps. Preprints 10th Conf. Aviation, Range, and Aerospace Meteor.

70. Benjamin, S.G., G.A. Grell, S.S. Weygandt, T.L. Smith, T.G. Smirnova, B.E. Schwartz, D. Kim, D. Devenyi, K.J. Brundage, J.M. Brown, and G.S. Manikin, **2001**: The 20-km version of the RUC. 14th Conf. on Numerical Weather Prediction, Fort Lauderdale, FL, Amer. Meteor. Soc., J75-J79
71. Devenyi, D., S.G. Benjamin, and S.S. Weygandt, **2001**: 3DVAR analysis in the Rapid Update Cycle. 14th Conf. on Numerical Weather Prediction, Fort Lauderdale, FL, Amer. Meteor. Soc., J103-J107.
72. Kim, D., and S.G. Benjamin, **2001**: Cloud/hydrometeor initialization for the 20-km RUC using satellite and radar data. 14th Conf. on Numerical Weather Prediction, Fort Lauderdale, FL, Amer. Meteor. Soc., J113-J115.

73. Brundage, K.J., S.G. Benjamin, and M.N. Schwartz, **2001**: Wind energy forecasts and ensemble uncertainty from the RUC. Ninth Conf. on Mesoscale Processes, Fort Lauderdale, FL, Amer. Meteor. Soc., 343-345
74. Weygandt, S.S., S.G. Benjamin, and C. Velden, **2001**: Assimilation of rapid-scan satellite cloud motion vectors into the RUC model in support of the PACJET experiment. 14th Conf. on Numerical Weather Prediction, Fort Lauderdale, FL, Amer. Meteor. Soc., 263-267.
75. Schwartz, B.E. and S.G. Benjamin, **2001**: Verification of 20-km RUC surface and precipitation forecasts. 14th Conf. on Numerical Weather Prediction, Fort Lauderdale, FL, Amer. Meteor. Soc., 138-141.
76. Lu, C., D. Devenyi, S. Benjamin, and W. Schubert, **2001**: Vertical normal modes in a hybrid-coordinate system. Preprints 13th Conf. Atmos. Ocean. Fluid Dyn..
77. Wu, W., M. Xue, T.W. Schlatter, R.J. Purser, M. McAtee, J. Gao, D. Devenyi, J.C. Derber, D.M. Barker, S. Benjamin, and R. Aune, **2001**: The WRF 3D-VAR analysis system. 18th Conf. on Weather Analysis and Forecasting, Fort Lauderdale, FL, Amer. Meteor. Soc., J84-J86.

78. Brown, J.M., T.G. Smirnova, and S.G. Benjamin, **2000**: Use of a mixed-phase microphysics scheme in the operational NCEP Rapid Update Cycle. Preprints, 13th Intl. Conf. on Clouds and Precipitation, AMS, Reno.
79. Smirnova, T.G., S.G. Benjamin, J.M. Brown, B. Schwartz, and D. Kim, **2000**: Validation of long-term precipitation and evolved soil moisture and temperature fields in MAPS. 15th Conf. on Hydrology, Long Beach, CA, 43-46.
80. Kim, D., and S.G. Benjamin, **2000**: Assimilation of cloud-top pressure derived from GOES sounder data into MAPS/RUC. 10th Conf. on Satellite Meteorology and Oceanography, Long Beach, AMS, 110-113.
81. Cole, R.E., S. Green, M. Jardin, B.E. Schwartz, and S.G. Benjamin, **2000**: Wind prediction accuracy for air traffic management decision support tools. Preprints, 3rd USA/Europe Air Traffic Management R&D Seminar, Eurocontrol and FAA, Naples, Italy.
82. Schwartz, B.E., and S.G. Benjamin, **2000**: Verification of RUC2 precipitation forecasts using the NCEP multisensor analysis. 4th Symposium on Integrated Observing Systems, Long Beach, AMS, 182-185.
83. Benjamin, S.G., G.A. Grell, J.M. Brown, K.J. Brundage, D. Devenyi, D. Kim, B. Schwartz, T.G. Smirnova, T.L. Smith, S.S. Weygandt, and G.A. Manikin, **2000**: The 20-km version of the Rapid Update Cycle. Preprints, 9th Conf. on Aviation, Range, and Aerospace Meteorology, AMS, Orlando, 421-423.
84. Schwartz, B., S.J. Weiss, and S. Benjamin, **2000**: An assessment of the Rapid Update Cycle short-range forecast fields related to convective development. Preprints, 20th Conf. on Severe Local Storms, AMS, Orlando, 443-446.
85. Kim, D., and S.G. Benjamin, **2000**: An initial RUC cloud analysis

assimilating GOES cloud-top data. Preprints, 9th Conf. on Aviation, Range, and Aerospace Meteorology, AMS, Orlando, 522-524.
86. Smith, T.L., S.G. Benjamin, B.E. Schwartz, and G. Grell, **2000**: A past and future look at the Rapid Update Cycle for the 3 May 1999 severe weather outbreak. Preprints, 20th Conf. on Severe Local Storms, AMS, Orlando, 21-24.
87. Brown, J.M., T.G. Smirnova, S.G. Benjamin, R. Rasmussen, G. Thompson, and K. Manning, **2000**: Use of a mixed-phase microphysics scheme in the operational NCEP Rapid Update Cycle. Preprints, 9th Conf. on Aviation, Range, and Aerospace Meteorology, AMS, Orlando, 100-101.
88. Smirnova, T.G., S.G. Benjamin, and J.M. Brown, **2000**: Case study verification of RUC/MAPS fog and visibility forecasts. Preprints, 9th Conf. on Aviation, Range, and Aerospace Meteorology, AMS, Orlando, 31-36.
89. Brown, J.M., T.G. Smirnova, S.G. Benjamin, R. Rasmussen, G. Thompson, and K. Manning, **2000**: Use of a mixed-phase microphysics scheme in the operational NCEP Rapid Update Cycle. Proc. 13th International Conf. on Clouds and Precipitation (Reno) (Sponsored by International Commission on Clouds and Precipitation (ICCP) of the International Association of Meteorology and Atmospheric Sciences, Vol. 2, 1104-1105.

90. Benjamin, S.G., J.M. Brown, K.J. Brundage, D. Kim, B. Schwartz, T. Smirnova, and T.L. Smith, **1999**: Aviation forecasts from the RUC-2 Meteorology, AMS, Dallas, 486-490.
91. Benjamin, S.G., and B.E. Schwartz, **1999**: Accuracy of RUC-1 and RUC-2 wind and aircraft trajectory forecasts as determined by ACARS observations. Preprints, 8th Conf. on Aviation, Range, and Aerospace Meteorology, AMS, Dallas, 481-485.
92. Smirnova, T.G., J.M. Brown, and S.G. Benjamin, **1999**: Parameterization of frozen soil physics in MAPS and its effect on hydrological cycle components. Preprints, 14th Conf. on Hydrology, 5th Conf. on Polar Meteorology and Oceanography. AMS, Dallas.

93. Smith, T.L. and S.G. Benjamin, **1998**: The combined use of GOES cloud-drift, ACARS, VAD, and profiler winds in the RUC-2. Extended abstracts, 4th International Symposium on Tropospheric Profiling: Needs and Technologies, Snowmass, Vol. 2, 302-304.
94. Schwartz, B.E. and S.G. Benjamin, **1998**: Verification of RUC-2 and Eta model precipitation forecasts. Preprints, 16th Conf. on Wea. Analysis and Forecasting, AMS, Phoenix, J19-J22.
95. Benjamin, S.G., T.L. Smith, B.E. Schwartz, S.I. Gutman, and D. Kim, **1998**: Precipitation forecast sensitivity to GPS precipitable water observations combined with GOES using RUC-2. Preprints, 12th Conf. on Num. Wea. Pred., AMS, Phoenix, 73-76.
96. Smith, T.L. and S.G. Benjamin, **1998**: The combined use of GOES cloud-drift, ACARS, VAD, and profiler winds in the RUC-2. Preprints, 12th Conf.

on Num. Wea. Pred., AMS, Phoenix, 297-299.
97. Brown, J.M., T.G. Smirnova, and S.G. Benjamin, **1998**: Introduction of MM5 level 4 microphysics into the RUC-2. Preprints 12th Conf. on Num. Wea. Pred., AMS, Phoenix.
98. Smirnova, T.G., J.M. Brown, and S.G. Benjamin, 1998: Impact of a snow physics parameterization on short-range forecasts of skim temperature in MAPS/RUC. 12th Conf. on Num. Wea. Pred., AMS, Phoenix.
99. Marroquin, A., T.G. Smirnova, J.M. Brown, and S.G. Benjamin, **1998**: Forecast performance of a prognostic turbulence formulation implemented in the MAPS/RUC model. 12th Conf. on Num. Wea. Pred., AMS, Phoenix.
100. Benjamin, S.G., J.M. Brown, K.J. Brundage, B.E. Schwartz, T.G. Smirnova, and T.L. Smith, **1998**: The operational RUC-2. Preprints, 16th Conference on Weather Analysis and Forecasting, AMS, Phoenix, 249-252.
101. Devenyi, D. and S.G. Benjamin, **1998**: Application of a 3DVAR analysis in RUC-2. 12th Conf. on Num. Wea. Pred., AMS, Phoenix, 37-40.
102. Kim, D., S.G. Benjamin, T.G. Smirnova, and J.M. Brown, **1998**: Comparison of skin temperatures from the MAPS/RUC forecast model and from GOES-8. 9th Conf. on Satellite Meteorology and Oceanography, May, Paris, France.
103. Kim, D., S.G. Benjamin, J.M. Brown, and T.G. Smirnova, **1998**: The use of satellite information in correcting model-predicted clouds. 9th Conf. on Satellite Meteorology and Oceanography, May, Paris, France, 722-723.
104. Dudhia, J., J. Klemp, W. Skamarock, D. Dempsey, Z. Janjic, S. Benjamin, and J. Brown, **1998**: A collaborative effort toward a future community mesoscale model (WRF). 12th Conf. on Numerical Weather Prediction, Phoenix, AZ, Amer. Meteor. Soc., 242-243.

105. Benjamin, S.G., J.M. Brown, K.J. Brundage, D. Devenyi, D. Kim, B.E. Schwartz, T.G. Smirnova, T.L. Smith, and A. Marroquin, **1997**: Improvements in aviation forecasts from the 40-km RUC. Preprints, 7th Conference on Aviation, Range, and Aerospace Meteorology, Long Beach, February, 411-416.
106. Baillie, C.F., S.G. Benjamin, Z. Christidis, J.P. Edwards, M.W. Govett, L.B. Hart, T.B. Henderson, J.-L. Lee, A.E. MacDonald, B.J. Rodriguez, A.B. Sathye, and J.S. Snook, **1997**. Parallel regional weather prediction modeling at FSL. Journal of Parallel and Distributed Computing.
107. Benjamin, S.G., J.M. Brown, K.J. Brundage, D. Devenyi, D. Kim, B.E. Schwartz, T.G. Smirnova, T.L. Smith, and A. Marroquin, **1997**: Improvements in aviation forecasts from the 40-km RUC. Preprints, 7th Conference on Aviation, Range, and Aerospace Meteorology, Long Beach, February, 411-416.

108. Benjamin, S. G., J. M. Brown, K. J. Brundage, D. Devenyi, B. Schwartz, T. G. Smirnova, T. L. Smith, and F.-J. Wang, **1996**: The 40-km 40-level version of MAPS/RUC. Preprints, 11th Conference on Numerical

Weather Prediction, Norfolk, August, 161-163.
109. Kim, D., J.-S. Hong, and S.G. Benjamin, **1996**: Analysis of 3-hour forecast errors in MAPS. Preprints, 11th Conference on Numerical Weather Prediction, Norfolk, August, 113-115.
110. Smirnova, T.G., J.M. Brown, and S.G. Benjamin, **1996**: The soil component of the MAPS model: Description and performance in one and three dimensional applications. Preprints, 11th Conference on Numerical Weather Prediction, Norfolk, August, 259-261.
111. Schwartz, B.E., S.G. Benjamin, and K.J. Brundage, **1996**: Verification of precipitation forecasts from the RUC and Eta models using high resolution precipitation observations. Preprints, 11th Conference on Numerical Weather Prediction, Norfolk, August, J115-J119.

112. Benjamin, S. G., G. A. Grell, K. J. Brundage, T. L. Smith, J. M. Brown, T. G. Smirnova, and Z. Yang, **1995**: The next version of the Rapid Update Cycle -- RUC II. Preprints, 6th Conference on Aviation Weather Systems, 15-20 January, Dallas, AMS, 57-61.
113. Smith, T. L., J. E. Ramer, and S. G. Benjamin, **1995**: MAPS forecasts of aviation-impact variables. Preprints, 6th Conference on Aviation Weather Systems, 15-20 January, Dallas, AMS, 51-56.
114. Benjamin, S. G., D. Kim, and T. W. Schlatter, **1995**: The Rapid Update Cycle: A new mesoscale assimilation system in hybrid theta-sigma coordinates at the National Meteorological Center. Preprints, Second International Symposium on Assimilation of Observations in Meteorology and Oceanography, Tokyo, Japan, 13-17 March, 337-342.

115. Benjamin, S. G., T. L. Smith, and G. Grell, **1994**: Tests of the MAPS isentropic/sigma hybrid forecast model. 1994 Research Activities in Atmospheric and Oceanic Modelling. CAS/JSC Working Group on Numerical Experimentation, ed. G. J. Boer.
116. Smith, T. L. and S. G. Benjamin, **1994**: Relative impact of data sources on a data assimilation system. Third Symposium on Tropospheric Profiling, Hamburg, Germany, 30 August - 2 September.
117. Benjamin, S.G., G. Grell, J.M. Brown, R. Bleck, K. J. Brundage, T.L. Smith, and P.A. Miller, **1994**: An operational isentropic-sigma hybrid forecast forecast model and data assimilation system. Preprints, International Symposium on the Life Cycles of Extratropical Cyclones. 27 June - 1 July, Bergen, Norway, Vol. III, 268-273.
118. Smirnova, T. G., S. G. Benjamin, and J. M. Brown, **1994**: Comparative experiments for different boundary-layer schemes based on the implementation of a soil model. Preprints, 10th Conference on Numerical Weather Prediction, 17-21 July, Portland, OR, AMS, 432-434.
119. Smith, T. L. and S. G. Benjamin, **1994**: Relative impact of data sources on a data assimilation system. Preprints, 10th Conference on Numerical Weather Prediction, 17-21 July, Portland, OR, AMS, 491-493.
120. Benjamin, S. G., K. J. Brundage, P. A. Miller, T. L. Smith, G. A.

Grell, D. Kim, J. M. Brown, T. W. Schlatter, and L. L. Morone, **1994**: The Rapid Update Cycle at NMC. Preprints, 10th Conference on Numerical Weather Prediction, 17-21 July, Portland, OR, AMS, 566-568.

121. Benjamin, S. G., K. J. Brundage, and L. L. Morone, **1994**: The Rapid Update Cycle. Part I: Analysis/model description. Technical Procedures Bulletin No.~416, NOAA/NWS, 16 pp. [National Weather Service, Office of Meteorology, 1325 East-West Highway, Silver Spring, MD 20910]

122. Grell, G. A., R. Bleck, and S. G. Benjamin, **1994**: A comparison of different vertical coordinates and numerics in MM5. Proceedings, Fourth PSU/NCAR Mesoscale Model Users' Workshop, 29 Aug - 1 Sep, Boulder, 84-87.

123. Henderson, T., C. Baillie, S. Benjamin, G. Carr, M. Govett, L. Hart, A. Marroquin, J. Middlecoff, B. Rodriguez, **1994**: Progress toward demonstrating operational capability of massively parallel processors at Forecast System Laboratory. Workshop on Massively Parallel Computing, ECMWF, Nov.

124. Pan, Z.-T., S. G. Benjamin, and J. M. Brown, **1993**: Comparative experiments on different types of formulations computing surface moisture flux in a regional model. Preprints, Conference on Hydroclimatology: Land-Surface/Atmosphere Interactions on Global and Regional Scales, 17-22 January 1993, Anaheim, California, AMS.

125. Benjamin, S. G., **1993**: Correspondence of water vapor image features and potential vorticity patterns from an isentropic mesoscale data assimilation system. Annales Geophysicae, Part II - Oceans, Atmosphere, Hydrology & Nonlinear Geophysics, Supplement II to Volume 11, European Geophysical Society, 2-6 May, Wiesbaden, C202.

126. Benjamin, S. G., R. Bleck, G. Grell, Z.-T. Pan, T. L. Smith, J. M. Brown, J. E. Ramer, P. A. Miller, and K. Brundage, **1993**: Aviation forecasts from the hybrid-b version of MAPS - effects of a new vertical coordinate and improved model physics. Preprints, 5th Conference on Aviation Weather Systems, 2-6 August, Vienna, VA, AMS, J5-J9.

127. Smith, T. L., and S. G. Benjamin, **1993**: A severe winter storm as described by a real-time isentropic-sigma data assimilation system. Preprints, 13th Conference on Weather Analysis and Forecasting, 2-6 August, Vienna, VA, AMS, 1-4.

128. Smith, T. L., and S. G. Benjamin, **1993**: Evaluation of CAPE/CIN fields derived from model soundings. Preprints, 17th Conference on Severe Local Storms, 4-8 October, St. Louis, MO, AMS.

129. Smith, T. L., and S. G. Benjamin, **1992**: Forecasting applications of a hybrid isentropic-sigma data assimilation system. Preprints, Fourth Workshop on Operational Meteorology, 15-18 September, Whistler, B.C., Canada

130. Benjamin, S. G., 1991: Short-range forecasts from a 3-h isentropic-sigma assimilation system using ACARS data. Preprints, 4th International Conference on Aviation Weather Systems, 24-26 June, Paris, France.
131. Smith, T. L., and S. G. Benjamin, 1991: Impact of network profiler data on a hybrid data assimilation system. Extended Abstracts, Symposium on Lower Tropospheric Profiling: Needs and Technologies, 10-13 September, Boulder, 189-190.
132. Miller, P. A., and S. G. Benjamin, 1991: Horizontal quality control for a real-time 3-h assimilation system configured in isentropic coordinates. Preprints, 9th Conference on Numerical Weather Prediction, 14-18 October, Denver, CO, AMS, 32-35.
133. Benjamin, S. G., T. L. Smith, P. A. Miller, D. Kim, and T. W. Schlatter, and R. Bleck, 1991: Recent improvements in the MAPS isentropic-sigma data assimilation system. Preprints, 9th Conference on Numerical Weather Prediction, 14-18 October, Denver, CO, AMS, 118-121.
134. Benjamin, S. G., and P. A. Stamus, 1991: Experiments with 1-h and 3-h assimilation cycles using mesoscale aircraft and surface data. Preprints, 9th Conference on Numerical Weather Prediction, 14-18 October, Denver, CO, AMS, 186-189.
135. Smith, T. L., and S. G. Benjamin, 1991: Impact of network profiler data on a hybrid-coordinate data assimilation system. Preprints, 9th Conference on Numerical Weather Prediction, 14-18 October, Denver, CO, AMS, 418-421.
136. Smith, T. L., and S. G. Benjamin, 1990: The evolution of the regional severe-storm environment as viewed by a hybrid isentropic-sigma assimilation system. Preprints, 16th Conference on Severe Local Storms, 22-26 October, Kananaskis Provincial Park, Alta., Canada, AMS, 504-509.
137. Benjamin, S. G., K. A. Brewster, R. L. Brümmer, B. F. Jewett, T. W. Schlatter, T. L. Smith, and P. A. Stamus, 1989: A 3-hour mesoscale assimilation system using ACARS aircraft data combined with other mesoscale observations. Preprints, 3rd International Conference on the Aviation Weather System, 30 January--3 February, Anaheim, AMS, 117-122.
138. Brewster, K. A., S. G. Benjamin and R. Crawford, 1989: Quality control of ACARS meteorological observations -- a preliminary data survey. Preprints, 3rd International Conference on the Aviation Weather System, 30 January--3 February, Anaheim, AMS, 124-129.
139. McGinley, J. A., and S. G. Benjamin, 1989: Mesoscale data assimilation for national, regional and local scales. Preprints, Department of Defense Environmental Technical Conference on Mesoscale Phenomena, 23-27 January, Columbia, MD, 287-298.
140. Smith, T. L., and S. G. Benjamin, 1989: Weather forecasting applications of potential vorticity analyses on isentropic surfaces. Preprints, 12th Conference on Weather Analysis and Forecasting, 2-6 October, Monterey, CA, AMS, 260-265.

141. Benjamin, S. G., D. L. Birkenheuer, R. D. McPherson, T. L. Smith, and J. S. Snook, 1988: Experiments in the assimilation of radiance observations from VAS. Preprints, 8th Conf. on Numerical Weather Prediction, Baltimore, AMS, 269-276.
142. Miller, P. A. and S. G. Benjamin, 1988: A scheme for analyzing surface observations over heterogeneous terrain. Preprints, 8th Conf. on Numerical Weather Prediction, Baltimore, AMS, 178-184.
143. Benjamin, S. G., 1987: An isentropic mesoscale analysis system. Preprints, IUGG Symp. Mesoscale Analysis and Forecasting, Vancouver, Canada, 17-19 August, ESA SP-282, 555-560.
144. Benjamin, S. G., R. Brümmer, E.-Y. Hsie, E. J. Szoke and J. M. Brown, 1987: Effects of surface heating on a topographically induced low-level circulation - 3-D simulations. Extended abstracts, 3rd Conf. on Mesoscale Processes, Vancouver, AMS, 112-113.
145. Benjamin, S. G., R. Brümmer, E.-Y. Hsie, E. J. Szoke and J. M. Brown, 1986: Comparisons of a nested grid model simulation to observations of a local topographically induced circulation. Preprints, 11th Conf. on Weather Forecasting and Analysis, Kansas City, AMS, 370-374.
146. Benjamin, S. G., R. S. Lieberman, T. W. Schlatter and R. G. Rasmussen, 1985: Preliminary tests of a regional objective analysis and short-range numerical forecasting system. Preprints, 7th Conf. on Numerical Weather Prediction, Montreal, AMS, 440-443.
147. Benjamin, S. G. and J. M. Lanicci, 1985: Effects on dryline behavior due to soil moisture and topography: numerical results from SESAME I and SESAME IV. Preprints, 14th Conf. on Severe Local Storms, Indianapolis, AMS, 9-12.
148. Benjamin, S. G., 1983: Some effects of differential heating and topography on the regional severe storm environment - numerical simulations of the SESAME IV (9-10 May 1979) case. Preprints, 6th Conf. on Numerical Weather Prediction, Omaha, AMS, 284-290.
149. Benjamin, S. G. and N. L. Seaman, 1983: Objective analysis in curved flow. Preprints, 6th Conf. on Numerical Weather Prediction, Omaha, AMS, 159-165.
150. Benjamin, S. G. and T. N. Carlson, 1983: Effects on stability, winds and surface pressure due to surface heating and topography in the regional severe storm environment. Preprints, 13th Conf. on Severe Local Storms, Tulsa, AMS, 332-335.

151. Benjamin, S. G. and T. N. Carlson, 1982: Numerical simulations of the severe storm environment for the 10-11 April 1979 (SESAME I) case. Preprints, 12th Conf. on Severe Local Storms, San Antonio, AMS, 201-204.
152. Carlson, T. N. and S. G. Benjamin, 1982: Radiative heating rates for a desert aerosol (Saharan dust). Atmospheric Aerosols: Their Formation, Optical Properties, and Effects, Spectrum Press, Hampton, VA, 435-457.