

**“The Collaborative Science, Technology,
and Applied Research (CSTAR) Program”**

Title:

**“Continuing Studies of Cool- and Warm-Season Precipitation
Events over the Northeastern United States”**

University: University at Albany

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NWS/AFWA/Navy Office: National Weather Service, Albany, New York

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SECTION 1: Summary of Graduate Student Research Activities

(a) CSTAR Graduate (Heather Archambault)

Heather Archambault - 2005: "Cool-Season Regime Transition and Its Impact on Precipitation in the Northeastern United States"

ABSTRACT

Past research has indicated that reconfigurations of large-scale flow regimes can alter regional weather patterns due to shifts in storm tracks and associated eddy transports of heat, momentum, and vorticity. Conventional wisdom also suggests that high-impact weather events tend to occur during large-scale regime transitions. Motivated by these considerations, this research investigates relationships between large-scale regime transitions and Northeast precipitation in the cool season (November–April) from a statistical and synoptic perspective.

In this study, a regime transition is defined as a two-standard-deviation change centered on zero in the North Atlantic Oscillation (NAO) index or Pacific/North American (PNA) pattern index over a seven-day period. To identify regime transitions, a 56-year database (1948–2003) of daily NAO and PNA indices was generated from the National Centers for Environmental Prediction (NCEP)–National Center for Atmospheric Research (NCAR) reanalysis dataset. A daily precipitation anomaly database for the Northeast was derived from the Unified Precipitation Dataset (UPD) for the same 56-year period.

Key statistical results indicate that transitions from positive to negative NAO regimes and from negative to positive PNA regimes are associated with enhanced precipitation in the Northeast. Conversely, transitions from negative to positive NAO regimes and from positive to negative PNA regimes are associated with suppressed Northeast precipitation. Results also show that during periods surrounding major Northeast precipitation events in the cool season, the NAO index tends to decrease and the PNA index tends to increase.

To interpret these relationships synoptically, composite analyses were created of cool-season regime transitions surrounding major precipitation events in the Northeast. The analyses suggest that synoptic-scale features are important in these types of large-scale regimes transitions. A positive-to-negative NAO regime transition (a weakening of the North Atlantic jet) surrounding a major Northeast precipitation event appears to be related to strong warm air advection in the western North Atlantic downstream of a surface low associated with the Northeast precipitation event. In the case of a negative-to-positive PNA regime transition [an amplification of a trough (ridge) over eastern (western) North America] surrounding a major Northeast precipitation event, two synoptic-scale features appear to be important. One feature is persistent warm air advection that amplifies a ridge over western North America, and the other feature is a weak cold surge in the Northeast in the wake of the precipitation event that acts to precondition the atmosphere for a second, stronger cold surge over eastern North America.

(b) Mesoscale Aspects of Heavy Snow/Icing Events in the Northeast U.S. (Matthew Greenstein)

Research Summary (1 May – 31 Oct):

Since the last CSTAR update, a number of significant advances, despite some setbacks, have occurred with this research on mesoscale precipitation patterns in heavy snow events.

An attempt was made to use 2-km national radar composites from UCAR (available at <http://locust.mmm.ucar.edu/case-selection>) and archived upper-air maps from the Plymouth State Weather Center (available at <http://vortex.plymouth.edu/u-make.html>) to classify the heavy snow cases two ways: 1) into overrunning, wrap-around, and mixed varieties, and 2) into primarily warm air advection-driven, primary differential cyclonic vorticity advection-driven, and blends of the two. This was then re-attempted using the 2.5-degree NCEP/NCAR Reanalysis and then with the 32-km North American Regional Reanalysis (NARR). However, as suspected, each analysis revealed that most of the cases were varying blends of the two primary quasi-geostrophic (QG) forcings and that there was no strong correlation between the two classifications (e.g., wrap-around and differential cyclonic vorticity advection-driven). The spectrum of blends of QG forcings made it hard to perform a clear-cut classification of the cases. An attempt was also made to classify the cases by the location of the surface low center relative to the 1000-500 mb thickness and 500 mb height patterns. While this resulted in an acceptable stratification of cases into those where the low was located near the trough, just behind the inflection point, just ahead of the inflection point, and near the ridge, there was not a great correlation between those categories and the varying blends of thermal and differential vorticity advections. From this, it was hypothesized that the ratio of the QG forcings could play a role in the precipitation patterns. (Thus, as seen later in this report, this is one of the parameters plotted for analysis.) These results along with sample imagery were presented in Washington, D.C., this past August (P1.10: "Examining the role of mesoscale features in the structure and evolution of precipitation regions in northeast winter storms," 21st Conference on Weather Analysis and Forecasting/17th Conference on Numerical Weather Prediction).

Next, the plan was to take advantage of this university-NWS partnership to obtain WES DVDs from NWS WFOs Binghamton and Albany to view the full suite of radar products and analyses for the cases. Most of the DVDs were successfully obtained through the generous help of David Nicosia of WFO BGM and Thomas Wasula of WFO ALY. Unfortunately, a few issues ensued that resulted in the WES not being used in this research. The department's Computer System/Network Administrator was unable to get the WES working on one of the department's Linux machines, as originally planned. Fortunately, Warren Snyder (WFO ALY SOO) was able to arrange for the WES in his WFO to be used by CSTAR students. After a number of delays in preparing the WES for student use, it was discovered that key data were lacking. At the time, certain plots, including EPV, were unable to be produced. More importantly, however, high-resolution radar mosaics were limited to only the radar sites adjacent to the WFO, which counteracted one of the main reasons for using the WES – being able to create high-resolution radar mosaics spanning the entire northeastern U.S.

So, the job of creating radar composites from raw Level III data from NCDC was attempted and completed with a good deal of success. Then, it was discovered that 2-km WSI NOWrad composites were available, courtesy of David Ahijevych at NCAR. This radar data, while only at 15-minute intervals instead of the Level III's 6-minute intervals, offered a cleaner radar image than the Level III composite because it had been passed through three levels of quality control. Previous research has utilized this data for its high horizontal resolution and complete spatial and temporal coverage. However, it should be noted that the NOWrad is a type of composite reflectivity (in the vertical sense), with the exact algorithm proprietary to the WSI Corporation (Carbone et al. 2002). From the NOWrad data, the spatially- and temporally-evolving character of the precipitation for each case was ascertained. Some cases had bands within uniform precipitation shields, while others had bands with low-dBZ spaces between them. Of those with bands, some bands were solid, some were broken, and some were small segments dispersed

throughout the precipitation shield. Additionally, instead of uniform shields, some heavy snow events featured fractured or grainy precipitation patterns. See Figures 1 and 2 for examples of some of these types.

Next began the task of creating horizontal plan view maps from the NARR. Besides having to determine the appropriate parameters to plot, the most significant issue was smoothing and filtering the NARR grids to obtain low-noise plots that still revealed mesoscale detail. After much trial-and-error, a set of GEMPAK smoothers and filters was selected for use with the NARR. Additionally, other GEMPAK issues were tackled through FORTRAN scripts to manipulate the gridded data for use in GEMPAK. For a list of plotted parameters, see Table 1.

Currently, each parameter is being examined for each of the now-21 cases. (Upon closer inspection earlier in the summer, nine of the original 30 cases were eliminated for not satisfying the criteria originally established prior to the last CSTAR update.) Depending on the parameter, subjective or objective information is being recorded for each parameter and case. See Figures 3 and 4 for sample plots of two of the parameters.

Throughout this process, the student has collaborated with David Nicosia (WFO BGM WCM). They met in person at WFO ALY in July and have spoken over the phone a number of times to discuss research avenues and operational considerations involved in this CSTAR research.

Future Research:

The information currently being collected will be put into a matrix of cases and parameters in order to perform a quasi-“cluster analysis” to ascertain which parameters can distinguish the different precipitation modes. From there, composites will be created and horizontal maps and cross-sections will be developed to display relationships between the variables and precipitation modes. A few in-depth analyses of some of the heavy snow events may be done. Additionally, since the NARR is currently only available through 2004, the meso-ETA analyses may be needed for events from this past winter if the NARR is not updated into 2005 soon.

Ultimately, the goal is to develop a diagnostic for determining modes of precipitation during heavy snow events based on QG and mesoscale forcings, instabilities, and microphysics. Such a diagnostic could be transformed into a Smart Tool with much benefit to NWS WFOs.

Preliminary results will be presented at the Seventh Northeast Regional Operational Workshop (NROW) on November 1-2, 2005, at the Center for Environmental Science and Technology Management (CESTM) Auditorium on the University at Albany campus. Additionally, a presentation of these results will also be delivered at WFO BGM’s winter weather workshop on November 18, 2005.

Reference:

Carbone, R. E., J. D. Tuttle, D. A. Ahijevych and S. B. Trier, 2002: Inferences of predictability associated with warm season precipitation episodes. *J. Atmos. Sci.*, **59**, 2033–2056.

Table 1 – Plotted Parameters

QG forcing from the laplacian of advection of 1000-500 mb thickness by the 700mb wind (A)
QG forcing from 700-300 mb differential vorticity advection (B)
QG forcing from 1000-500 mb differential vorticity advection (C)
Ratio of the QG forcings: e.g. [B:(A+B)], [C:(A+C)]
EPV* for the layers 600-550 mb, 700-650 mb, and 800-750 mb with an overlay of areas that contain any layers of negative $d\theta_{es}/dp$ (to indicate areas of CI)
Depth of the negative EPV* layer
2D frontogenesis for layers 750-650 mb and 850-700 mb
Average relative humidity for the layer 600-400 mb
Depth of the dendritic layer

Figure 1 – Precipitation Mode: Fractured with bands and segments

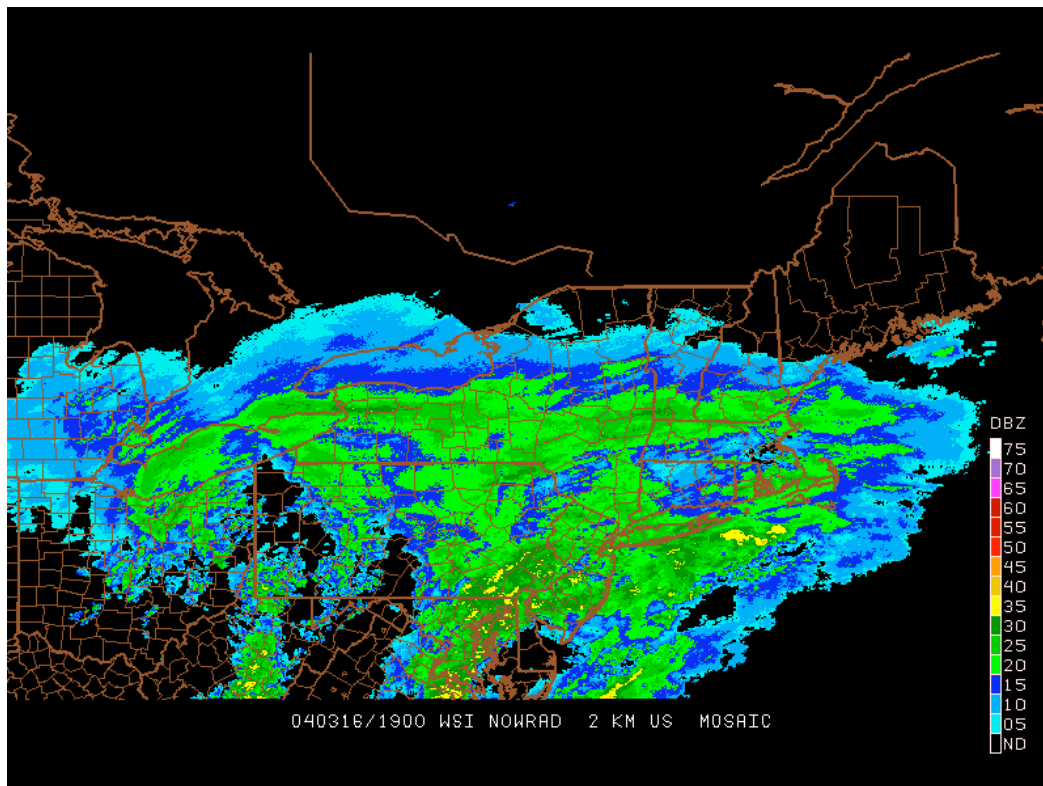


Figure 2 – Precipitation Mode: Relatively Uniform

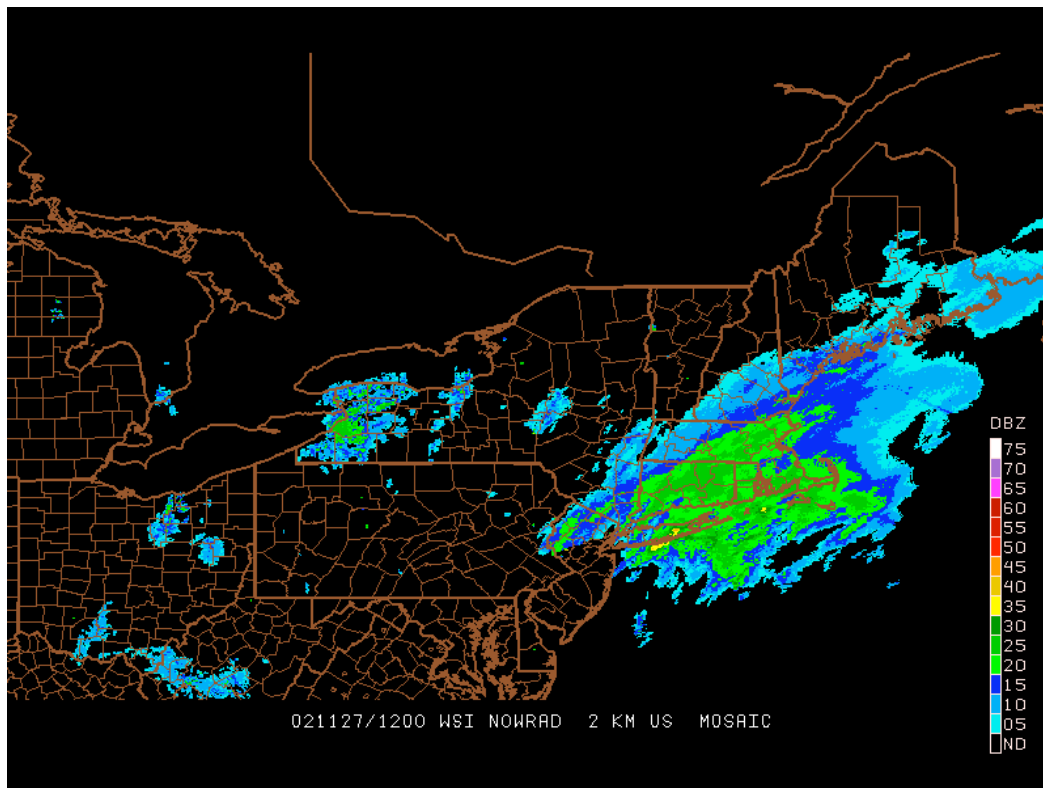


Figure 3 – QG forcing from the laplacian of 1000-500 mb thickness advection by the 700 mb wind

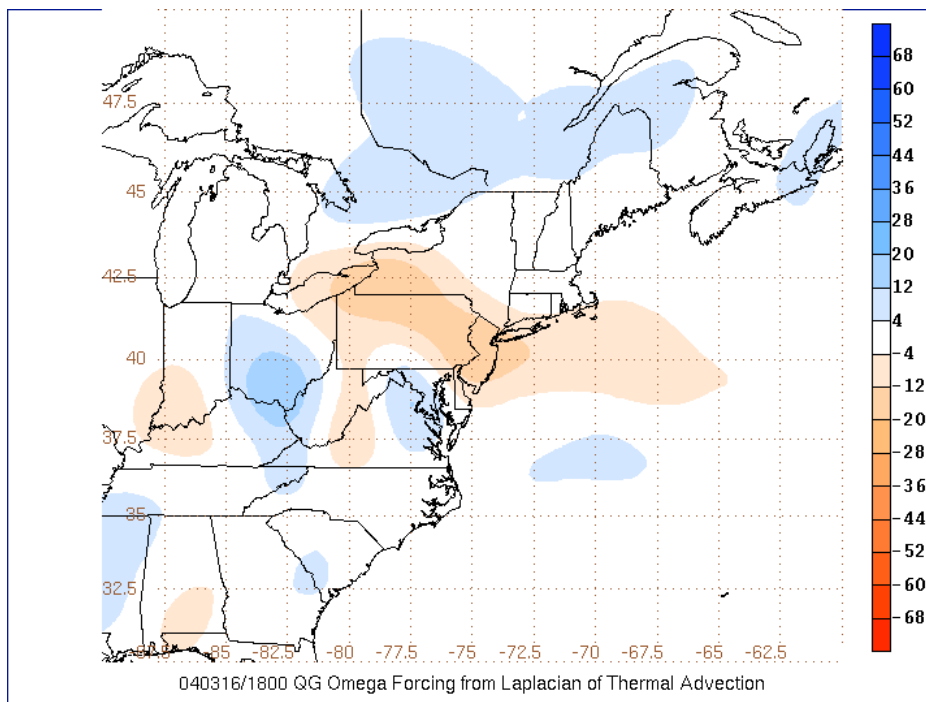
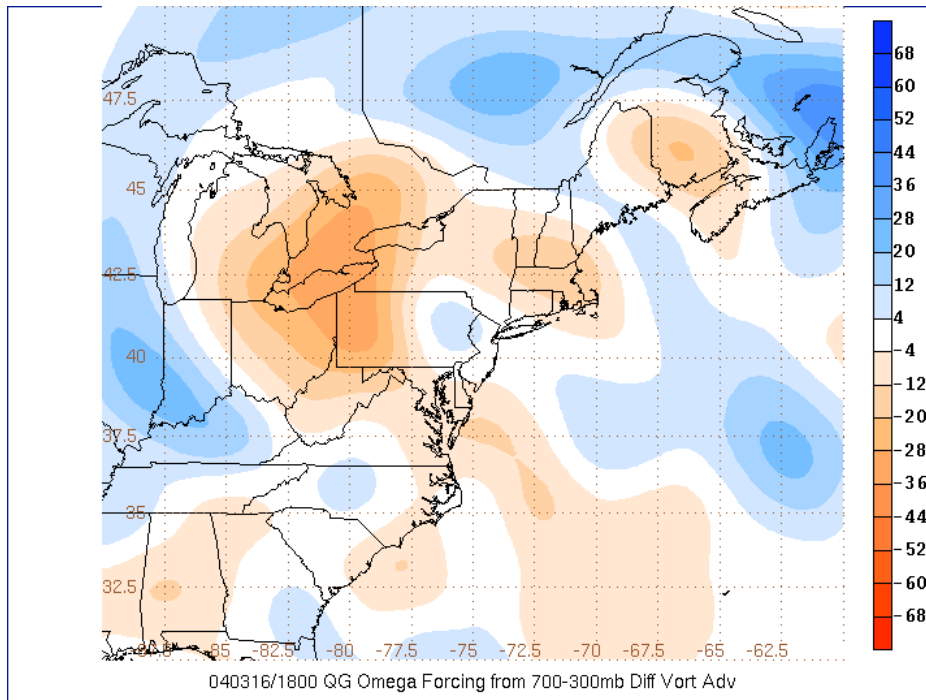


Figure 4 – QG forcing from the 700-300 mb differential vorticity advection



(c) Weakly Forced Moderate Cool-Season Precipitation Events in the Northeastern United States (Keith Wagner)

Research Summary (1 May–30 Oct):

This research continues to focus on cool-season moderate precipitation events in the Northeast. A 10-year climatology of these events was produced for 36 first-order NWS stations across the Northeast during the previous 6-month period. As a method of summarizing the results of the climatology, a contour map was produced showing the ratio of the number of events at each station to the mean number of events for all stations. This clearly shows the higher event frequency across the northern and western sections of the domain.

The focus of the research then shifted to case studies of a few Northeast cool-season moderate events. These events were limited to those occurring in relatively weak synoptic-scale forcing regimes (i.e. no rapid cyclogenesis, etc.). Several moderate events were selected based on event-total precipitation. The events included 26–27 December 2004, 9 January 2005, and 26 January 2005. As a point of reference, a schematic of heavy snowbands or snow events was consulted to see how stability, moisture sources, and lifting mechanisms contributed to the heavy event. These types of events typically feature a deep layer of negative saturation equivalent potential vorticity (EPV*) in conjunction with strong, sloping low to midlevel frontogenesis. The moderate events from this study were then compared to heavy events. It was found that many of the same features that appear in heavy events also appear in moderate events, except their structure is different in the moderate case. The moderate events generally have weaker low-level frontogenesis maxima, which are also much less steeply sloped than the heavy events. The region of negative EPV*, which denotes areas of conditional instability, is also in a very thin layer. The regions of negative EPV* and frontogenesis tend to be not as well aligned with each other in moderate events. Also, the features in moderate events are often more transient. Therefore, even when they do align themselves with each other, it usually is for a relatively short period of time. Thus the precipitation totals are reduced. The key result is that features commonly seen in heavy events are also found in moderate events. The difference is that in moderate events the features are not as strong, deep, sloped, or well aligned.

NWS Interactions:

Work on the case studies began at the summer CSTAR meeting on 2 June 2005 at the Albany NWS. NWS focal point Mike Evans and I looked briefly at one case on the Albany WES. A more in depth look at the cases began on 8 June at the Binghamton NWS with Mike Evans. Throughout the 6-month period we have made good use of the Albany NWS WES. Cases were installed and viewed with the help of Warren Snyder, Ken Lapenta, and Tom Wasula. Mike Evans has also been providing input during this time.

Successes and Problems:

The major problem for this 6-month period has been the availability and functionality (or lack thereof) of the WES at NWS Albany. Several times work was put on hold while the WES had to be upgraded. WES worked for a period of a few weeks, and then stopped functioning correctly again in August. It would not allow cross sections to be made. Luckily another upgrade solved this problem and it has been working well since. When it works correctly, the WES has been an invaluable tool for creating cross sections and plan view maps through the precipitation region. NWS personnel have been extremely helpful with the whole project.

Publications and Workshop Submissions:

The final climatology results and initial case study results were presented in poster form at the AMS WAF conference held 1-5 August 2005 in Washington, D. C. Mike Evans will also be using the results thus far in his AWOCS winter weather training course this fall.

Future Work:

Research will continue with case studies of moderate events. The main focus will be on identifying common signatures between the different case types and comparing those results with what is typically seen in heavier events.

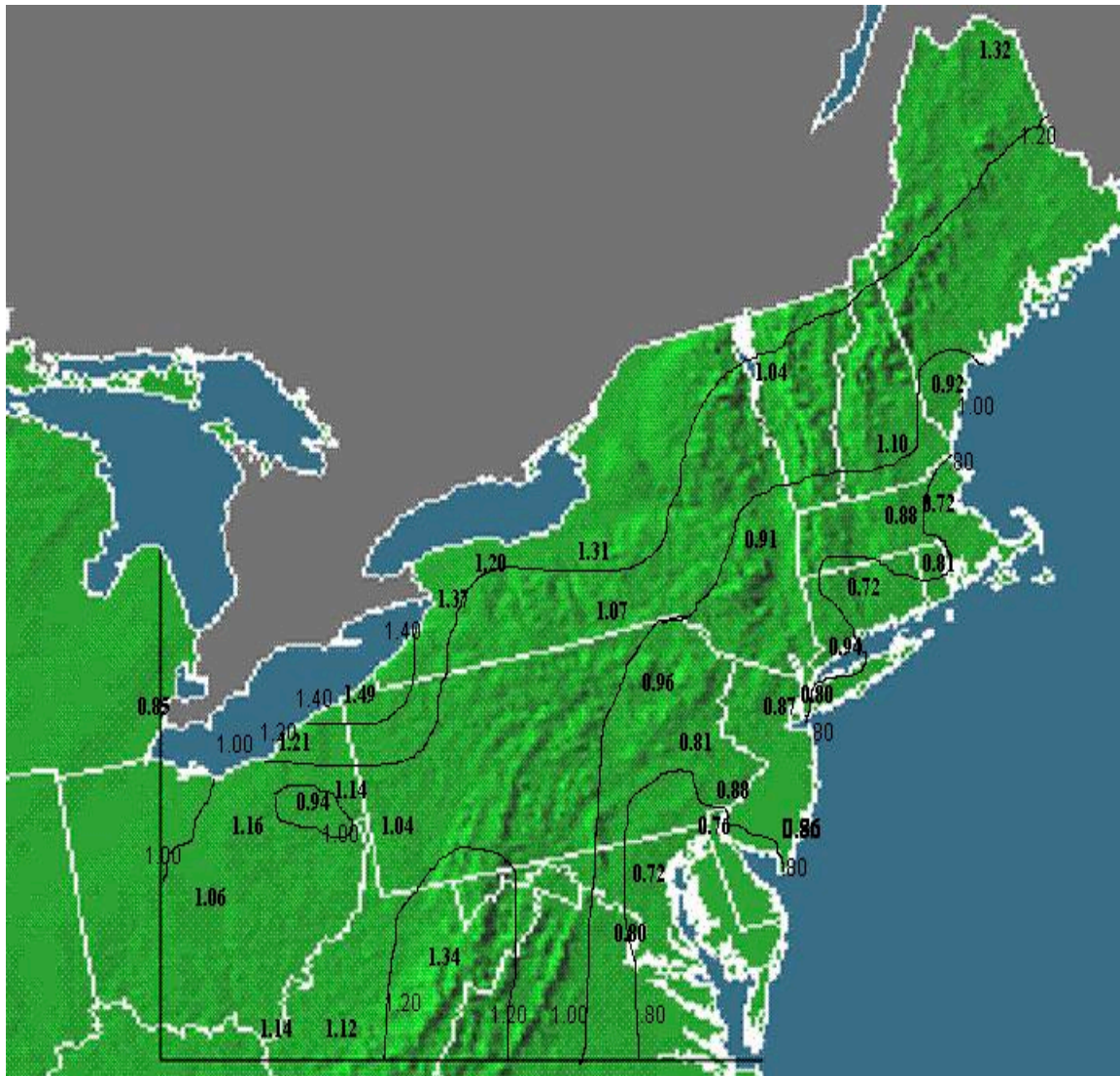


Figure 1. Ratio of number of moderate events at each station to the mean number of events for all stations.

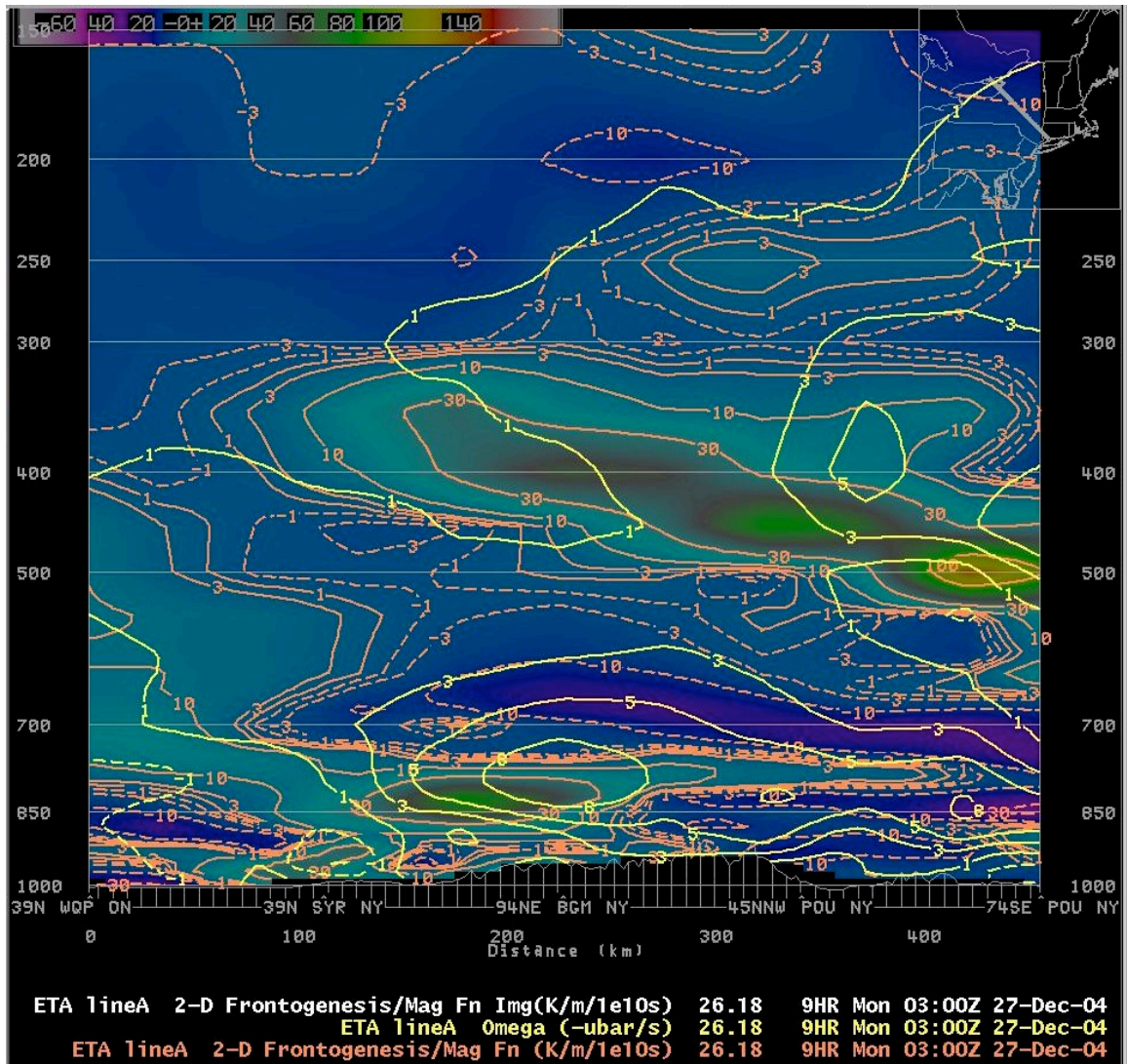


Figure 2. Cross section of frontogenesis and omega through a moderate snowband.

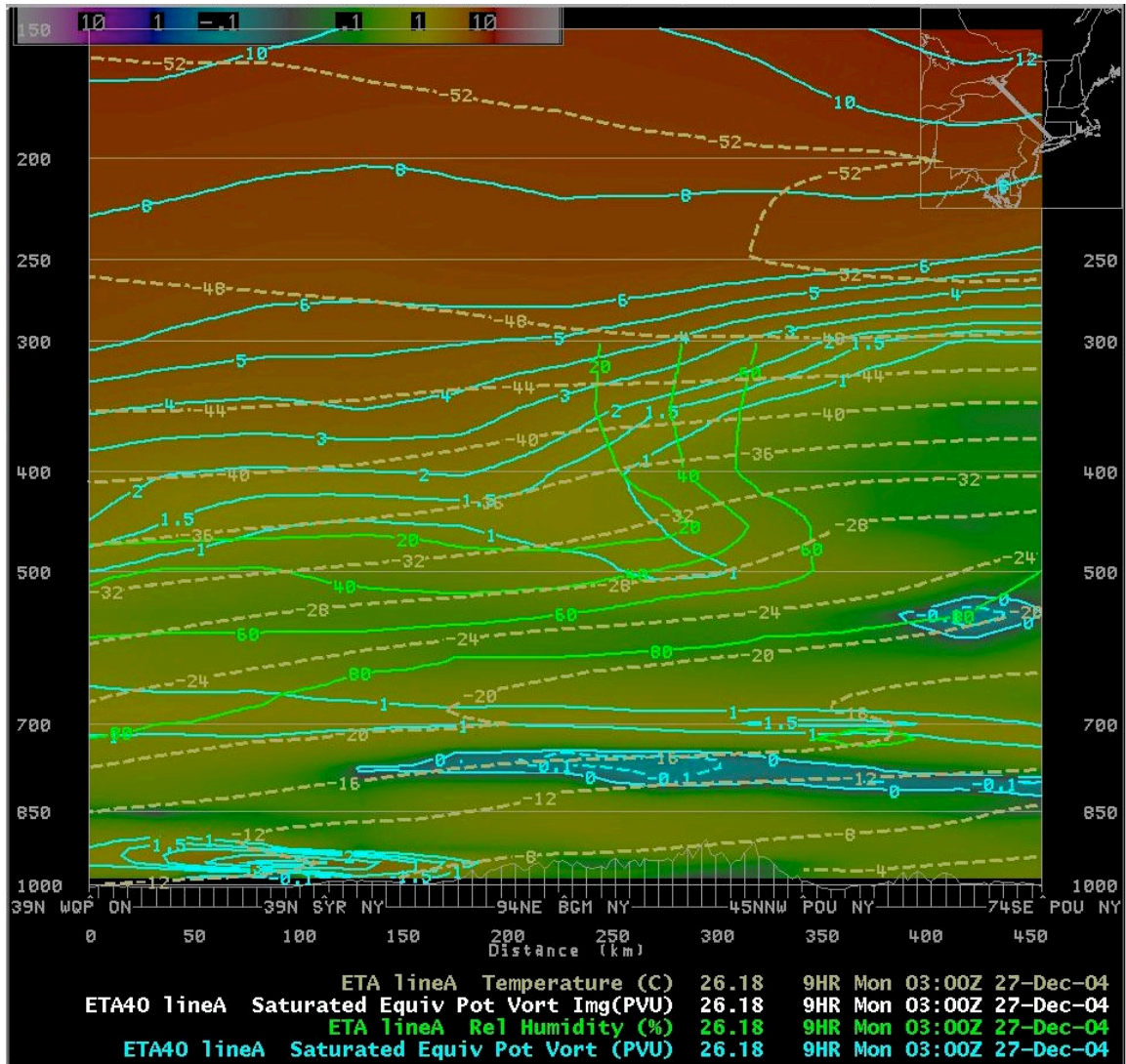


Figure 3. Cross section of EPV*, relative humidity, and temperature through a moderate snowband.

SECTION 2: Cumulative CSTAR Project Publications

a) Theses completed:

- Groenert, D., 2002: Large-scale circulation anomaly indices in relation to cool-season precipitation events in the Northeastern United States. Master of Science Thesis, Department of Earth and Atmospheric Sciences, University at Albany/SUNY, Albany, NY, 144 pp.
- Novak, D., 2002: A climatological and composite study of cold season banded precipitation in the Northeast United States. Master of Science Thesis, Department of Earth and Atmospheric Sciences, University at Albany/SUNY, Albany, NY, 182 pp.
- Smith, B. A., 2003: Cutoff cyclones: A global and regional climatology and two case studies. Master of Science Thesis, Department of Earth and Atmospheric Sciences, University at Albany/SUNY, Albany, NY, 165 pp.
- DeLuca, D. 2004: The distribution of precipitation over the northeast accompanying landfalling and transitioning tropical cyclones. Master of Science Thesis, Department of Earth and Atmospheric Sciences, University at Albany/SUNY, Albany, NY, 178 pp.
- Fracasso, A, 2004: Case studies of cold season 500 hPa cutoff cyclone precipitation distribution. Master of Science Thesis, Department of Earth and Atmospheric Sciences, University at Albany/SUNY, Albany, NY, 121 pp.
- Najuch, J., 2004: Case studies of warm season cutoff cyclone precipitation distribution. Master of Science Thesis, Department of Earth and Atmospheric Sciences, University at Albany/SUNY, Albany, NY, 108 pp.
- Archambault, H., 2005: Cool-season regime transition and its impact on precipitation in the northeastern United States. Master of Science Thesis, Department of Earth and Atmospheric Sciences, University at Albany/SUNY, Albany, NY, 163 pp.
- Wasula, A. C., 2005: A comprehensive study of cool season tornadoes in the southeast United States. Ph.D. Dissertation, Department of Earth and Atmospheric Sciences, University at Albany/SUNY, Albany, NY, 222 pp.

b) Preprints:

- Groenert, D., L. F. Bosart, D. Keyser, and R. H. Grumm, 2002: Large-scale circulation anomaly indices in relation to cool-season precipitation events in the northeastern United States. Preprints, 19th Conference on Weather Analysis and Forecasting, American Meteorological Society, 12-16 August 2002, San Antonio, TX, pp 168–171.
- Grumm, R. H., N. W. Junker, R. Hart, and L. F. Bosart, 2002: Can possible heavy rainfall events be identified by comparing various parameters to the climatological norms? Preprints, 19th Conference on Weather Analysis and Forecasting, American Meteorological Society, 12-16 August 2002, San Antonio, TX, pp 160–163.
- Junker, N. W., R. Hart, R. H. Grumm, and L. F. Bosart, 2002: Establishing a 10 Year climatology of 101.6 mm (4 inch) rainfall days, Part I. Preprints, 19th Conference on Weather Analysis and Forecasting, American Meteorological Society, 12-16 August 2002, San Antonio, TX, pp 156–159.
- Novak, D. R., and R. S. Horwood, 2002: Analysis of mesoscale banded features in the 5–6 February 2001 New England snowstorm. Preprints, 19th Conference on Weather Analysis and Forecasting, American Meteorological Society, 12-16 August 2002, San Antonio, TX, pp J103–J105.
- Novak, D. R., L. F. Bosart, D. Keyser, and J. S. Waldstreicher, 2002: A climatological and composite study of cold season banded precipitation in the northeast United States. Preprints, 19th Conference on Weather Analysis and Forecasting, American Meteorological Society, 12-16 August 2002, San Antonio, TX, pp 164–167.
- Novak, M. J., L. F. Bosart, D. Keyser, T. A. Wasula, and K. D. LaPenta, 2002: Climatology of warm season 500 hPa cutoff cyclones and a case study diagnosis of 14-17 July 2000. Preprints, 19th Conference on Weather Analysis and Forecasting, American Meteorological Society, 12-16 August 2002, San Antonio, TX, pp 68–71.

- Smith, B. A., L. F. Bosart, D. Keyser, and D. St. Jean, 2002: A global 500 hPa cutoff cyclone climatology: 1953-1999. Preprints, 19th Conference on Weather Analysis and Forecasting, American Meteorological Society, 12-16 August 2002, San Antonio, TX, pp 74-77.
- Wasula, A. C., L. F. Bosart, R. Schneider, S. J. Weiss, and R. H. Johns, 2003: Mesoscale aspects of the rapid intensification of a tornadic squall line across central Florida: 22-23 February 1998. Preprint CD-ROM, 10th Conference on Mesoscale Processes, American Meteorological Society, 23-27 June 2003, Portland, OR.
- Bosart, L. F., W. Drag, and A. C. Wasula, 2003: The unusually intense coastal front passage of 17-18 April 2002 in eastern New England. Preprints, Fifth Conference on Coastal Atmospheric and Oceanic Prediction and Processes, American Meteorological Society, 6-12 August 2003, Seattle, WA, 169-174.
- Novak, D. R., J. S. Waldstreicher, L. F. Bosart, and D. Keyser, 2003: An observational study of cold season mesoscale band formation in the Northeast United States. Preprints, 31st Conference on Radar Meteorology, American Meteorological Society, 6-12 August 2003, Seattle, WA, pp 969-972.
- Archambault, H. M., L. F. Bosart, D. Keyser, and R. Grumm, 2004: Large scale regime transition and its relationship to significant cool season precipitation events in the Northeast. Preprint CD-ROM, 20th Conference on Weather Analysis and Forecasting, 11-15 January 2004, Seattle, WA.
- DeLuca, D. P., L. F. Bosart, D. Keyser, and D. R. Vallee, 2004: The distribution of precipitation over the Northeast accompanying landfalling and transitioning tropical cyclones. Preprint CD-ROM, 20th Conference on Weather Analysis and Forecasting, 11-15 January 2004, Seattle, WA.
- Fracasso, A. R., 2004: Cold season 500 hPa cutoff cyclone precipitation distribution and a case study. Preprint CD-ROM, 20th Conference on Weather Analysis and Forecasting, 11-15 January 2004, Seattle, WA.
- Junker, N. W., R. H. Grumm, R. Hart, and L. F. Bosart, 2004: A climatological study of 100 mm or greater days in northern California. Preprint CD-ROM, 20th Conference on Weather Analysis and Forecasting, 11-15 January 2004, Seattle, WA.
- Najuch, J. S., L. F. Bosart, D. Keyser, T. Wasula, and K. D. LaPenta, 2004: Case studies of warm season cutoff cyclone precipitation distribution. Preprint CD-ROM, 20th Conference on Weather Analysis and Forecasting, 11-15 January 2004, Seattle, WA.
- Novak, D. R., J. S. Waldstreicher, L. F. Bosart, and D. Keyser, 2004: A forecast strategy for anticipating cold season mesoscale band formation within developing extratropical cyclones. Preprint CD-ROM, 20th Conference on Weather Analysis and Forecasting, 11-15 January 2004, Seattle, WA.
- St. Jean, D. P., P. A. Sisson, L. F. Bosart, D. Keyser, and B. Smith, 2004: Characteristics of upslope snowfall events in Northern New York State and Northern Vermont: Diagnostics and model simulations of several Northwest-flow cases. Preprint CD-ROM, 20th Conference on Weather Analysis and Forecasting, 11-15 January 2004, Seattle, WA.
- Wasula, T. A., A. C. Wasula, and L. F. Bosart, 2004: A multi-scale analysis of the end of the millennium snowstorm. Preprint CD-ROM, 20th Conference on Weather Analysis and Forecasting, 11-15 January 2004, Seattle, WA.
- Wasula, A. C., L. F. Bosart, R. Schneider, S. J. Weiss, and R. H. Johns, 2004: Cool season tornadoes in the southeast United States: A climatological and case study perspective. Preprint CD-ROM, 20th Conference on Weather Analysis and Forecasting, 11-15 January 2004, Seattle, WA.
- Bosart, L. F., K. LaPenta, A. Seimon, M. Dickinson, and T. J. Galarneau, Jr., 2004: Terrain-influenced tornadogenesis in the northeastern United States. Preprint CD-ROM, 11th Conference on Mountain Meteorology, 21-25 June 2004, Bartlett, NH.
- Sisson, P. A., D. St. Jean, E. Evenson, W. E. Murray, S. F. Hogan, L. F. Bosart, D. Keyser, and B. Smith, 2004: Applying local research to National Weather Service operations: Forecasting heavy mountain snowfalls in Vermont and Northern New York. Preprint CD-ROM, 11th Conference on Mountain Meteorology, 21-25 June 2004, Bartlett, NH.

- Bosart, L. F., K. D. LaPenta, A. Seimon, and M. J. Dickinson, 2004: Terrain-influenced tornadogenesis in the northeastern United States: An examination of the 29 May 1995 Great Barrington, Massachusetts, Tornado. Preprint CD-ROM, 22nd Conference on Severe Local Storms, 4-8 October 2004, Hyannis, MA.
- LaPenta, K. D., L. F. Bosart, T. J. Galarneau Jr., and M. J. Dickinson, 2004: A multiscale examination of the 31 May 1998 Mechanicville, New York, Tornado. Preprint CD-ROM, 22nd Conference on Severe Local Storms, 4-8 October 2004, Hyannis, MA.
- Novak, D., and A. Aiyyer, 2004: The 2004 April fool's New England flooding event: Analysis of three heavy precipitation episodes associated with a slow moving cutoff cyclone. Preprint CD-ROM, 22nd Conference on Severe Local Storms, 4-8 October 2004, Hyannis, MA.
- Seimon A., and L. F. Bosart, 2004: An observationally based hypothesis for significant tornadogenesis in mountain environments. Preprint CD-ROM, 22nd Conference on Severe Local Storms, 4-8 October 2004, Hyannis, MA.
- Wasula, A. C., L. F. Bosart, R. Schneider, S. J. Weiss, R. H. Johns, G. S. Manikin, and P. Welch, 2004: The structure and climatology of boundary layer winds in the southeast United States and its relationship to nocturnal tornado episodes. Preprint CD-ROM, 22nd Conference on Severe Local Storms, 4-8 October 2004, Hyannis, MA.
- Archambault, H. M., D. Keyser, L. F. Bosart, and A. Aiyyer, 2004: Cool-season regime transition and its impact on precipitation in the northeast United States. Preprint, The First THORPEX International Science Symposium, 6-10 December, Montréal, Québec, Canada.

c) PI and/or student oral presentations:

- Bosart, L. F., 2001: Scientific and operational lessons from the 25 Jan '00 and 30 Dec '00 snowstorms. Oral presentation at the 26th Annual Northeastern Storm Conference, 9-11 March 2001, Saratoga Springs, NY.
- Bosart, L. F., 2001: An overview of derechos and their environments. Oral presentation at the CSTAR Conference and Albany Weather Forecasting Office Spring Meeting, 25-26 April 2001, Albany, NY.
- Bosart, L. F., 2001: Death by 1000 Cuts? Oral presentation at the Third Northeast Regional Operational Workshop, 6-7 November 2001, Albany, NY.
- Groenert, D., L. F. Bosart, D. Keyser, and R. Grumm, 2001: Large-scale circulation anomaly indices in relation to cool-season precipitation events in the northeastern United States. Oral presentation at the Third Northeast Regional Operational Workshop, 6-7 November 2001, Albany, NY.
- Novak, D., L. F. Bosart, D. Keyser, and J. Waldstreicher, 2001: A climatology of cold season banded precipitation in the northeast United States. Oral presentation at the Third Northeast Regional Operational Workshop, 6-7 November 2001, Albany, NY.
- Smith, B. A., L. F. Bosart, D. Keyser, and D. St. Jean, 2001: A climatology of 500 hPa cutoff cyclones. Oral presentation at the Third Northeast Regional Operational Workshop, 6-7 November 2001, Albany, NY.
- Bosart, L. F., 2002: Dynamic tropopause and PV maps: A user's guide. Oral presentation at the 27th Annual Northeastern Storm Conference, 8-10 March 2002, Saratoga Springs, NY.
- Groenert, D., L. F. Bosart, and D. Keyser, 2002: Large-scale circulation anomaly indices in relation to cool-season precipitation events in the northeastern United States. Oral presentation at the 27th Annual Northeastern Storm Conference, 8-10 March 2002, Saratoga Springs, NY.
- Novak, D., L. F. Bosart, D. Keyser, and J. Waldstreicher 2002: A climatological and composite study of cold season banded precipitation in the northeast United States. Oral presentation at the 27th Annual Northeastern Storm Conference, 8-10 March 2002, Saratoga Springs, NY.
- Bosart, L. F., 2002: Mesoscale boundaries, organized deep convection and forecast derailments. Oral presentation at the Northeast Regional Operational Workshop, 5 November 2002, Albany, NY.
- Novak, D., J. Waldstreicher, L. F. Bosart, and D. Keyser, 2002: Anticipating mesoscale band formation in winter storms. Oral presentation at the Northeast Regional Operational Workshop, 5 November 2002, Albany, NY.

- Novak, M. J., L. F. Bosart, D. Keyser, T. A. Wasula, and K. D. LaPenta, 2002: A climatology of warm season 500 hPa cutoff cyclones and case study. Oral presentation at the Northeast Regional Operational Workshop, 5 November 2002, Albany, NY.
- Smith, B. A., L. F. Bosart, D. Keyser, and D. St. Jean, 2002: Cutoff cyclones: A global and regional climatology (1948–2001) and two case studies. Oral presentation at the Northeast Regional Operational Workshop, 5 November 2002, Albany, NY.
- Atallah, E. H., and L. F. Bosart, 2003: Tropical cyclone extratropical transition evolutions: Forecast vs. observed. Oral presentation at the 28th Annual Northeastern Storm Conference, 7-9 March 2003, Saratoga Springs, NY.
- Atallah, E. H., A. Ayyer, and L. F. Bosart, 2003: Teleconnections, 1000-500 hPa thickness and storm tracks in the Northern Hemisphere. Oral presentation at the 28th Annual Northeastern Storm Conference, 7-9 March 2003, Saratoga Springs, NY.
- Brewster, J., and M. Evans, 2003: Forecasting the Christmas Day 2002 Snowstorm using modernized National Weather Service tools, training and technology. Oral presentation at the 28th Annual Northeastern Storm Conference, 7-9 March 2003, Saratoga Springs, NY.
- Bosart, L. F., and M. J. Dickinson, 2003: The double transition of Hurricane Michael (2000): Baroclinic to tropical to baroclinic. Oral presentation at the 28th Annual Northeastern Storm Conference, 7-9 March 2003, Saratoga Springs, NY.
- Novak, M. J., A. Ayyer, L. F. Bosart, D. Keyser, T. A. Wasula, and K. D. LaPenta, 2003: Climatology of warm season 500 hPa cutoff cyclones and case study diagnosis of 14–17 July 2000. Oral presentation at the 28th Annual Northeastern Storm Conference, 7-9 March 2003, Saratoga Springs, NY.
- Smith, B. A., L. F. Bosart, D. Keyser, and D. St. Jean, 2003: Cutoff cyclones: A global and regional climatology (1948–2001) and two case studies. Oral presentation at the 28th Annual Northeastern Storm Conference, 7-9 March 2003, Saratoga Springs, NY.
- Archambault, H. M., 2003: Large-scale regime transition and its relationship to significant cool season precipitation events in the Northeast. Oral presentation at the NWS/UAlbany/NCSU CSTAR Workshop, 9-10 July 2003, Silver Spring, MD.
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- d) CSTAR/COMET related refereed publications:**
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- Novak, D. R., L. F. Bosart, D. Keyser, and J. S. Waldstreicher, 2004: An observational study of cold season-banded precipitation in northeast U.S. cyclones. *Wea. and Forecasting*, **19**, 993–1010.
- Novak, D. R., J. S. Waldstreicher, D. Keyser, and L. F. Bosart, 2005: A forecast strategy for anticipating cold season mesoscale band formation within eastern U.S. cyclones. *Wea. and Forecasting*, **20**, (in press).
- Bosart, L. F., A. Seimon, K. D. LaPenta, M. J. Dickinson, and W. E. Bracken, 2005: Supercell tornadogenesis over complex terrain: The Great Barrington, Massachusetts Tornado on 29 May 1995, (submitted to *Wea. and Forecasting*).
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- Wasula, A. C., L. F. Bosart, R. S. Schneider, S. J. Weiss, G. S. Manikin, and P. Welch, 2005: Mesoscale aspects of the rapid intensification of a tornadic convective line across central Florida: 22-23 February 1998. *Wea. and Forecasting*, **20**, (conditionally accepted).
- Bosart, L. F., A. C. Wasula, W. Drag, and K. Meier, 2005: Strong surface fronts over sloping terrain and coastal plains. *Mesoscale Weather Systems*, L. F. Bosart and H. B. Bluestein, Ed., *Meteor. Monogr.*, American Meteorological Society, (accepted).

SECTION 3: Report by Eugene P. Auciello, (NWS Perspective)

CSTAR: May 2005 – October 2005

**Eugene P. Auciello
Meteorologist In Charge
WFO Albany, NY**

The CSTAR II Project, “Continuing Studies of Cool and Warm Season Events over the Northeast United States,” continues at a high level.

On June 2, 2005, a CSTAR II organizational meeting was conducted at the Center for Environmental Sciences and Technology Management, University at Albany, to address current and planned research activities. Attendees included CSTAR principal investigators, graduate students, and NWS collaborators from across the Northeast. The meeting focused on project prioritization, data availability, levels of participation, and reporting procedures.

Principal investigators, graduate students, and Science and Operations Officers have engaged NWS meteorologists and hydrologists in CSTAR II projects, and associated research projects, at the following NWS Eastern Region offices.

• WFO Albany, New York

Project: *Northeast Warm Season Severe Weather, Identifying the Role Terrain Features, and Land/Water Boundaries Have on Convective Development and Evolution*

Project: *Northeast Convective Flash Flood Events*

Project: *Integration of Research into Operations*

Project: *Utility of Modernized Coop Data to Support CSTAR Research*

• WFO Binghamton, New York

Project: *Mesoscale Aspects of Heavy Snow/Icing Events in the Northeast*

Project: *Weakly Forced Moderate Cool-Season Precipitation Events in the Northeastern United States*

Project: *Fog Forecasting*

• WFO Caribou, Maine

Project: *Integrating Probabilistic Methods into the Aviation Forecast Process; Applying Signal Detection Theory in Creating TAFs*

Project: *Northern New England Inverted Coastal Trough*

• WFO Gray, Maine

Project: *Upslope Localized Flood Events*

• WFO State College, Pennsylvania

Project: *Cool Season Regime Transition and Its Impact on Precipitation in the Northeastern United States*

- WFO Taunton, Massachusetts

Northeast River Forecast Center, Taunton, Massachusetts

Project: *Landfalling and Transitioning Tropical Cyclones*

- WFO Upton, New York

Project: *Transition of Ensembles of Mesoscale Models to Operational Forecasting –Exploring the Use of Multiple Runs of Mesoscale Models and Their Utility to Forecasting*

- Center Weather Service Unit, Oberlin, Ohio

Project: *Assess the Work Station ETA's Ability to Access Thunderstorm Formation to Improve Air Traffic Routing at the Cleveland FAA Air Route Traffic Control Center*

Project: *Correlation of Snow Intensity to Runway Visual Range*

A follow-up CSTAR II organizational meeting will be held at the University at Albany on November 1-2, 2005, in conjunction with the 7th Northeast Regional Operational Workshop. The workshop is co-hosted by WFO Albany and the Department of Earth and Atmospheric Sciences. The American Meteorological Society is a cooperating organization. The workshop will highlight CSTAR research.

Finally, a recently hired Information Technology Specialist at WFO Albany will focus on the integration of research into operations in order to capitalize on the scientific and technological advances that result from CSTAR research. Activities will include AWIPS SmartTool development, AWIPS visualizations, AWIPS procedures and diagnostics, weather event simulator training, and teletraining.

SECTION 4: NWS Semi-Annual Reports

(a) NWS Binghamton, NY

Mike Evans (NWS WFO BGM)

May 2005 – October 2005

I can summarize what I have done with my project pretty quickly. I met with Keith Wagner at NRO Mike Evans (SOO at BGM) continued to work as an NWS focal point on the project on moderate snow events, with graduate student Keith Wagner, and faculty advisors Lance Bosart and Dan Keyser. Mike visited ALY and Keith visited BGM in May. During both visits Mike and Keith examined case study diagnostics on the available NWS WES machines, and discussed ideas for the project. Mike Evans is currently involved in transferring some of the findings from Keith's research and case studies to the NWS Winter Advanced Warning Operations Course. Mike is a co-author of the course, and is working on integrating the results of this study into the section on Precipitation Forcing Mechanisms and Diagnosis for Winter Weather.

Mike Evans and Mike Jurewicz (lead forecaster at BGM) continue to work with Dave Vallee (SOO at BOX) on a CSTAR project on heavy precipitation associated with transitioning tropical cyclones. Mike and Mike provided Dave with detailed analyses of the mechanisms for heavy precipitation across the northern mid-Atlantic region associated with tropical cyclones Frances and Ivan. Mike Jurewicz presented some of that work at the Weather and Forecasting conference in Washington DC in August. In addition, Mike and Mike are currently working on a study that compares the forcing for heavy precipitation associated with transitioning tropical storm Cindy with the forcing associated with Frances and Ivan. Tentative plans are for that research to be presented at the Northeast Regional Operational Workshop in Albany in November.

Dave Nicosia (WCM at BGM) continues to work as an NWS focal point on the project on cyclogenesis and banded snowfall, with graduate student Matt Greenstein, and faculty advisor Lance Bosart. Dave and Matt met in Albany during the spring of 2005, and Dave continues to provide input and suggestions on Matt's research project.

Keith Wagner and Matt Greenstein assisted Mike Evans on a central NY tornado climatology project, by providing him with copies of several old weather maps obtained from the SUNY Albany library. Mike Evans, Mike Jurewicz and Tom Wasula (general forecaster at ALY) have begun some data collection on this potential collaborative project.

(b) NWS Binghamton, NY

Focal point: David Nicosia, Warning Coordination Meteorologist (NWS WFO BGM)

Report for May 1, 2005 to October 31, 2005

Mesoscale Aspects of Heavy Snow/Icing Events in the Northeast U.S.

In the period between April 1, 2005 through August 31, 2005 WFO Binghamton continues work with Matt Greenstein on research in the realm of Mesoscale aspects of heavy precipitation events in the northeast. In this time period, Matt has identified his thesis topic.

His topic entails understands the physical and dynamical processes associated with different types of precipitation shields associated with east coast cyclogenesis. Matt is looking at a large set of nor'easter's which produced heavy snowfall as defined by a threshold snow amount (6 inches in 12 hours).

Matt is researching what processes lead to large shields of moderate to heavy snow vs. to a precipitation shield dominated by mesoscale banded as well as a "fractured" more convective-like appearance to the precipitation shield. Matt is look at positive thermal advections, differential cyclonic vorticity advection, negative saturated geostrophic equivalent potential vorticity and frontogenesis using GEMPAK to better understand the evolution of the precipitation fields during cyclogenesis.

We also have obtained a variety of cases on the WES at NWS Binghamton and Albany for further analysis. Matt is also looking at obtained radar data from a couple other sources. Matt continues to be involved with gathering data for GEMPAK.

I visited NWS Albany and SUNY Albany on August 30th, 2005 to meet with Matt Greenstein and Warren Snyder, SOO, NWS Albany to further discuss strategies associated with the research project.

The next phase has begun as we have most of our data. Matt is also actively involved in reading research papers related to mesoscale precipitation banding and other aspects of snowstorms. Matt and I plan to meet again shortly and discuss some preliminary results that we have found and to determine the next phase for the research.

(c) NWS Taunton, MA

Focal Point: David Vallee (NWS WFO KBOX)

May 2005 – October 2005

Project name: CSTAR Warm Season Tropical Project Report

NWS Lead: David R. Vallee

Contributors: R. Horwood (NERFC)
Mike Evans (SOO WFO BGM)
Mike Jurewicz (WFO BGM)
J. Cannon (WFO GYX)
J. Notchey (ITO WFO BOX)

Completed Activities:

Activities increased during the March through September period on the NWS side of the project. Mike Evans and Mike Jurewicz conducted a study on the heavy rainfall associated with Ivan and Frances of the 2004 season. Their results were presented at the WAF conference, August 2005.

David Vallee completed the development of a Visit Teletraining session on the results of CSTAR 1 – entitled “Examining the Distribution of Heavy Rainfall Associated with Land Falling Tropical Cyclone in the Northeast U.S.” This presentation was given twice, on July 15 and again on July 21. Participation included all ERH offices as well as HPC and neighboring River Forecast Centers. This information was provided to over 100 attendees between the two sessions.

Lastly, the remnants of tropical cyclone Katrina gave us an opportunity to test out some of the research results as she made the turn northeast through the Great Lakes region. Coordination occurred between WFO BOX, NERFC, WFO BUF and HPC on model projections and how they related to our research results. In response, HPC raised initial rainfall forecasts to the 4-6 inch range, which later verified as the system moved through northern New York State.

Upcoming Activities:

David Vallee will be working on an analysis of rainfall associated with Charley, Gaston and Jeanne of the 2004 season.

Ron Horwood, of the Northeast River Forecast Center, will spend some time during the next 3 to 6 months reconstructing rainfall analyses for tropical cyclones meeting the greater than 4 inch criteria in the study region from 1999 through 2004.

James Notchey (ITO WFO BOX) and David Vallee will continue their work on the construction of reanalyses to support work on the relationship of Potential Vorticity coupling and the evolution of the shift of heavy rainfall left of center. These reanalyses will also support a branch study being conducted by David Vallee and John Cannon addressing the critical components leading to rapid recurvature and acceleration into New England.

NWS thoughts on focus for the next 1-2 years:

1. Investigation of meso-scale processes associated with heavy rainfall in land falling tropical cyclones.
 - a. Coastal frontogenesis
 - b. Meso-scale banded structures
 - c. Orographic enhancement

2. Pre-storm heavy rainfall (flash flood) events

References:

Jurewicz, Michael L. Sr. and M. Evans 2005: **Atmospheric Processes Associated with Heavy Rainfall during the Extra-tropical Transitions of Ivan and Frances.** Preprint. *21st Conf. on Wea. Anal. and Forecasting/17th Conf. NWP*, Washington, D.C.

Vallee, David R. 2005: **Examining Heavy Rainfall Associated with Land Falling Tropical Cyclones in the Northeastern U. S.** Visit Teletraining Session, *ERH SSD*, Bohemia, NY.

(d) NWS Albany, NY

Focal Point Leader: Thomas A. Wasula, NWS Albany, NY

Robert LaPlante, NWS Cleveland, OH

Thomas Niziol, NWS Buffalo, NY

David Zaff, NWS Buffalo, NY

Steve Zubrick, NWS Sterling, VA

Michael Ekster, NWS Upton, NY

Dr. Lance Bosart, University at Albany

Dr. Daniel Keyser, University at Albany

Warren Snyder, NWS Albany, NY

CSTAR II Research (May 2005 - October 2005)

I. Project Activities and Work Done

Tom participated in the Albany CSTAR II meeting on June 2, 2005. Collaborative and associated CSTAR II projects were discussed. The discussion also involved CSTAR I research results and how to infuse them into training and technology. Tom volunteered to work on a VISIT session on Warm Season Closed Lows. The goal is to have the session ready by the end of the Winter of 2006 (roughly April 1, 2006). A copy of Jessica Najuch M.S. thesis on Warm Cutoff Cyclones and their Precipitation Distributions was forwarded to Tom from the University at Albany to compliment the NWS research work on the topic for the potential training session. None of the other NWS contributors to the CSTAR II warm season severe convection project were able to attend the meeting.

Tom continued work on a Lake Breeze severe weather event that impacted eastern New York and western New England on August 9, 2001. In this particular case, a lake breeze coming off Lake Ontario initiated severe weather in the Mohawk River Valley eastward into western New England. Some new results show the orientation and the strength of the mid level ridge axis being important for the lake breeze development. Also, the lake-land thermal gradient is very important for the intensity of the convection coupled with the shear and instability in place. It is still unclear where the lake breeze boundary is being separated from the thunderstorm outflow. The marginal importance of the 0-2 km and 0-3 km shear is also being investigated, since results show the high 850 mb theta-e air in excess of 350K advected over central and eastern New York and extremely large surface base instability values helped fuel the storms. The high theta-e air in the boundary layer or surface to 850 mb seems to be crucially important in lake or land breeze severe thunderstorms. This case will still be further analyzed and will perhaps be used to write a conference technical preprint in 2006 (AMS Severe Local Storms) or a technical attachment.

Dave Zaff, the SOO at Buffalo, is looking at few land/lake breeze severe weather cases from this summer. One case occurred on June 9-10, 2005 and the other occurred on August 1, 2005. An e-mail synopsis was sent of the two cases with some slight editing by Tom. It is included in **section VI** of this report.

Mike Ekster from the NWS at Upton joined the CSTAR II project. He is trying to come up with some cases in the Long Island and the southern New England region. Two cases he has come across are

July 19, 2005 and August 5, 2005. He has done a brief mesoanalysis of the August 5, 2005 case. Tom will be assisting him on a joint mini-presentation at the October 31, 2005 CSTAR II meeting at Albany summarizing this case. Mike's brief initial summary stated the following evolution: "Severe thunderstorms developed mainly on the North Shore of Long Island during the afternoon which caused wind damage from Nassau County all the way to Orient Point on the North Fork. Several intriguing boundary collisions involving the sea breeze were noted on the visible satellite imagery and the OKX radar."

Cases and datasets (model and observational) will still continue to be gathered for this project over the next 6 months by some of the contributing offices.

There are no new items to report from Bob LaPlante (SOO at Cleveland) and Steve Zubrick (SOO at Sterling) over the past 6 months.

The Advanced Weather Operations Course (AWOC) has been completed by the Northeast offices and peak summer leave has concluded in mid-September, which may free up more time for CSTAR research in the Fall.

No university students have been assigned to the warm season Northeast severe weather CSTAR II research yet.

II. Publication(s) on CSTAR II Research

LaPenta K. D., T. A. Wasula, M. J. Novak, 2004: The Eastern New York and Western New England Floods of 14-17, 2000. Eastern Region Technical Attachment October 2004

III. Presentations on CSTAR II Research

Wasula, T. A., 2004. The August 9, 2001 Lake Breeze Severe Weather Event across New York and Western New England, 6th Northeast Operational Workshop, Albany, NY, November 2, 2004.

IV. Past Research Presentations (CSTAR I)

- LaPenta, K. D., 2002. A Multi-scale Examination of the 31 May 1998 Mechanicville, New York F3 Tornado, 4th Northeast Regional Operational Workshop, Albany, NY, November 5-6, 2002.
- Najuch, J. S., A. Aiyyer, L. F. Bosart, D. Keyser, T. A. Wasula and K. D. LaPenta, 2003: Case Studies of Warm Season Cutoff Cyclone Precipitation Distribution. Northeast Storms Conference, Saratoga Springs, NY, March, 2004.
- Najuch, J. S., L. F. Bosart, D. Keyser, T. A. Wasula, K. D. LaPenta, 2004: Case Studies of Warm Season Cutoff Cyclone Precipitation Distribution. AMS 20th Conference on Weather Analysis and Forecasting, Seattle, WA. (January 11-16, 2004 - Poster Session)
- Najuch, J. S., A. Aiyyer, L. F. Bosart, D. Keyser, T. A. Wasula and K. D. LaPenta, 2003: Case Studies of Warm Season Cutoff Cyclone Precipitation Distribution. Joint NWS/UAlbany/NCSU CSTAR Workshop at NOAA Headquarters, Silver Spring, MD, July 9-10, 2003.
- Novak, M.J., A. Aiyyer, L.F. Bosart, D. Keyser, T. A. Wasula, and K. D. LaPenta, 2003: Climatology of Warm Season 500 hPa Cutoff Cyclones and Case Study. Joint NWS/UAlbany/NCSU CSTAR Workshop at NOAA Headquarters, Silver Spring, MD, July 9-10, 2003.
- Novak, M.J., L.F. Bosart, D. Keyser, T. A. Wasula, and K. D. LaPenta, 2002. A Climatology of Warm Season 500 hPa Cutoff Cyclones, Northeast Storms Conference, Saratoga Springs, NY, March 8, 2003.
- Novak, M.J., L.F. Bosart, D. Keyser, T. A. Wasula, and K. D. LaPenta, 2002. A Climatology of Warm Season 500 hPa Cutoff Cyclones, 4th Northeast Regional Operational Workshop, Albany, NY, November 5-6, 2002.

- Novak, M.J., L.F. Bosart, D. Keyser, T. A. Wasula, and K. D. LaPenta, 2002. Climatology of Warm Season 500 hPa Cutoff Cyclones, AMS 19th Conference on Weather Analysis and Forecasting, San Antonio, TX. (August 12-16, 2002 -> poster session)
- Wasula, T. A., 2004. The Father's Day 2002 Severe Weather Outbreak across New York and Western New England, AMS 22nd Conference on Severe Local Storms Forecasting, Hyannis, MA. (October 4-8, 2004 -> poster session)
- Wasula, T. A., 2003. The Father's Day 2002 Severe Weather Outbreak across New York and Western New England, 5th Northeast Regional Operational Workshop, Albany, NY, November 6-7, 2003.
- Wasula, T. A., 2003: Memorial Day 2001 - A Closed Low Hail Event Case Study. Joint NWS/UAlbany/NCSU CSTAR Workshop at NOAA Headquarters, Silver Spring, MD, July 9-10, 2003.
- Wasula, T. A., 2003. Overview of a Warm Season CSTAR Project, Spring Station Meeting, Albany, NY (May 6, 2003).
- Wasula, T. A., K. D. LaPenta, 2002. A Hail Event Case Study of a Warm Season Closed Low in the Northeast, 4th Northeast Regional Operational Workshop, Albany, NY, November 5-6, 2002.
- Wasula, T. A. and K. D. LaPenta, 2002. Warm Season Closed Lows in the Northeastern United States, 27th Annual National Weather Association Conference, Fort Worth, TX, October 19-24, 2002 (Poster Session).
- Wasula, T.A., 2002. Severe Weather across Eastern New York and Western New England, Science Symposium at Salem High School, Salem, NY.
- Wasula, T. A., 2002. Albany Warm Season Holiday Severe Weather 2001 - An Analysis on the Memorial Day Severe Weather Event, Spring Station Meeting, Albany, NY.
- Wasula, T. A. and K. D. LaPenta, 2002. Warm Season Closed Lows in the Northeastern United States, Northeast Storms Conference, Saratoga Springs, NY, March 9, 2002.
- Wasula, T. A. and K. D. LaPenta, 2001. Warm Season Closed Lows in the Northeastern United States, 3rd Northeast Operational Workshop, Albany, NY.

V. Preprints

- Najuch, J. S., L. F. Bosart, D. Keyser, T. A. Wasula, K. D. LaPenta, 2004: Case Studies of Warm Season Cutoff Cyclone Precipitation Distribution. Preprints of the 20th AMS Conference on Weather Analysis and Forecasting, Seattle, WA, American Meteorological Society, 11-16 January 2004, CD-ROM, P 1.46.
- Novak, M. J., L.F. Bosart, D. Keyser, T. A. Wasula, and K. D. LaPenta, 2002: Climatology of warm season 500 hPa cutoff cyclones and a case study diagnosis of 14-17 July 2000. Preprints, 19th Conference on Weather Analysis and Forecasting, American Meteorological Society, 12-16 August 2002, San Antonio, TX, pp 68-71.
- Wasula T. A., 2004: The Father's Day 2002 Severe Weather Outbreak across New York and Western New England. Preprints, 22nd Conference on Severe Local Storms Forecasting, American Meteorological Society, 4-8 October 2004, Hyannis, MA, CD-ROM, P 1.5.

VI. E-mail Correspondence/Summary (from Buffalo)

June 9-10: Major flooding across Buffalo's South Towns as violent thunderstorms raked metro Buffalo with prolific lightning. The event almost entirely resulted from the interaction of boundaries in a tropical air mass. Precipitable Water values were 1.7 to 2.0". Surface temps were near 90°F with dewpoints near 70°F during afternoon of the 9th. Outflow boundaries from earlier storms over Genesee/Orleans counties interacted with a boundary situated inland from Lake Erie over Chautauqua County (Co.) around 7 pm. New cells popped up over northern Cattaraugus Co., then fired west to near Silver Creek and built eastward along the original boundary into Northern Wyoming Co. These thunderstorms evolved into an

east-west line of slow moving cells, which then lifted slowly north across the Buffalo metro after midnight. 3 to 5 inches of rain fell over portions of South Towns...with 1 to 2 inches over Buffalo and just north. This heavy rainfall ended a long dry period of nearly a month.

Aug 1: Severe weather which occurred over Niagara County. Region was in northwest flow around building tropical high over Ohio Valley. Convective available energy values (CAPES) were in the 2000 J/kg range and the Buffalo forecast area was very unstable with temps in the high 80s and dewpoints near 70°F. Dewpoints were pooling over southern Ontario and western NY. Weak short waves were dropping southeast within the flow. Convection developed over Ontario north of Kingston in the early afternoon and rapidly pushed southeast into Jefferson and Lewis Counties by 4 pm. Major wind damage and large hail occurred near the lakeshore north of Watertown. The thunderstorms exhibited some rotation briefly as they traversed the Tug Hill Plateau and then weakened, as they dropped southeast into Oneida County. A Severe Thunderstorm Watch was issued by SPC for all the areas east of Rochester until 11 pm. Meanwhile...a line of storms developed along the north shore of Lake Ontario and extended back to Oshawa. They slowly dropped south across the lake but gradually weakened...except for its western end which intensified as it reached the Niagara County lakeshore...which was helped along by a strong moist southwest inflow off Lake Erie. The activity then focused and stalled over eastern Niagara County with some wind damage, then as the Lake Erie wind ceased around 8 pm, the large cell over Niagara County broke apart, spreading out into individual cells, and drifted south and southwest over Erie County. It weakened and ended by 11 pm. Wind damage was focused on Jefferson and Niagara Counties...while up to two inches of rain fell on eastern Niagara and northeast Erie counties. An interesting fact, aside from the initial storms over the North Country, no storms occurred in the Watch area. They occurred west of it. The Lake Erie flow interaction played a major role in reinforcing the western edge of the line, as it approached Niagara County.

(e) NWS Buffalo, NY

Focal: David Zaff (NWS WFO BUF)

May 2005 – October 2005

Tom,

We have identified two dates where land/water boundaries had a significant impact on the severity of storms moving through Western NY.

Very briefly:

June 9-10: Major flooding across Buffalo's South Towns as violent thunderstorms raked metro Buffalo with prolific lightning. Event nearly entirely resulted from interaction of boundaries in a tropical soupy airmass. PW's were 1.7 to 2.0 inches. Temps were near 90 with dew pts near 70 during afternoon of 9th. Outflows from earlier storms over Genesee/Orleans counties interacted with a boundary inland from lake Erie over Chaut. Co around 7 pm...cells popped up over northern Catt county then fired west to near Silver Creek and built east along original boundary into Nrn Wyoming county. these turned into an east-west line of slow moving cells which then lifted slowly north across Buffalo metro after midnight. 3 to 5 inches of rain fell over portions of South Towns...with 1 to 2 inches Buffalo and just north. This ended a long dry period of nearly a month.

Aug 1: Severe Weather over Niagara County. Region was in northwest flow around building tropical high over Ohio Valley. Capes were in 2000 range and we were unstable with temps in high 80s and dew pts near 70. Dew pts were pooling over southern Ontario and western NY. Weak short waves were dropping southeast within the flow. Convection developed over Ontario north of Kingston in early afternoon and rapidly pushed southeast into Jefferson and Lewis Counties by 4 pm. Major wind damage and large hail occurred near the lakeshore north of Watertown. The storms exhibited some rotation briefly as they traversed the Tug Hill and then weakened as they dropped southeast into Oneida County. A Severe Tstm Watch was issued by SPC for all areas east of Rochester until 11 pm. Meanwhile...a line of storms developed along the north shore of Lake Ontario and extended back to Oshawa. They slowly dropped south across the lake but gradually weakened...except for its western end which intensified as it reached the Niagara County lakeshore...helped along by a strong moist southwest inflow off Lake Erie. The activity then focused and stalled over eastern Niagara County with some wind damage...then...as the Lake Erie wind ceased around 8 pm, the huge cell over Niagara County broke apart...spread out into individual cells...and drifted south and southwest over Erie County. It weakened and ended by 11 pm. Wind damage was focused on Jefferson and Niagara Counties...while up to two inches of rain fell on eastern Niagara and northeast Erie counties. An interesting fact...aside from the initial storms over the north country...no storms occurred in the Watch area...they occurred west of it...the Lake Erie flow interaction played a major role in reinforcing the western edge of the line as it approached Niagara County

Dave

(f) Workstation ETA project with Center Weather Service Unit at Oberlin Ohio

In July 2004 WFO Albany began running the Workstation ETA (WSETA) mesoscale model for the Oberlin Center Weather Unit (CWSU) area of responsibility. The objective of this project was to better identify areas and time of convective initiation. Then use this information in the CWSU's products, that are then used by the FAA controllers to route aircraft, and possibly reduce or better time ground stops. Ground stops result in major rerouting and delay of aircraft and are quite disruptive to airspace management. To the traveling public they are often cause of many flight delays.

The WSETA model output was placed on the internet so that the CWSU could access them in real time. The full data sets were also archived at WFO Albany. During the period July 2004 to June 2005 convective event datasets were collected.

In April 2005 the CWSU staff was given one-on-one training on using the model output. It covered the modeling system, data available, strengths and weakness in the model, and overviewed the project. We also sought their participation in the survey parts of the project.

A PC with GARP and all the archived model data sets was put together using a surplus machine from WFO Albany. The PC was shipped to the CWSU in late April.

Through the 2005 convective season the CWSU continued to use the model output operationally. Meanwhile a SUNY Brockport student who lives in the Cleveland area worked on the project at CWSU Oberlin as a summer research project with the office Meteorologist in Charge.

She investigated 29 events. She correlated how well the model forecasted convective initiation and location using 850 hpa Theta-E, Convective Precipitation, 700 hpa omega, 850 hpa jet location, 250 hpa divergence and boundary layer convergence. She classified the model performance using a three category system. Convective precipitation and 700 hpa Omega significantly identified convective initiation as in the ok to good correlation in 24 of 29 cases for the Convective precipitation and 27 of 29 for the Omega.

The student prepared a paper on her work, which I am in the process of refining and rewriting. The data continues to be produced operationally, and I will attempt to obtain testimonials from the CWSU forecasters of the model data utility, and if possible the FAA at the CWSU. In addition the data from the rest of the 2005 convective season will be compared at WFO Albany if we are able to obtain hourly lighting data from within the NWS or UAlbany.

SECTION 5: Computer and Technology Transfer Issues (David Knight)

The results described herein would not have been possible without appropriate computing infrastructure. Several Sun workstations and PCs are available for use by CSTAR participants. Approximately 120 GB of disk space on the UAlbany Department of Earth and Atmospheric Science (DEAS) Sun servers is dedicated to storing CSTAR related data and software. This disk space is available on all DEAS workstations and provides a central location where both UAlbany and NWS personnel can store, process, and exchange large datasets. Each CSTAR student has a PC laptop, which enables them to take familiar computers with them when visiting NWS staff, and provides them ready access to the DEAS UNIX machines. Early in the project email lists were created on the DEAS computers for exchange of scientific ideas, results, and information between CSTAR participants. There are email lists for all the CSTAR participants, as well as focused lists for those involved in specific projects. These email lists simplify the exchange of information between University and NWS personnel involved in this project. Albany WSFO staff took the lead in maintaining content for the CSTAR webpage at <http://cstar.cestm.albany.edu>. The web page provides an additional mechanism for exchanging information and ideas. The DEAS web server (<http://www.atmos.albany.edu>) and ftp server (<ftp://ftp.atmos.albany.edu>) are being used to facilitate exchange of large datasets between CSTAR collaborators. Recently PI's in the DEAS were awarded a large NSF grant for equipment upgrades. Among these is a new Sun server (with 4 CPUs and 16GB RAM) and a multi-terabyte disk storage array, which have recently been ordered. While CSTAR money was not used for this, and the machines were not bought specifically for CSTAR use, they will nonetheless directly benefit the CSTAR research by providing much faster servers for computation and storage space for commonly used datasets.

SECTION 6: Selected Documentation of CSTAR Project Activities:

From michael.evans@noaa.gov Wed May 4 15:06:41 2005

Wed, 4 May 2005 15:06:40 GMT

ESMTP id IFZ0ND00.RY1; Wed, 4 May 2005 11:06:49 -0400

Date: Wed, 04 May 2005 11:08:41 -0400

From: "Michael Evans" <michael.evans@noaa.gov>

Organization: DOC/NOAA/NWS - National Weather Service

X-Sender: "Michael Evans" <michael.evans@werhmsg.werh.noaa.gov>

To: bosart@atmos.albany.edu, keyser@atmos.albany.edu, wagner@atmos.albany.edu,
Barbara Watson <Barbara.Watson@noaa.gov>

CC: Warren.Snyder@noaa.gov, Michael Evans <michael.evans@noaa.gov>

Subject: Keith Wagner's CSTAR project

Hi,

How is everything going up at Albany? I just wanted to share some news from my end about some NWS plans regarding Keith's project.

I don't know if any of you are familiar with the NWS acronym "AWOC". If not, AWOC stands for "Advanced Warning Operations Course". It is a course being run out of the Warning Decision Training Branch in Norman Ok. Basically, it is a series of online training modules and some teletraining, that is being given to every meteorologist in the NWS. The current AWOC, which NWS meteorologists have been going through during the past 6 months, has been mainly concerned with warm season severe weather. However another AWOC is being planned for 2006, with the emphasis being on winter weather forecasting.

I have volunteered to help plan this training and to be one of the instructors. I talked with the person in charge of planning the course yesterday, and I mentioned Keith's project. I thought that one approach that we could take would be to have a section where a lot of the theory involved with heavy, banded snowstorms could be introduced, including material on the importance of frontogenesis, reduced EPV ect. Examples of very heavy, banded storms (ie the types of storms studied by Novak, Grumm and Nicosia, ect) could be shown in this section. A natural progression of this training would then be to introduce some of the things that Keith will be looking at; ie how important are things like fgen, reduced EPV, ect for moderate storms. The person that I talked to mentioned that we would probably need to come up with a conceptual model, which I believe is exactly the kind of thing that Keith will be trying to do.

At this point, the schedule for putting this together will be: 1) I need to confirm what areas I will be working on by June. 2) We will be having a meeting in Oklahoma in late July. 3) The material probably needs to be assembled and organized early next fall.

So what does this mean for you guys? It depends on what you want to do. I think that the most likely course of action would be for you to just continue to work on the project as you have been. It will be up to me to take your work, and try to organize it into formats that can be used in the course. However, if you would like to get more involved than that, just let me know. I realize that the time

schedule may be just a bit faster than you might like, but based on my discussions with Keith I feel that he probably will be far enough along by early next fall to provide some good material for the course.

To me this sounds like a great opportunity to increase the visibility of the CSTAR project, and also to increase Keith's visibility to potential future employers. Keith and I had discussed getting together at BGM pretty soon to go over some of the case studies, but if you would like to meet at Albany to discuss this, I would be glad to drive up. In the meantime, if you have anything else you would like to discuss, please give me a call (607-770-9531 x 224).

- Mike

From wagner@cypress.atmos.albany.edu Fri May 6 17:03:01 2005
Fri, 6 May 2005 17:03:00 GMT
Date: Fri, 6 May 2005 17:03:00 +0000 (GMT)
From: Keith Wagner <wagner@atmos.albany.edu>
Subject: Re: Keith Wagner's CSTAR project
To: michael.evans@noaa.gov
Cc: bosart@atmos.albany.edu, keyser@atmos.albany.edu, celeste@atmos.albany.edu

Hi Mike,

I met with Lance and Dan this morning to discuss plans for summer research and your email regarding use of some of my research for NWS training. In regards to summer research, you and I talked about having me come down to Binghamton the first week of June. Lance and Dan said that Warren has scheduled the spring CSTAR meeting for Thursday June 2 at NWS Albany. If you are planning on coming up for this, then it will probably be easier to put the data on a cd and we can view it here at that time. If not, I can still come down to Binghamton.

As far as the AWOC training, we feel that we can come up with some results that will be able to help both of us. Some of the parameters I will be looking at in our moderate event case studies are frontogenesis, EPV, 700 hpa RH, etc., and how they effect atmospheric stability and provide a source of lift for such systems. It seems like this will fit in well with the material you will be teaching. Once we get together and start looking at some cases in early June, we should be able to identify some results that can be used toward the NWS training as well as my thesis. You also mentioned that you would have a section on the theory of heavy, banded snowstorms. SUNY Albany CSTAR student Matt Greenstein is beginning work on this area with Dave Nicosia. They may be able to provide some material on that aspect.

The best plan is to keep going on the project as we are. Let me know if you will be coming up for the CSTAR meeting, and we can plan around that. As a side note, I will be out of the office from May 13 ~ May 31, so if you need to contact me during that time, please use the following email address:
kwag0519@yahoo.com

Thanks for your help.

Keith

----- Forwarded message -----

Date: Fri, 27 May 2005 13:23:27 -0400
From: Jeff Waldstreicher <Jeff.Waldstreicher@noaa.gov>
To: CSTAR Mailing List <cstar@atmos.albany.edu>,
Cc: Gene Auciello <Gene.Auciello@noaa.gov>,
Darin Figurskey <Darin.Figurskey@noaa.gov>,
_nws er ssd <nws.er.ssd@noaa.gov>, Dan Keyser <keyser@atmos.albany.edu>,
Dr. Al Riordan <al_riordan@ncsu.edu>, Gary Lackmann <gary@ncsu.edu>,
Lance Bosart <bosart@atmos.albany.edu>,
Kermit Keeter <Kermit.Keeter@noaa.gov>,
Warren Snyder <Warren.Snyder@noaa.gov>
Subject: CSTAR's Impact on ER Winter Storm Warning Performance

ER CSTAR Participants -

These are the type of e-mails I really enjoy writing. We have just finished compiling our 2004-2005 regional Winter Storm Warning verification. Before I share the results with you, let me make a couple of brief comments regarding the type of winter it was. Region-wide from an event count standpoint, it was near normal. There were 1889 events, the 6th most of the last 12 seasons. From a predictability standpoint, my highly subjective assessment would put the this winter in the near to slightly above range. There were some big events with high predictability, and some real pain in the you know where events and several marginal events. What stands out most to me about this winter (besides the what the folks on Cape Cod went through) was the real challenges posed by some very inconsistent performances from the operational NWP systems. The GFS seemed to take a couple of steps back from the generally strong performances of the previous 2 winters. The Eta/NAM seemed to improve...until that multi-storm run in February where bizarre might be the best adjective to describe some of the runs. Both models seemed to struggle regularly with run to run consistency. It is in this context that I present this winter's verification scores:

POD - .915 (3rd highest - .921 last year and .916 in '93-'94)

FAR - .301

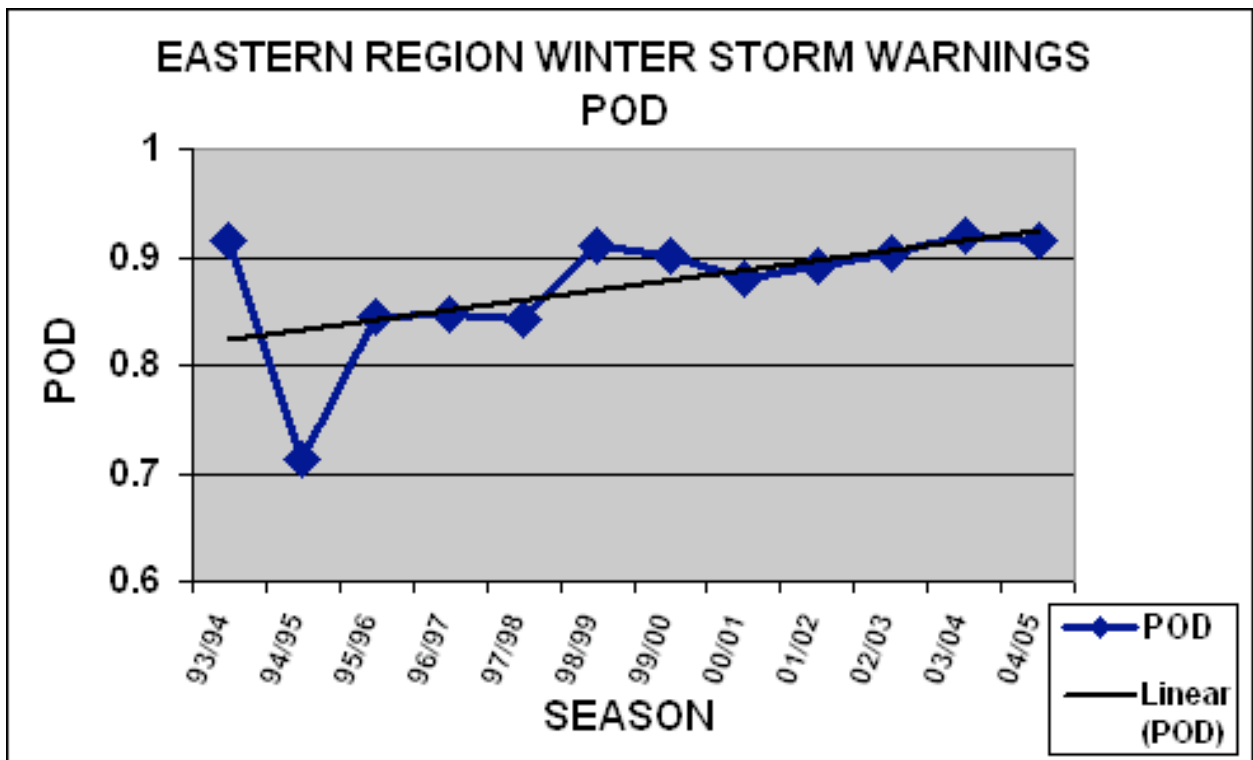
*Lead Time - 20.8 hours *(Previous record 18.5 hr last year - the 2010 national goal is 17 hours)

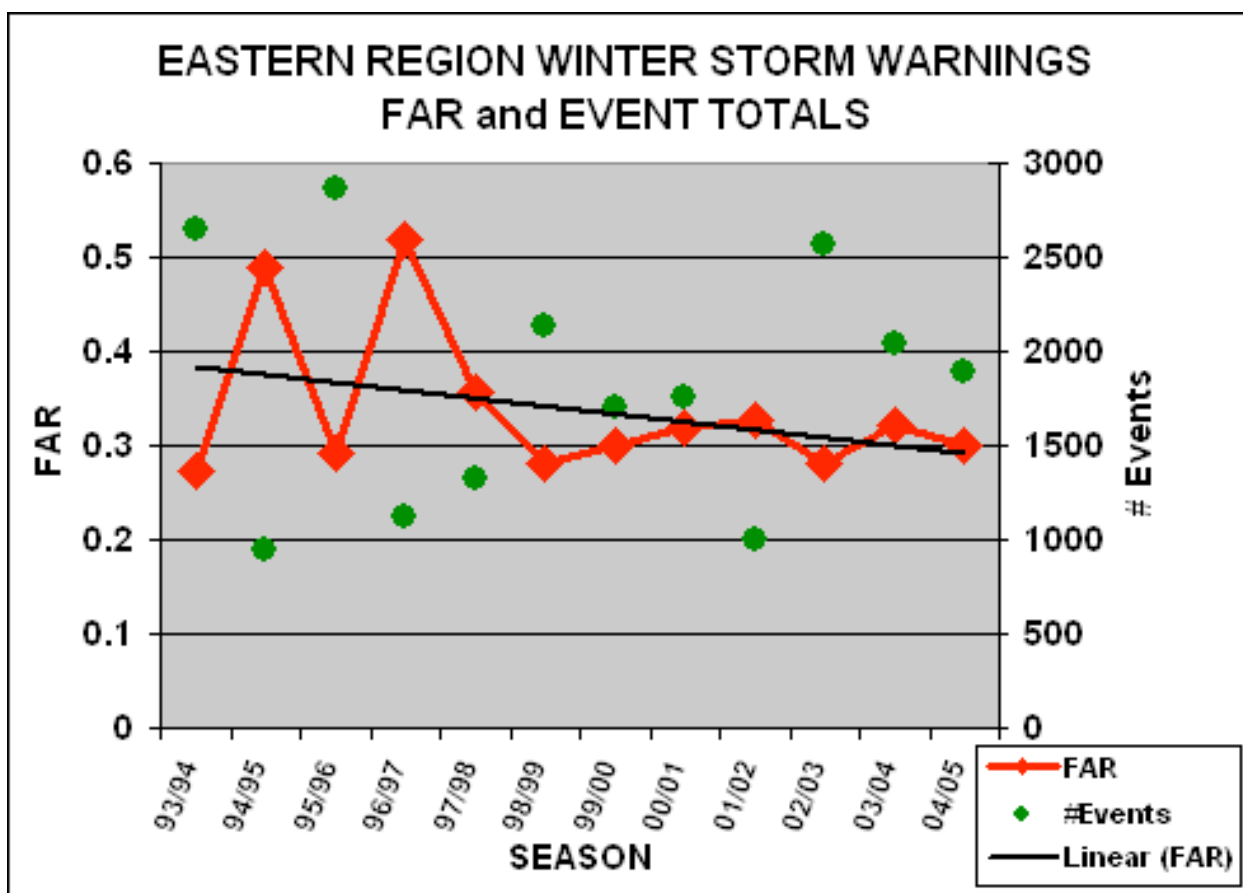
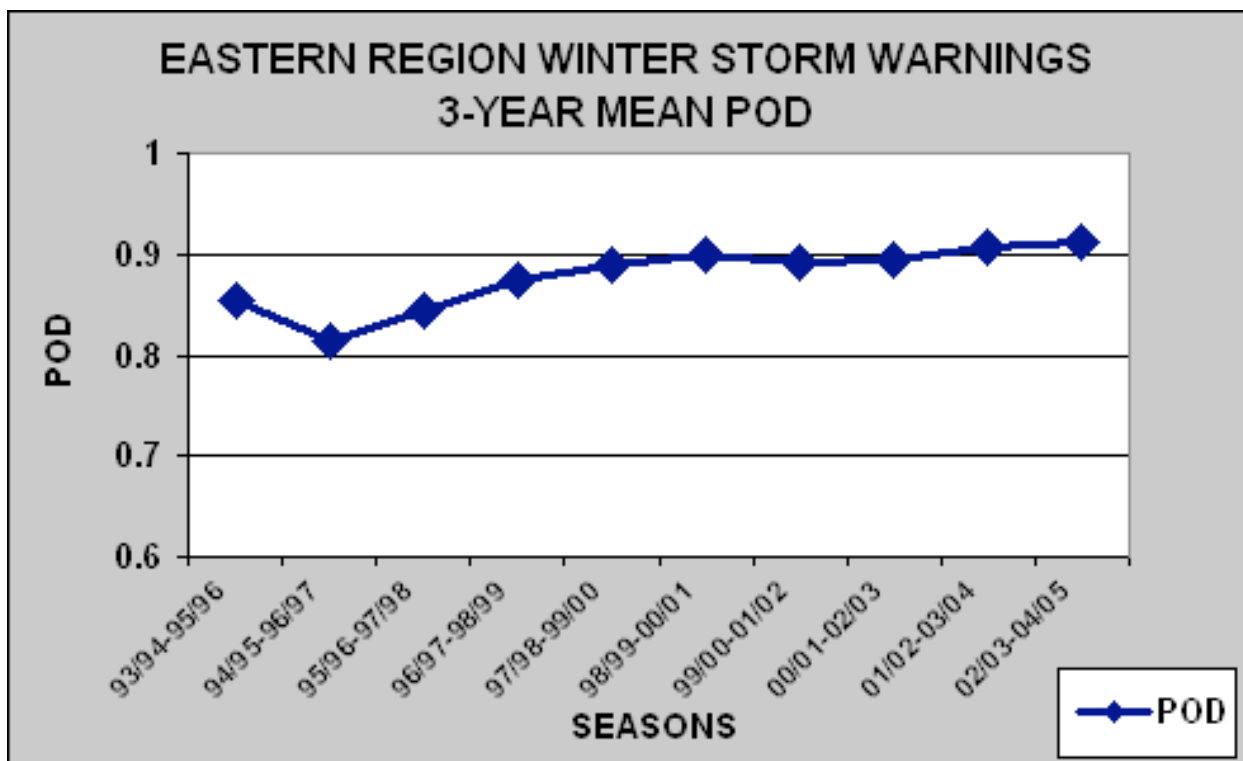
I have attached figures showing the trends of the regional scores annually, and 3-year running means (weighted by event counts). What really strikes me is how the tremendous spike in lead time was accomplished with only slight improvements in POD (due to the already high performance) and most importantly, a flat line FAR (slightly dropping if anything).

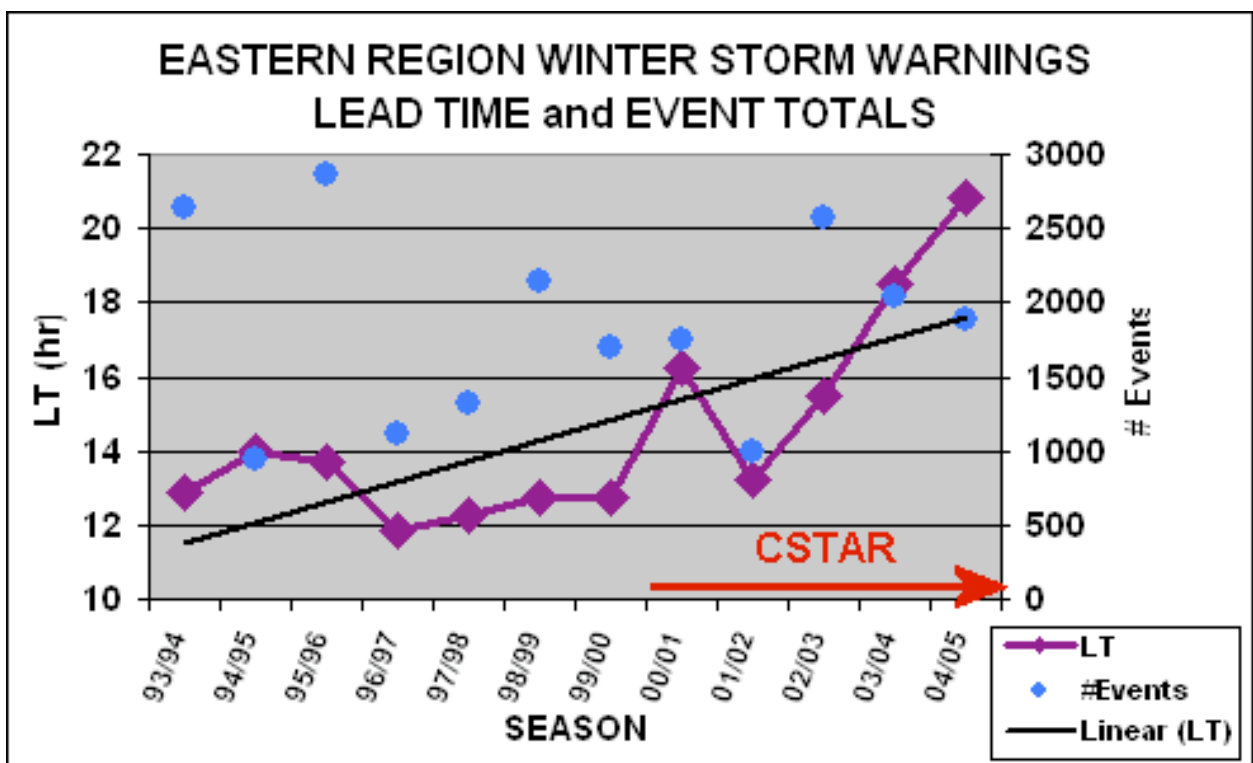
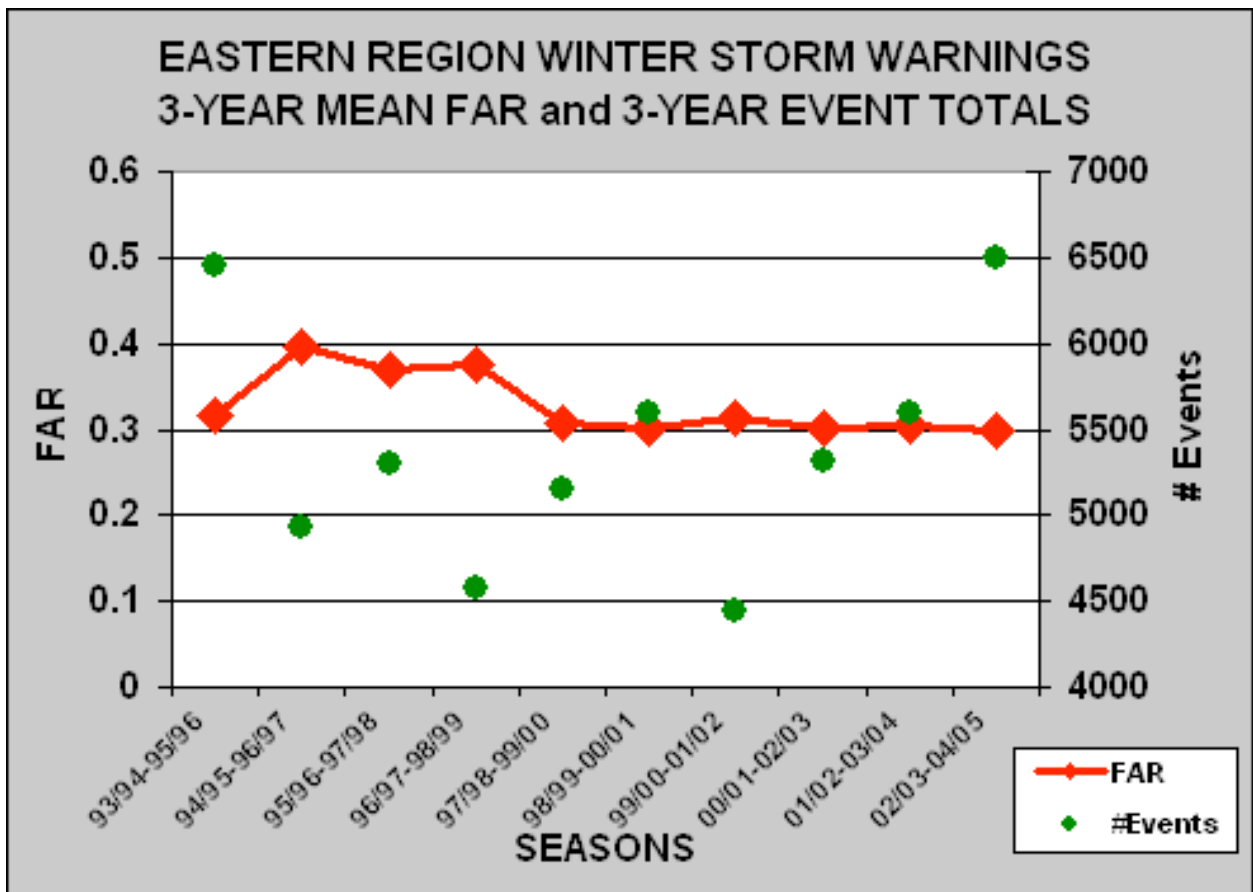
The screaming message to me here is that despite some real NWP use/interpretation challenges, ER forecasters fundamental understanding of winter weather processes and evolution have improved, resulting in increased forecaster confidence enabling warning decisions to be made sooner -- 6-8 hours sooner with equal to slightly better skill than just 5 years ago. While other activities such as NWP improvements and a few other COMET projects have certainly played a role, I do not think there is any question that the predominant source of this region-wide

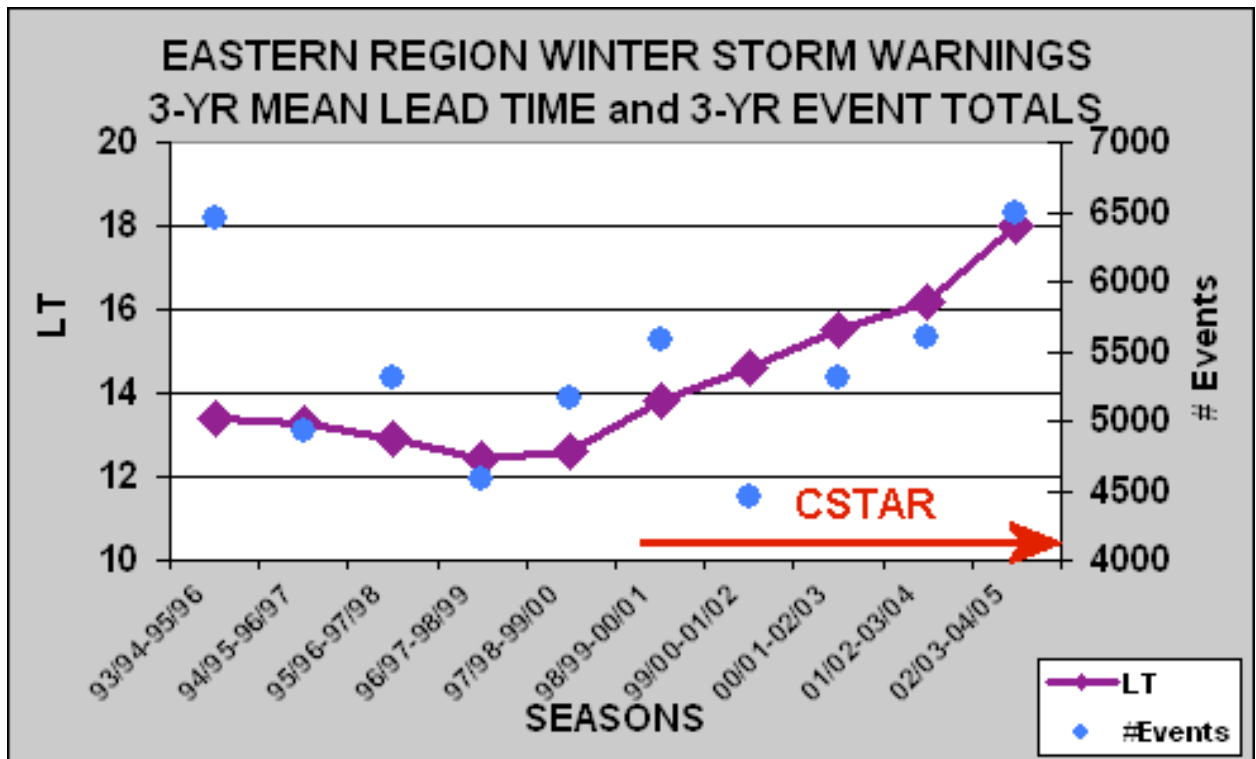
improvement has been the CSTAR related activities, especially when considered in a broad scope including: training; sharing and collaboration activities, many of which have spilled over into operational collaboration efforts; 2nd and 3rd order development efforts spurned from 1st order research, etc. (Did someone say 5-step process? :-)) The 3-year running mean chart speaks volumes, especially when put in a context of the fact that ~90 million people are getting this level of improved service for an investment of \$250K per year. That works out to roughly a quarter of a penny per person per year. While I don't have specific numbers, I suspect the economic benefits that have resulted are somewhat higher :-D I think this is something we can all be very proud about.

Jeff









From gail.hartfield@noaa.gov Sat May 28 00:39:50 2005
Sat, 28 May 2005 00:39:50 GMT
Date: Sat, 28 May 2005 00:39:48 +0000
From: "Gail Hartfield" <Gail.Hartfield@noaa.gov>
To: Mid-Atlantic CSTAR Discussion Group <cstar@infolist.nws.noaa.gov>
CC: Gene Auciello <Gene.Auciello@noaa.gov>,
Darin Figurskey <Darin.Figurskey@noaa.gov>,
_nws er ssd <nws.er.ssd@noaa.gov>,
Dan Keyser <keyser@atmos.albany.edu>,
"Dr. Al Riordan" <al_riordan@ncsu.edu>, Gary Lackmann <gary@ncsu.edu>,
Lance Bosart <bosart@atmos.albany.edu>,
Kermit Keeter <Kermit.Keeter@noaa.gov>,
Warren Snyder <Warren.Snyder@noaa.gov>
Subject: Re: [cstar] CSTAR's Impact on ER Winter Storm Warning Performance
References: <LYRIS-13746-144258-2005.05.27-13.23.29--gail.hartfield#noaa.gov@infolist.nws.noaa.gov>
In-Reply-To: <LYRIS-13746-144258-2005.05.27-13.23.29--gail.hartfield#noaa.gov@infolist.nws.noaa.gov>

Jeff,

Thank you very much for sending along those winter stats. It's always wonderful to see tangible results from the Herculean efforts of so many terrific NWS personnel, faculty, and students! Let's hope this buoys the chances for a resumption of CSTAR funding as soon as is economically feasible. (And your 1/4 cent per person cost calculation should be sent to every congressperson in D.C.!)

-Gail

Date: Mon, 6 Jun 2005 13:02:11 +0000 (GMT)
From: Tom Galarneau <tomjr@atmos.albany.edu>
To: "Lance F. Bosart" <bosart@atmos.albany.edu>
Subject: SPC outlook

Hi Lance,

Here's today's outlook from SPC...check out the last sentence. Also, look at the graphic...

Tom

...PA/NY AREA...

A MID LEVEL SHORTWAVE TROUGH OVER THE UPPER GREAT LAKES WILL MOVE EWD TO WRN PA/NY THIS EVENING AND NEW ENGLAND TONIGHT. AN ASSOCIATED WEAK SFC TROUGH FROM ERN LOWER MI TO WRN OH THIS MORNING WILL MOVE EWD TO WRN/CENTRAL PA/NY BY THIS EVENING...WHILE A N-S BAROCLINIC ZONE ACROSS ERN NY DRIFTS EWD. BOUNDARY LAYER DEWPOINTS IN THE MID-UPPER 60S WILL SPREAD NEWD INTO WRN PA/NY FROM THE OH VALLEY...AND NWD INTO ERN PA/NY FROM THE MID ATLANTIC. THIS MOISTURE...COMBINED WITH AFTERNOON TEMPERATURES GENERALLY IN THE 80S AND MID LEVEL LAPSE RATES OF 6.5-7 C/KM...WILL RESULT IN MODERATE INSTABILITY /MLCAPE VALUES OF 1000-2000 J/KG/.

THUNDERSTORMS WILL LIKELY FORM INVOF OF THE SURFACE TROUGH BY MIDDAY AND MOVE EWD THROUGH THE EVENING...THOUGH THE ONGOING CONVECTION IN WRN PA MAY PERSIST AS WELL. PRIMARILY UNIDIRECTIONAL WIND PROFILES WITH 30-40 KT LOW-MID LEVEL FLOW WILL LIKELY SUPPORT LINE SEGMENTS IN THE WARM SECTOR...WHERE DAMAGING WINDS WILL BE THE PRIMARY SEVERE THREAT. SOMEWHAT BACKED LOW-LEVEL FLOW ALONG THE BAROCLINIC ZONE NEAR THE ERN NY BORDER...AS WELL AS CHANNELED SLY FLOW IN THE HUDSON VALLEY...MAY SUPPORT MORE OF A SUPERCELL THREAT...AND PERHAPS AN ISOLATED TORNADO OR TWO.

Date: Tue, 07 Jun 2005 14:04:51 +0000
From: "Warren Snyder" <Warren.Snyder@noaa.gov>
Organization: DOC/NOAA/NWS - National Weather Service
To: Gregory Gerwitz <Gregory.Gerwitz@noaa.gov>,
Vasil Koleci <Vasil.Koleci@noaa.gov>,
Kenneth Lapenta <Kenneth.Lapenta@noaa.gov>,
George Maglaras <George.Maglaras@noaa.gov>,
Stephen Pertgen <Stephen.Pertgen@noaa.gov>,
John Quinlan <John.Quinlan@noaa.gov>,
Warren Snyder <Warren.Snyder@noaa.gov>,
Tom Wasula <Tom.Wasula@noaa.gov>,
John W Cannon <John.W.Cannon@noaa.gov>, Alan Cope <Alan.Cope@noaa.gov>,
Eric Evenson <Eric.Evenson@noaa.gov>,
Robert Mundschenk <Robert.Mundschenk@noaa.gov>,
David Nicosia <David.Nicosia@noaa.gov>,
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Ronald Horwood <Ronald.Horwood@noaa.gov>,
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David Vallee <David.Vallee@noaa.gov>,
Michael Evans <michael.evans@noaa.gov>,
David Wally <David.Wally@noaa.gov>,
Michael Jurewicz <Michael.Jurewicz@noaa.gov>,
David Morford <David.Morford@noaa.gov>,
Daniel Cobb <Daniel.Cobb@noaa.gov>,
Mark McKinley <mark.mckinley@noaa.gov>,
Christopher Mello <christopher.mello@noaa.gov>,
Nelson Vaz <nelson.vaz@noaa.gov>,
Jeffrey Tongue <Jeffrey.Tongue@noaa.gov>,
Michael Fitzsimmons <Michael.Fitzsimmons@noaa.gov>,
William Goodman <william.goodman@noaa.gov>,
James Hayes <James.Hayes@noaa.gov>, Paul Sisson <Paul.Sisson@noaa.gov>,
Richard Grumm <Richard.Grumm@noaa.gov>, cstar@atmos.albany.edu,
Kenneth Johnson <Kenneth.Johnson@noaa.gov>,
Gene Auciello <Gene.Auciello@noaa.gov>
Subject: Report on CSTAR II Meeting June 2
Sender: owner-cstar@atmos.albany.edu

See attached...

Department of Commerce

NOAA, National Weather Service
251 Fuller Rd. Suite B-300
Albany, NY 12203-3640

June 7, 2005

0

MEMORANDUM FOR: Eugene P. Auciello
MIC, WFO, Albany, NY

FROM: Warren R. Snyder
SOO, WFO, Albany, NY

SUBJECT: CSTAR Meeting June 2

The CSTAR meeting was held June 2, 2005 from 9:00 am to 12:15 pm. It was attended by Principal Investigators Lance Bosart, Dan Keyser, and Dave Knight, SOOs Mike Evans, Dan St. Jean and myself. Also attending were graduate students Keith Wagner, Heather Archambault, and Matthew Greenstein and NWS Focal Point Thomas Wasula.

The meeting opened with a review of the Collaborative and Associate Projects, also nicknamed the Snyder Project. The Workstation ETA project with CWSU Oberlin was overviewed. A PC with last years datasets and GARP was set up and shipped to the CWSU. A SUNY Brockport undergraduate student is working on the project with MIC Mark McKinley at the CWSU several days per week, assessing the models ability to forecast convective initiation, and assess its utility in the CWSU forecasting process.

The following Collaborative and Associate Projects are complete: Fog Forecasting at Elmira, New York, Compare and Contrast Three Ice Storms over New York, and the Development of a WES for the 17 February 2003 Snow Event. (Presidents Day Storm II). The papers and the WES case will be forwarded from Mike Evans to the Albany SOO, to be posted on the CSTAR webpage.

The project Integrating Probabilistic Methods into the Aviation Forecast Process, and Applying Signal Detection Theory lead by Dan Cobb has begun. Dan provided a work plan, which is attached.

Dan St. Jean and Dan Cobb have discussed and coordinated work on the Norlund Inverted Coastal Trough project, and discussed it with Lance.

The three graduate students gave presentations on their projects. Heather's is largely done. The two gave presentations that were outlines of their work plans for this summer. Matt will be setting up his data on the WFO Albany WES in late June.

The meeting then shifted to an open forum discussion on technology transfer opportunities, documenting operational successes from CSTAR work, and topics for potential VISIT sessions.

The following action items came out of that discussion:

1. Mike Evans is on the team developing Winter AWOC which will begin work in the summer of 2005. They expect to have the training in place for FY2007. Mike will work to incorporate the results of CSTAR projects into Winter AWOC, including Synoptic Scale Aspects of Weak to Moderate Winter Storms, and Mesoscale Aspects of Heavy Snow/Icing Events in the Northeast. Rich Grumm is on this team as well, and Mike will see if any of the Regime Change work can be included. In addition the Mesoscale Banding work from CSTAR I will likely be included as well.
2. Dan St.Jean will lead an effort to turn the Cutoff Lows work from CSTAR I into a VISIT Session.
3. Thomas Wasula will develop a VISIT session on his CSTAR work.
4. The NWS focal points will receive copies of their students masters thesis's to review, and to serve as a starting point for the development of potential training.
5. All the thesis's will be provided to Warren Snyder for inclusion on the CSTAR webpage, and to review for potential training opportunities.
6. Emphasis was placed on mentioning CSTAR concepts/work in AFDs and how effective it has been. Also using Post Storm Analysis to document when this work was used operationally was encouraged. Post Storm analysis is being used increasingly in NWS offices after significant events. A standardized methodology is being developed, lead by Buffalo MIC Tom Niziol, that should be available shortly, for all offices to use.

PROB TAFS CONOPS – ONE PAGER

DRAFT – MAY 18, 2005

Overview: There is growing economic demand for increased efficiency in terms of both the cost and air-traffic throughput in the National Airspace System (NAS). Recent findings of Keith (2003, WAF) suggest that probabilistic Terminal Aerodrome Forecast (TAF) would allow airlines to realize greater economic benefit through reduced fuel consumption. Secondly, it hypothesized that probabilistic TAFs through the idea of common situational awareness (CSA) could also incur economic benefit by reducing airborne holding through more effective use of traffic management programs at pacing airports. Creating and implementing a probabilistic TAF is critical in meeting the NOAA mission goal of providing support for safe and efficient transportation.

Roadmap: There are three phases and possibly a fourth to the implementation of a probabilistic TAF.

Phase I - Data Collection & Analysis: Forecaster confidence data must be collected over a 1+ year period to obtain a statistically relevant sample. A prototype of an AVNFPS GUI to collect estimated probabilities or forecaster confidence is provided in Attachment #1.

The dataset would then be analyzed similar to Keith in order to understand the intrinsic skill of NWS aviation meteorologist. Such an analysis would also seek to confirm outcomes of Keith's experiment – namely:

1. That the value of TAF is obscured by application of somewhat arbitrary decision thresholds used by individual forecasters in formatting TAF FM, TEMP, and PROB groups.
2. That the decision threshold for a given forecaster for a given event varies overtime further obscuring the full value of a given TAF.
3. Probabilistic input is reliable and can become more reliable given performance feedback from past forecasts.

During the second year, probabilistic category forecasts would be transitioned from point forecasts to gridded NDFD or similar database. This dataset would be analyzed both with and separately from the first year dataset and would be evaluated similarly to the first dataset.

This phase of the project is supportable through the current CSTAR collaboration with SUNY Albany.

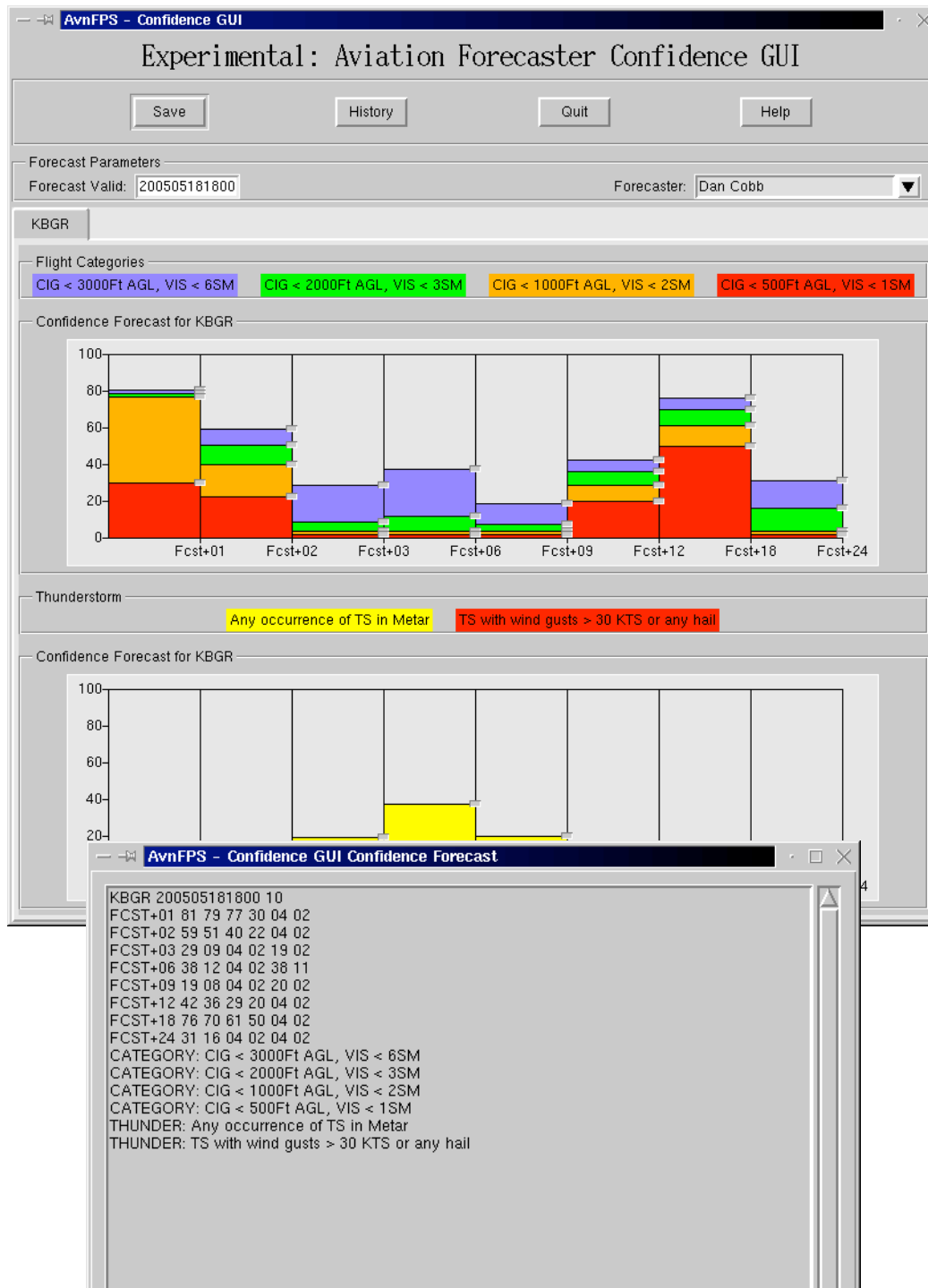
Phase II – Economic Value: Provide experimental probabilistic data to several customers including CWSUs for economic analysis. Again following work of Keith, allow end users to calculate the most economically efficient decision thresholds given identified skill of NWS forecasts. For airlines this would involve a model of fuel loading and designation of alternates. In terms of the CWSU and various TMU units of the ARTCC/TRACON/ATCT, it would entail a model which seeks to minimize the frequency at which airports arrival demand exceeds airport arrival rates. Further develop methods in which airlines and the FAA could collaborate on operational decisions similar in respect to the methods of the CCFP.

Some commercial customers of NWS are Enhanced Weather Information System (EWINS) certified to amend/produce their own internal use forecast products including TAFs. EWINS is described in Volume 3 – Chapter 7 – Section 4. of FAA order 8400.10. As such, this ability may allow a given certified customer to integrate and/or compare our experimental probabilistic forecasts with legacy methods to further evaluate its operational utility.

Phase III – Implementation: Based on outcome of Air-Traffic Weather Services Team (TIGER II), further refine forecasts to meet FAA requirements, identify dissemination system/format, and create tactical display formats for CWSU/FAA TMUs.

An additional goal would be to illustrate an overly broad and consequently flawed interpretation of conditional forecasts as discussed in Volume 3 – Chapter 7 – Section 1. of FAA order 8400.10 and effect change that would allow implementation of probabilistic TAFs to move forward given proof-of-concept in phases I and II.

Attachment #1 – AVNFPS Forecaster Confidence GUI & Verification Message



From bosart@atmos.albany.edu Fri Jun 17 13:27:45 2005
for <keyser@atmos.albany.edu>; Fri, 17 Jun 2005 13:27:45 GMT
Fri, 17 Jun 2005 09:27:42 -0400 (EDT)
X-Sender: bosart@pop.atmos.albany.edu
In-Reply-To: <42B22CC7.9090405@noaa.gov>
Date: Fri, 17 Jun 2005 13:27:40 +0000
To: Louis Uccellini <Louis.Uccellini@noaa.gov>,
Dean Gulezian <dean.gulezian@noaa.gov>
From: Lance Bosart <bosart@atmos.albany.edu>
Subject: Re: [Fwd: Warren County Service Assessment]
Cc: Gene.Auciello@noaa.gov, keyser@atmos.albany.edu

Hi Louie,

My view is that the jury is out on how big a role the remnant Arlene moisture played in the Northway washout. Arguments for would center on the track of the weak remnant circulation center across extreme northern NY and precipitable water values > 5 cm across parts of the area. Arguments against would center on the well known tendency for training echoes to line up east-west from the central Adirondacks eastward across Lake George to Vermont a few times a year.

There has to be an orographic signature involved too because these east-west bands always seem to form in the same area subject to case-to-case north-south variability of perhaps 50 km. Past events have yielded local flash flooding in the region, but nothing quite as dramatic as undermining the Northway pavement and closing a main road (and guaranteeing media attention). Surface data across New York and Vermont is too sparse, alas, to permit any boundary identification (sure would love to have a surface mesonet here like they do in OK/MN/IA). I tried to convince myself that I was seeing a boundary between GFL and PLB/BTV from earlier convection, but I would be overreaching significantly if I tried to argue the case in synoptic court. How you spell modeling studies?

We have two new CSTAR graduate students starting school in September. A study of damaging flood-producing warm-season rain events such as this case would be a good thesis topic for one of them.

Lance

At 21:52 -0400 16/06/2005, Louis Uccellini wrote:

Dean: I wish I was back in the science/research community. I would treat the statement from the regional assessment as a potential hypothesis and try to prove it wrong. I think that while the "moisture" feeding these storms could have been more related to the resident moisture distribution in the Albany region than to a moisture plume from Arlene, the deep circulation associated with the remnants of Arlene had to play a role in organizing and concentrating the convective elements which created this flooding situation. I doubt that this event happened by accident as the circulation approached the region.. Thus I would tend to think that the focus on "moisture" in the regional statement unnecessarily detracts from an apparent dynamic/organizing contribution related to

the circulation of the remnants of the tropical system. The best way to prove this would be to compute the perturbation wind fields prior to and during the event to really isolate the impact of the system on the Albany area. I have cc'd Lance. Perhaps he has a Masters student who could rip into this. Please share my comments with your SSD folks and Gene. Louis

Dean Gulezian wrote:

Thought you'd be interested in this service assessment done by WFO Albany. Their opinion is that the Arlene moisture was not a big player in the flash flood.

Subject:
Warren County Service Assessment
From:
"Gene Auciello" <Gene.Auciello@noaa.gov>
Date:
Thu, 16 Jun 2005 12:25:10 -0400
To:
Dean Gulezian <dean.gulezian@noaa.gov>

CC:
Mickey Brown <Mickey.Brown@noaa.gov>, Peter Gabrielsen
<Peter.Gabrielsen@noaa.gov>, George Mckillop
<george.mckillop@noaa.gov>, John Guiney <John.Guiney@noaa.gov>, I
Ross Dickman <I.Ross.Dickman@noaa.gov>, Jason Franklin
<jason.franklin@noaa.gov>, Richard Watling
<Richard.Watling@noaa.gov>, Raymond Okeefe
<Raymond.Okeefe@noaa.gov>, Stephen DiRienzo
<Stephen.DiRienzo@noaa.gov>

Dean...

The attached service assessment of the Warren County, New York, flash flood event of 13 June 2005 was prepared by WCM Ray O'Keefe in cooperation with members of the warning and forecast team who worked the event and the Warren County Office of Natural Disaster and Civil Defense.

Gene

From bosart@atmos.albany.edu Fri Jun 17 16:48:52 2005
Date: Fri, 17 Jun 2005 16:48:49 +0000
To: keyser@atmos.albany.edu (Keyser, Daniel)
From: Lance Bosart <bosart@atmos.albany.edu>
Subject: Fwd: Re: [Fwd: [Fwd: [Fwd: Warren County Service Assessment]]]
cypress.atmos.albany.edu

Hi Dan,

As you can see, Gene is running the show for us.....

Lance

Date: Fri, 17 Jun 2005 12:27:28 -0400
From: "David Novak" <david.novak@noaa.gov>
X-Accept-Language: en-us, en
To: Gene Auciello <Gene.Auciello@noaa.gov>, bosart@atmos.albany.edu
CC: Kenneth Johnson <Kenneth.Johnson@noaa.gov>,
Jeff Waldstreicher <Jeff.Waldstreicher@noaa.gov>,
Joshua Watson <Joshua.Watson@noaa.gov>
Subject: Re: [Fwd: [Fwd: [Fwd: Warren County Service Assessment]]]

Gene, Lance,

FYI...we did a limited archive of this event here at ERH. I have some screen captures of the ENX radar overlaid with METARS and available mesonet sites every half hour from 16Z on Monday to 9Z on Tuesday which you may be interested in. The images are at:
<ftp://ftp.werh.noaa.gov/share/SSD/Dave/northway/>
and are named as obs2300Z.jpg, obs2330Z.jpg, etc...

Dave

Gene Auciello wrote:

All...

Attached is the service assessment Louie U. is referring to. Lance is on it.

Gene

From bosart@atmos.albany.edu Fri Jun 17 18:19:24 2005
X-Sender: bosart@pop.atmos.albany.edu
Date: Fri, 17 Jun 2005 18:18:57 +0000
To: "David Novak" <david.novak@noaa.gov>,
Gene Auciello <Gene.Auciello@noaa.gov>, bosart@atmos.albany.edu
From: Lance Bosart <bosart@atmos.albany.edu>
Subject: Re: [Fwd: [Fwd: [Fwd: Warren County Service Assessment]]]
Cc: Kenneth Johnson <Kenneth.Johnson@noaa.gov>,
Jeff Waldstreicher <Jeff.Waldstreicher@noaa.gov>,
Joshua Watson <Joshua.Watson@noaa.gov>,
keyser@atmos.albany.edu (Keyser, Daniel)

Hi David,

I just checked the NCAR 4 km ARM-WRF runs initialized 0000 UTC 13 and 14 Jun'05. The run from the 14th had no clue. The 27 h forecast in the run from the 13th showed a solid north-south band (as opposed to an east-west) of convection crossing the upper Hudson Valley. This forecast convection was moving rapidly eastward as opposed to the training and quasi-stationary echoes as observed. Also, the model-forecast convection looked rather ordinary. Little indication of good situational awareness value from the model in this specific case in my opinion.

Lance

At 12:27 -0400 17/06/2005, David Novak wrote:
Gene, Lance,

FYI...we did a limited archive of this event here at ERH. I have some screen captures of the ENX radar overlaid with METARS and available mesonet sites every half hour from 16Z on Monday to 9Z on Tuesday which you may be interested in. The images are at:
<ftp://ftp.werh.noaa.gov/share/SSD/Dave/northway/>
and are named as obs2300Z.jpg, obs2330Z.jpg, etc...

Dave
Gene Auciello wrote:

All...
Attached is the service assessment Louie U. is referring to. Lance is on it.
Gene

Date: Fri, 16 Sep 2005 08:55:03 -0400
From: David Novak <david.novak@noaa.gov>
Subject: [Fwd: Re: Another Pre-tropical Cyclone Rainfall event]
To: cstar@atmos.albany.edu
FYI...
Dave,

Yeah, interesting band, with some minor flooding around Stony Brook with the 3-4 inches here in 1-2 hours. Was the radar-derived qpe in tropical mode??? There was some hint of confluence and weak frontogenesis at 850 mb in the short-term (6-h) 12-km MM5 forecast from 12Z:
http://atmos.msfc.sunysb.edu/mm5rt_data/2005091512/images_d2/850t.06.0000.gif
http://atmos.msfc.sunysb.edu/mm5rt_data/2005091512/images_d2/700fr.06.0000.gif

MM5 had the band in the wrong spot (threat score = 0), but there was some suggestion of some sort of forcing in the region...

Brian

On Thu, 15 Sep 2005, David Novak wrote:

>

All,

Seems like we had another (recall the event that flooded the NYC subways last year) case of a heavy rainfall event well ahead of a TC yesterday and today. I've attached the OKX and BOX radar-derived storm total precip images, where isolated 4" amounts are shown. Although ISP caught only one of these showers, 0.22" was recorded in 3 minutes. I can confirm the rainfall had a "tropical" flavor with small drop size and large drop concentration (lots of small drops).

There was no obvious surface forcing (such as a coastal front) associated with the rainfall, although the linear concentration suggest there was some type of confluence...

Dave

Date: Mon, 19 Sep 2005 08:25:03 -0400
From: "William Goodman" <william.goodman@noaa.gov>
To: colle@cyclone.msfc.sunysb.edu
CC: David Novak <david.novak@noaa.gov>, cstar@atmos.albany.edu,
_nws er sbuens <nws.er.sbuens@noaa.gov>
Subject: Re: [Fwd: Re: Another Pre-tropical Cyclone Rainfall event]

Brian, you wrote:

Yeah, interesting band, with some minor flooding around Stony Brook with the 3-4 inches here in 1-2 hours. Was the radar-derived qpe in tropical mode??? There was some hint of confluence and weak frontogenesis at 850 mb in the short-term (6-h) 12-km MM5 forecast from 12Z:
http://atmos.msfc.sunysb.edu/mm5rt_data/2005091512/images_d2/850t.06.0000.gif
http://atmos.msfc.sunysb.edu/mm5rt_data/2005091512/images_d2/700fr.06.0000.gif

MM5 had the band in the wrong spot (threat score = 0), but there was some suggestion of some sort of forcing in the region...

Yes, OKX radar was in Tropical Z-R relationship, and its estimates were spot on with the early morning flooding in northeast NJ (spotter in Harrison NJ reported 1.72" while the radar estimated 1.5-2.0". Didn't look at the MM5 on the midnight shift just prior, but if I remember correctly, that day's 00Z GFS indicated the same things you mentioned above: a N-S axis of 850 mb moisture convergence/frontogenesis, but displaced a little from the area of actual heavy rainfall, and also too broad in areal extent.

Bill

From bosart@atmos.albany.edu Thu Sep 22 14:54:26 2005
Date: Thu, 22 Sep 2005 14:54:23 +0000
To: "David Vallee" <David.Vallee@noaa.gov>
From: Lance Bosart <bosart@atmos.albany.edu>
Subject: Re: Rains of 15 Sep'05
Cc: bosart@atmos.albany.edu (Bosart, Lance F.),
keyser@atmos.albany.edu (Keyser, Daniel)
cypress.atmos.albany.edu

Hi David,

Thanks for the response. Glad to know that our "eastern family" has room to two new young eager beavers. I'll let you "be a politician" and work out the details on how best to proceed from the NWS side. Dan Keyser and I will work on identifying two new CSTAR students for the projects and getting the academics in order. During the CSTAR/NROW gatherings we can focus on sharpening the research ideas and opportunities enumerated below, formulate a working plan for tackling the research problems that makes academic sense and has the potential for a good operational payoff, hammer out the implementation details, and get the new students involved in spinning up the projects.

Glad to you that we are going to have a full suite of "Harwood analyses" for storms through 2004 that we can use to help identify mesoscale precipitation structure. The time is indeed ripe to expand the family business.... :)

Lance

cc: Dan
.....

Lance,

I can see it now: Bush from the Galveston Sea Wall - Bullhorn in hand shouting: "RITA - DON'T MESS WITH TEXAS"!

The family would love to assist two students. I will continue as the NWS Lead - but it might be wise to bring in an "Under-boss" to work on the second CSTAR project regarding the "pre-event" events. Ron Horwood comes to mind immediately but I might also try to get a representative from OKX: Mike Exster is a sharp cookie and I think would represent the "Family" well. Please allow me to be a politician and work this out - but I see no reason not to pursue.

The third item is fascinating - I think Walt would be interested at least to some degree - he tends to be shy at first - but he would enjoy it.

Now from a forecasting stand point related to the tropical rainfall, my priorities would be:

1. Mesoscale processes
 - a. Coastal Fronts - I wanna know everything we can about these

nifty coastal fronts that do so much to enhance rainfall amounts/location; ie: Characteristics, behavior, structure and can we really forecast them!

b. Orographic enhancement - where, how and most importantly by how much can this process enhance the rainfall totals and location of maxima.

2. I like the idea of examining these "pre-events" - in the case of these distant offshore passages - (I'd add Gaston 2004 to the list too) they end up being the "real" event and difficult to forecast.

I believe we are "eating out of the same pasta bowl" on these issues. Looking forward to meeting the new students and ironing out where we wish to go.

As an FYI if nothing more, My ITO and I have cranked up the GEMPAK engine and are producing reanalyses for our primary landfalling storms in our continued effort to nail down the location/strength of the major players which enable these storms to get up here without being sheared east or sent inland south of 35. We are actually running data for all 38 storms - just to have a complete set - even doing upper/lower PV - trying to get a better handle on proximity of these players w/respect to those that dump vs. some "null cases" which we will run later. Cases from 1999 through 2004 will be coming - including the set of "Horwood Analyses" too!

Amazing that this season has been all "Gorillas in the GULF" and not a system worth worrying too much about on the east coast.

David

----- Original Message -----

From: Lance Bosart <bosart@atmos.albany.edu>

Date: Wednesday, September 21, 2005 12:38 pm

Subject: Re: Rains of 15 Sep'05

Hi David,

The eastern branch of the "family" is clearly on top of things (unlike the Hudson Valley chapter)! :)

And speaking of the family, how much room is there at the TAN branch of the "CSTAR Inn"? Would you guys be able to work with possibly two new CSTAR students on TC-related problems and, if so, who would be the focal points? The following possible projects are on my radar screen:

1. Mesoscale structure within landfalling and transitioning TCs.
2. Mesoscale rainstorms within the periphery of, and well in advance of, TCs (the Katrina and Ophelia events).
3. Multiscale analysis of the 1991 "perfect storms" (there was also quite the Halloween snowstorm event in the upper Midwest that can be directly linked to the events in the North Atlantic).

The third project is something I've always wanted to do because it combines a blizzard and a hurricane in one vast coupled storm system and because it gives new meaning to the term "blowing hot and cold". I can see the title of a future MWR paper now: The Great Pumpkin, the Big Chill and the Big Swell: Waves Galore and Drifts Aplenty. And, of course, the opening sentence will read: "It was the most wavy of times, it was the least calm of times, it was the snowiest of times....."

The first two possible projects lend them themselves nicely to CSTAR research. The third project, while relevant to CSTAR, can also be done under my NSF umbrella. From your perspective, what new TC/rainfall-related projects would make the most sense to tackle from an operational perspective? We can zero in on the details with the students when you are here for NROW.

I expect that we will see El Presidente on the beach somewhere in TX in a couple of days giving a "Let them eat seaweed" speech.

Lance

>Lance,
>
>Eh, how can the family break this easily to you; ah...
>From a warning stand point - performance was outstanding - lead
>times beyond the region goals!
>
>From a "gee boyz - I think it might rain a little stand point" -
>actually and in spite of the distractions being
>created by Ophelia - the mid shift (Walt of course) saw a swath
of >3-4" rains coming along/s and e of I95.
>Bingo. Flash Flood guidance didn't prompt him to issue a flash
>flood watch - but he at least had a good
>focused statement on the potential for Thursday.
>
>And just in case you were wondering - I've already burned the
day's
>8 Gb of data to DVD - so this makes
>two flash flood events awaiting review.
>
>Can't buck the tropical trend this season - it's a Gulf Coast
sort of year. While Ophelia may have had ambitions - Rita sure looks
>like she's about to be another blockbuster - roaring thru the
Gulf again. Landfall at Galveston - as a Cat 5 would be noteworthy!
Me thinks Mr. Bush would have a slightly faster response in that
state!
>Then again, I would also hope the Mayor of Galveston would be a
bit more equipped (shall we say) than the performance given
>by the New Orleans folks.
>David
>
>Lance Bosart wrote:

>>Hi Dave,
 >> Tell me that things were better this time around.....
 >>
 >> Lance
 >>
 >>P.S. Beware the Ides of September.....
 >>
 >>METAR> tan 8
 >>KTAN 151252Z AUTO VRB04KT 10SM BKN013 24/21 A3008 RMK AO2 SLP184
 T02390211=>>KTAN 151352Z AUTO 14004KT 10SM OVC011 26/22 A3007 RMK
 AO2 LTG DSNT
 >>N AND NW SLP181 T02560217=
 >>KTAN 151452Z AUTO 17006KT 10SM OVC015 26/22 A3007 RMK AO2 LTG
 DSNT
 >>SW-N TSB26E41RAB18E51 SLP180 P0000 60000 T02610222 58002=
 >>KTAN 151552Z AUTO VRB05KT 1/2SM +TSRA FG BKN014 BKN019 OVC030
 21/19
 >>A3009 RMK AO2 LTG DSNT NE AND E AND SW TSB08RAB07 SLP187 P0030
 >>T02110194=
 >>KTAN 151652Z AUTO 01006KT 1/4SM +TSRA FG BKN003 OVC024 21/20
 A3008
 >>RMK AO2 LTG DSNT NE AND E SLP186 P0147 T02110200=
 >>KTAN 151752Z AUTO 00000KT 1/2SM +RA FG BKN005 BKN023 OVC038
 22/21
 >>A3007 RMK AO2 LTG DSNT E AND SE TSE26 SLP183 P0078 60255
 T02170206
 >>10267 20211 50003=
 >>KTAN 151852Z AUTO 00000KT 5SM -RA BR BKN003 OVC015 22/21 A3007
 RMK
 >>AO2 SLP183 P0014 T02220211=
 >>KTAN 151952Z AUTO 12006KT 10SM -RA FEW003 SCT010 OVC048 23/22
 A3006
 >>RMK AO2 LTG DSNT SE SLP179 P0030 T02280217=
 >>KTAN 152052Z AUTO 12004KT 3SM -RA BR BKN014 BKN021 OVC031 23/22
 >>A3006 RMK AO2 SLP178 P0018 60062 T02280217 58005=

From: Jeff.Waldstreicher@noaa.gov Mon Oct 3 18:53:37 2005
Date: Mon, 03 Oct 2005 14:53:22 -0400
From: Jeff Waldstreicher <Jeff.Waldstreicher@noaa.gov>
Subject: CSTAR Pamphlet
To: Gene Auciello <Gene.Auciello@noaa.gov>,
Warren Snyder <Warren.Snyder@noaa.gov>,
Lance Bosart <bosart@atmos.albany.edu>,
Daniel Keyser <keyser@atmos.albany.edu>
Cc: Kenneth Johnson <Kenneth.Johnson@noaa.gov>

Gene/Warren/Lance/Dan -

I have recently completed a pamphlet that highlights the accomplishments of CSTAR (nationally - all of the projects) during the 6 years of the program. It is focused on detailing how CSTAR is contributing toward meeting NOAA's strategic goals (the pamphlet organization mirrors the 2005 NOAA Strategic Plan document). The target audience is NWS and NOAA senior management to educate them on just what a productive and effective (costs and results) program CSTAR is. I have attached a copy for your info. The CSTAR.pdf file is designed for screen viewing. For pamphlet printing (a 8.5" x 14" page folded to make a 4 page 8.5" x 7" pamphlet), use the CSTARprint.pdf file.

Jeff

----- End of forwarded message from Jeff Waldstreicher -----

From: Gene.Auciello@noaa.gov Mon Oct 3 19:22:54 2005
Date: Mon, 03 Oct 2005 15:22:47 -0400
From: gene auciello <Gene.Auciello@noaa.gov>
Subject: Re: CSTAR Pamphlet
To: Jeff Waldstreicher <Jeff.Waldstreicher@noaa.gov>
Cc: Warren Snyder <Warren.Snyder@noaa.gov>,
Lance Bosart <bosart@atmos.albany.edu>,
Daniel Keyser <keyser@atmos.albany.edu>,
Kenneth Johnson <Kenneth.Johnson@noaa.gov>

Hi Jeff...

This is great stuff! Thanks for getting it together. Hopefully, the benefits of CSTAR will be fully realized by NWS/NOAA senior management.

Gene

From david.novak@noaa.gov Wed Oct 5 13:58:07 2005
Date: Wed, 05 Oct 2005 09:58:12 -0400
From: David Novak <david.novak@noaa.gov>
Subject: ND Multibanding event
To: David Schultz <David.Schultz@noaa.gov>, keyser@atmos.albany.edu,
colle@cyclone.msfc.su.nyu.edu,
Jeff Waldstreicher <Jeff.Waldstreicher@noaa.gov>,
bosart@atmos.albany.edu

Banding Buddies,

If you get a chance, checkout the radar animations from eastern North Dakota this morning - a nice case of multibanding. I've attached an couple example images.

In my thesis work we identified these events several times in northeast cyclones. They seemed to form at the nose of the dry air intrusion (this current case no exception), with the composite cross section showing a layer of elevated conditional instability. Often times these fine-scale bands move northwest and merge with a single band further in the cold air, which is sort of happening in this case (see MBX radar image).

The unanswered question is why the elevated showers are organized into bands? There has to be some linear trigger. Are they gravity-wave forced? What other mechanisms could be at play?

Interested in your thoughts,
Dave

----- End of forwarded message from David Novak -----



CSTAR

Collaborative Science, Technology, and Applied
Research Program



Meeting NOAA's Strategic Goals Through Collaborative Partnerships

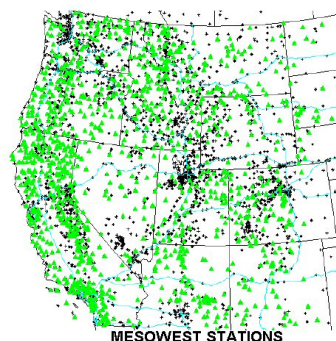
2000-2005 Accomplishments

In FY00, the NOAA initiated a grant program to fund collaborative research activities between the academic community and operational offices within the National Weather Service. The goal of the Collaborative Science, Technology and Applied Research (CSTAR) program was to create a cost-effective framework to conduct basic and applied research and transfer the results to operations and services. Grants of up to 3 years in duration have been awarded for projects that address identified NOAA and NWS science priorities. Since FY00, 15 CSTAR grants have been awarded to 10 academic institutions. This investment in collaborative research has resulted in the following contributions toward meeting NOAA's strategic goals:

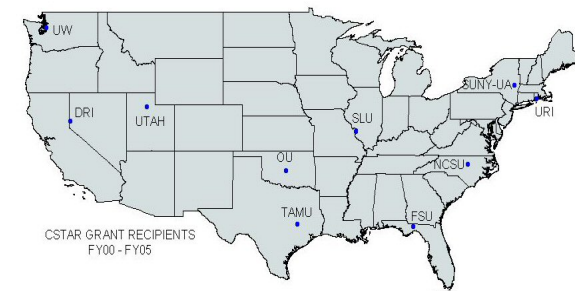
CLIMATE MISSION GOAL

Describe and understand the state of the climate system through integrated observations, analysis and data stewardship

The University of Utah CSTAR project has been instrumental in the development of MesoWest - a real-time cooperative mesonet data exchange that provides access to weather observations from more than 180



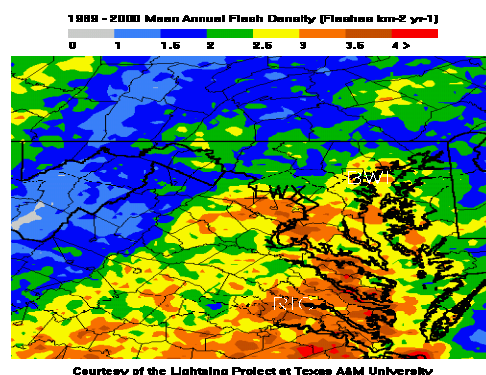
government, educational, and commercial data providers at over 6000 surface stations around the nation, with an emphasis on the western U.S. The MesoWest observations are integrated with other data to produce analyses of surface weather conditions. In addition, the Utah CSTAR project has helped spearhead a national effort to develop a high-resolution Analysis of Record (AOR) that will meet the diverse needs of the environmental community.



Increase number and use of climate products and services to enhance public and private sector decision making

CSTAR projects have resulted in a number of new climate products and services including:

- Snow-water ratio climatologies (St. Louis Univ.)
- Relationships between large-scale circulation indices and cool season precipitation in the Northeast (U. Albany)
- Incorporating mesoscale climatologies into new digital forecast products and services (Florida St.)
- Lightning climatologies (Texas A&M Univ. and Florida St. Univ.)

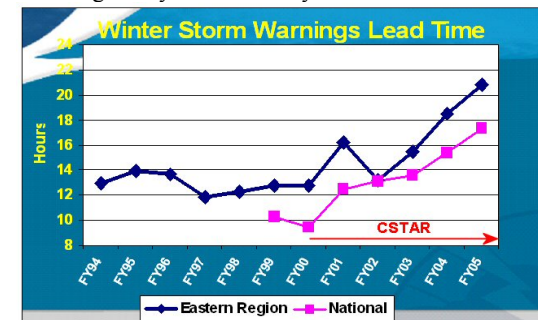


Courtesy of the Lightning Project at Texas A&M University

WEATHER AND WATER MISSION GOAL

Increase lead time and accuracy for weather and water information

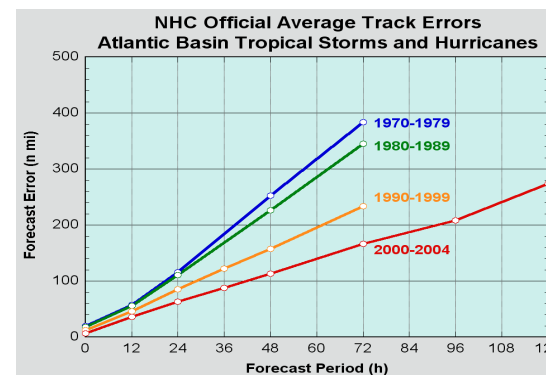
Results from several CSTAR projects have led to substantial improvements in winter storm warning lead times regionally and nationally.



CSTAR projects that have investigated regional and national aspects of winter storm forecasting include:

- Mesoscale snow bands (Albany and St. Louis)
- Precipitation type forecasting, including model improvements (North Carolina St., Univ. of Utah, and U. Washington)
- Snow microphysics and accumulation efficiencies (Albany and St. Louis)
- Winter weather in complex terrain (Utah, Washington, Albany, and North Carolina St.)

The CSTAR project between the Univ. of Rhode Island (URI) and the NCEP Tropical Prediction Center resulted in the coupling of the GFDL hurricane model with the URI ocean model. This advanced hurricane model is a major factor in the recent substantial improvements in hurricane track forecasts.



Improve predictability of the onset, duration, and impact of hazardous and severe weather and water events

Most of the CSTAR projects have examined some aspects of heavy precipitation and flood forecasting. Some of these include:

- Rainfall patterns of landfalling tropical systems (Albany and North Carolina St.)
- Regional conceptual models for heavy precipitation systems (St. Louis, Albany, North Carolina St.)
- Radar precipitation estimation algorithms in mountainous terrain (Desert Research Institute)
- Development of a coupled atmospheric and hydrologic modeling/forecast system (Washington)

The current University of Oklahoma CSTAR project is developing a technique to improve tornado detection utilizing spectral analysis of WSR-88D data. St. Louis University is conducting research on the characteristics of propagation of mesoscale convective systems. The University at Albany and University of Washington are investigating the roles of terrain and coastal interactions in severe weather events in the Northeast and Northwest, respectively.

Reduce uncertainty associated with weather and water decision tools and assessments

A CSTAR project at Florida St. Univ. developed new techniques for probabilistic quantitative precipitation forecasting.

The Univ. of Washington CSTAR project is working with a high resolution ensemble modeling system to develop calibrated probabilistic forecasts and associated techniques to assess forecast skill.

Increase application and accessibility of weather and water information as the foundation for creating and leveraging public, private and academic partnerships

MesoWest provides timely access to surface observations from a cadre of data providers to operational forecasters, the research and private sector communities, and the public. Univ. of Utah's Real-Time Observation Monitor and Analysis Network (ROMAN) web-page interface provides access to MesoWest observations for fire weather applications.

The University of Washington CSTAR project is working with the Northwest Modeling Consortium, a

group of federal, state and local agencies and private sector contributors to determine the benefits of high resolution forecasting, improve verification approaches, and to identify and address weaknesses in model physics.

Increased development, application, and transition of advanced science and technology to operations and services

The collaborative nature of the CSTAR research has resulted in an accelerated timeline for transition of research results into operations. With university faculty

and students and NOAA personnel jointly conducting the research, developing the applications and generating educational materials, CSTAR research results often have beneficial impacts on forecasts and warnings even before the research is formally published. Also, several CSTAR PIs have served as lead instructors for NWS and COMET training courses. Use of the NWS Weather Event Simulator has not only accelerated the transition of CSTAR results into

operations, but has also exposed the academic partners to the platform used by the forecasters, further focusing application development.

Increase coordination of weather and water information and services with integration of local, regional and global observation systems

The University of Utah CSTAR project is developing improved data assimilation techniques in complex terrain. Utah generates surface analyses of temperature, wind, relative humidity, and pressure by combining the MesoWest data with background fields provided by the NCEP Rapid Update Cycle model analysis.

The CSTAR projects at the Universities of Utah and Washington are developing methodologies to utilize observational resources to better evaluate numerical model data ingest and forecast performance, as well as new NWS digital forecast grids. The University of Washington is also developing techniques to use these analyses to generate model biases and then remove these biases from future model runs.

Enhance environmental literacy and improve understanding, value, and use of weather and water information and services

Several CSTAR projects have been co-sponsoring annual regional workshops that include sharing of CSTAR research results with participants from the full spectrum of the weather enterprise. These annual workshops include:

- Northeast Regional Operational Workshop (Albany)
 - Intermountain Workshop (Utah)
 - Pacific Northwest Weather Workshop (Washington)
- Other national, regional and local conferences, local professional society meetings, and outreach presentations are other vehicles for presenting and discussing CSTAR results with NOAA partners.

CSTAR project web pages have been another medium for sharing CSTAR activities and results. In addition, feedback from other partners in the weather enterprise, particularly the media and private sector indicates that the Area Forecast Discussions prepared by NWS forecast offices are a particularly effective way to share and illustrate the application of CSTAR-developed forecast techniques.

COMMERCE AND TRANSPORTATION MISSION GOAL

Reduce weather-related transportation crashes and delays

CSTAR projects at the University at Albany, North Carolina St. Univ., St. Louis University, and University of Utah have resulted in substantial improvements in winter weather forecasting, and the resultant impacts on surface and air transportation. Most of these projects, as well as the University of Washington project have also explored the impacts of terrain on regional weather conditions.

Other CSTAR project results that have improved transportation related forecasting activities include:

- Improved forecasts during cold air damming (CAD) episodes in the eastern U.S. These CAD events substantially impact aviation-related ceiling and visibility forecasts, as well as precipitation type (North Carolina St.)
- Improved thunderstorm forecasts using flow-dependent lightning climatologies (Florida St.)
- Gap winds in the Columbia River Gorge and their impacts on surface transportation conditions and forecasts for the Portland Int. Airport (Washington)
- Local modeling in support of the Oberlin, OH, aviation Center Weather Service Unit (Albany)
- New techniques for fog forecasting (Texas A&M and Albany)

CROSS-CUTTING PRIORITIES
Integrating Global Environmental Observations and Data Management

Through the MesoWest, ROMAN and Analysis of Record activities, the Utah CSTAR project is making substantial contributions towards the evolving Global Earth Observation System of Systems (GEOSS), by establishing efficient and effective methods to manage and integrate observations for enhancing economic security and national safety through the prediction and research of weather and climate-related events.

Promoting Environmental Literacy

Several of the CSTAR co-located facilities such as North Carolina St., Albany, and Florida St. have developed formal student-intern courses for academic credit. These courses enable students to experience forecast operations and the preparation of various NOAA products and services. In addition to the work experience and training, these students also receive career counseling from NOAA personnel. Similarly, NOAA personnel often serve as thesis review committee members, guest lecturers, and co-instructors for university courses such as the Operational Meteorology course at Florida St. In addition, the results of CSTAR research are routinely incorporated into NOAA web sites and outreach materials. These are many of the strategies advocated in the 2004 NOAA Education Plan.

Developing, Valuing, and Sustaining a World-Class Workforce

Human capital is an important benefit of the CSTAR program. The collaborative activities of the CSTAR projects expose both students and the academic PIs to the day-to-day challenges and opportunities presented by

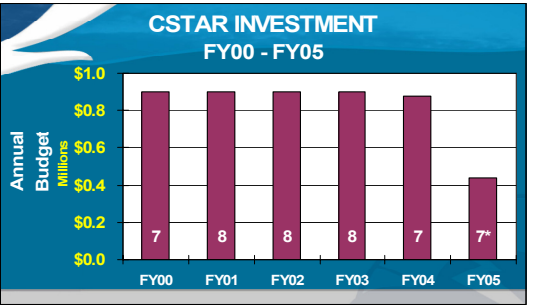
careers in NOAA. CSTAR students obtain valuable personal experience working operations alongside NOAA personnel. Upon graduation, many CSTAR alumni have embarked on careers within NOAA. As of the summer of 2005, at least 22 CSTAR project graduates were working in NOAA. In addition, 2 former CSTAR PIs have also taken positions within NOAA.

Ensuring Sound, State-of-the-Art Research

CSTAR related research has resulted in the publication of approximately 75 articles in various peer reviewed scientific journals between FY00 and FY05. Numerous additional articles are expected from ongoing research activities. In addition to these formal refereed articles, CSTAR collaborative research has produced nearly 1000 informal publications including conference preprints and conference and workshop presentations.

CSTAR projects have also been able to leverage other projects such as NSF and other funded field programs (BAMEX, IPEX, IMPROVE, and HEAT, for example), as well as participating in test bed efforts such as the recent Development and Test Center’s Winter Forecast Experiment to evaluate real-time experimental Weather Research and Forecasting model runs.

CSTAR has achieved this level of success despite a limited investment. Original plans called for an annual CSTAR budget of \$1.5M funding approximately 12 active 3-year projects in any year. To date, actual program budget topped out at \$900K per year, with a total investment through August 2005 of \$4.9M. Thus, CSTAR has only been able to support a maximum of 8 active projects. As a result of FY05 budget reductions, no CSTAR RFP was issued, and some projects received only partial funding.



Without continued investment in the CSTAR program, sustaining these invaluable contributions to NOAA’s strategic goals will be extremely difficult.

