UNIVERSITY AT ALBANY
State University of New York

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22 September 2014

Dr. Christopher Hedge
Office of Science and Technology
NOAA/National Weather Service
1325 East-West Highway, Suite 15328
Silver Spring, MD 20910

Dear Dr. Hedge:

I am transmitting a summary of the UAlbany CSTAR V project activities for the six-month period ending 31 August 2014. This report represents the second UAlbany CSTAR report with myself as PI, and Drs. Lance Bosart, Daniel Keyser, Andrea Lang, Brian Tang and Ryan Torn as co-PIs. Research conducted during this period has continued to address research questions related to the occurrence and prediction of high-impact weather events in the Northeast United States.

During the reporting period, second year graduate student Matthew Vaughan made substantial progress on CSTAR V Project #1, *Severe convection in scenarios with low predictive skill* (see Section 1a). Matthew's research benefited greatly from his interactions with Storm Prediction Center forecasters during his visit to the National Weather Center to participate in the 2014 NOAA Hazardous Weather Testbed Spring Forecasting Experiment. In addition to Matthew, two new CSTAR V students, Molly Smith and Rebecca Steeves, arrived on campus in September and July, respectively, and have begun their research on Project #s 2 and 3, *Predictability of heavy precipitation associated with tropical moisture*, and, *Transition season Northeast storms and East Coast atmospheric rivers*, respectively. Despite only working on their projects for a short amount of time, both students have started to produce interesting results (see Sections 1b and c).

The PI, co-PIs, graduate students, and NWS personnel participated in the Spring 2014 CSTAR meeting, held at the NWS Albany offices on 2 May 2014. Research results were presented and in-depth conversations on research methodologies and case studies were conducted with NWS focal points. Co-PI Bosart participated in the 2014 NOAA Hazardous Weather Testbed Spring Forecasting Experiment, and PI Corbosiero, co-PI Tang and co-PI Bosart began research on the long-lived supercell of 22 May 2014 that produced 4" hail and an EF3 tornado within the Albany County Warning Area. Further information on UAlbany CSTAR I–V related theses, presentations and publications can be found on the following webpage: http://www.atmos.albany.edu/facstaff/kristen/CSTAR/CSTAR_CumulativePublications.pdf.

An NWS perspective on CSTAR V project activities is provided by NWS Albany Science Operations Officer Warren Snyder in Section 3. The CSTAR V projects continue to contribute to the legacy of

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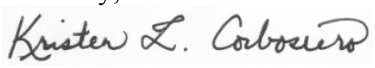
completing operationally focused research, engaging the academic community, providing the NWS with top quality applicants, enabling the involvement of dozens of operational meteorologists from numerous NWS offices, and facilitating the rapid transfer of project results into operational forecasting practice. Section 4 contains a comprehensive progress report on the "Snyder Plan IV," which continues to provide a framework for NWS participation in cooperative research and technology transfer.

Section 5 describes activities performed by David Knight and addresses computing and technology transfer, and Section 6 contains examples of UAlbany CSTAR project research that has transitioned into NWS forecast operations in the form of Area Forecast Discussions that explicitly refer to the UAlbany CSTAR program.

With the continued success of the longstanding research and educational partnership between the NWS and the UAlbany Department of Atmospheric and Environmental Sciences, the UAlbany Division for Research recognized the collaboration in their annual research report, *Advancing Our Promise*: http://www.albany.edu/research/assets/Research_Report_2014_all_pages.pdf.

In summary, the UAlbany CSTAR V project has begun to address research questions related to the occurrence and prediction of high-impact weather events in the Northeast United States. The three major projects leverage the activities of the UAlbany PI, co-PIs and graduate students for the benefit of NWS forecast operations in the Eastern Region and beyond.

Sincerely,



Kristen L. Corbosiero

cc: Lance Bosart
Daniel Keyser
Andrea Lang
Brian Tang
Ryan Torn
Raymond O'Keefe
Warren Snyder
Ken Johnson
Jeff Waldstreicher
David Knight
Matthew Vaughan
Molly Smith
Rebecca Steeves

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

Grant title:

"Cooperative Research with the National Weather Service on the Occurrence and Predictability of High-Impact Precipitation Events in the Northeastern United States"

University: University at Albany

Name of University Researcher Preparing Report: Kristen L. Corbosiero

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

Name of NWS/AFWA/Navy Researcher Preparing Report: Raymond O'Keefe

National Oceanic and Atmospheric Administration (NOAA) Award #: NA13NWS4680004

Date: 22 September 2014

1. SUMMARY OF GRADUATE STUDENT RESEARCH ACTIVITIES

a) Severe convection in scenarios with low predictive skill

Graduate student: Matthew Vaughan
Co-PIs: Brian Tang and Lance Bosart
NWS focal points: Joe Villani (ALY), Mike Evans (BGM) and Matthew Kramar (PIT)

Research Summary:

The primary objective of this research summary period was to form a database of poorly predicted severe weather events and evaluate the long-term statistics of this database over the continental U.S. (CONUS) and the Northeast. Matthew Vaughan and Lance Bosart worked with Storm Prediction Center (SPC) Science Support Branch Chief Steve Weiss and Andy Dean at the 2014 NOAA Hazardous Weather Testbed Spring Forecasting Experiment to obtain convective outlooks to construct a long-term database of poorly predicted severe weather events. Using the verification algorithm described in the previous CSTAR V report, skill scores for the CONUS and Northeast were calculated for each severe weather event from 1980–2013. For inclusion in the dataset, events must have either a Slight Risk contour or at least 20 severe reports within the respective domain.

Figure 1 depicts the annual median threat score for the Northeast (red) and the CONUS (blue). Error bars indicate the 25th and 75th percentile threat scores. The national threat score remained flat around 0.05 throughout the 1980s before increasing steadily during the 1990s into the early 2000s, after which the threat score has had little discernable trend. The Northeast threat score has substantially more variance than the CONUS threat score due to a smaller sample size. The increased variance makes detecting any substantial temporal improvements difficult. Nevertheless, the data suggest that the Northeast does not suffer lower predictive skill relative to the CONUS, despite the challenges of forecasting severe weather events in the Northeast.

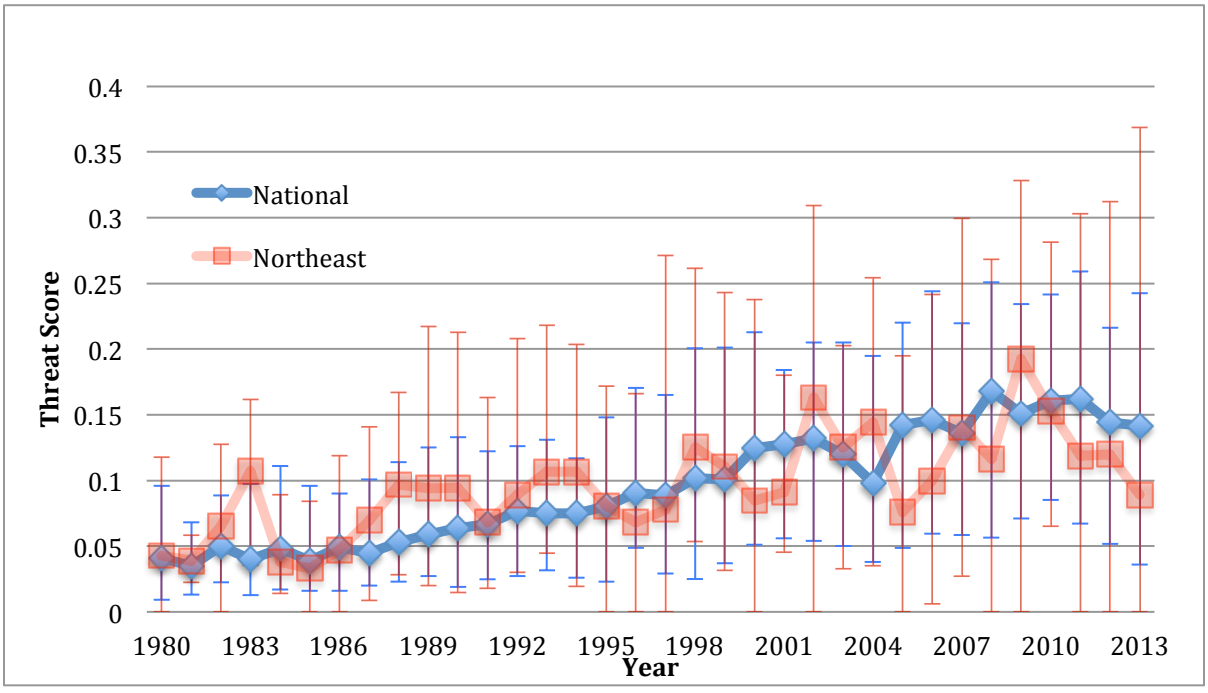

Fig. 1 Annual threat score medians for the Northeast (red) and the CONUS (blue) from 1980–2013. Error bars give the 25th and 75th percentiles of the threat score.

The probability of detection (POD) and false alarm rate (FAR) lead to a similar conclusion (not shown). The POD in the Northeast was greater than the CONUS for most of the study period. The POD in the Northeast was about 70% from 1980 through 1995, while the POD for the CONUS improved from 40% in 1980 to 60% in 1995. Interestingly, POD declined for both regions after 1995. Over the last three years, the POD for both the Northeast and CONUS has been below 50%. This may be attributed to changes in reporting practices in the last 15–20 years, rather than any change in the predictability of severe weather events. The FAR was over 90% for both the Northeast and the CONUS in 1980 and has gradually declined over the study period for both domains. Since 2007, the FARs for the nation and the Northeast have remained below 80% with the Northeast having a slightly lower, although more variable, FAR.

We will use this database to objectively determine a ranking of overpredicted and underpredicted events in the Northeast to see if they match up with subjectively identified events compiled by NWS focal points from their local predictability studies. We will then group the overpredicted and underpredicted events into synoptic-scale flow regimes (e.g., 500 hPa northwesterly flow). We also plan to composite overpredicted and underpredicted cases by flow regime to determine which parameters, such as convective available potential energy (CAPE), vertical wind shear, mid-level lapse rates, and cold air advection aloft, are relevant for determining whether forecasted severe weather events are overpredicted versus underpredicted.

An opportunistic example of an unexpected and underpredicted case was on 22 May 2014. An EF-3 tornado hit Duanesburg, NY and 4" diameter hail was observed in Amsterdam, NY. Such a high-end severe event was not anticipated, nor did any of the high-resolution convective models suggest the possibility. The 1200 UTC 22 May sounding from Albany, NY depicted a most unstable CAPE of 372 J kg^{-1}, a mixed layer lifting condensation level around 1 km, and relatively cold midlevel temperatures near -20°C at 500 hPa. The supercell formed between 1500 and 1600 UTC at a triple point and moved south along a north-south oriented stationary front that was maintained by strong differential shortwave heating. Figure 2 shows relatively high equivalent potential temperatures in the Mohawk Valley at the intersection of stronger heating to the east, and moisture pooling along the stationary front increased the CAPE to 2500 J kg^{-1} locally. This, combined with the low wet bulb freezing levels around 2.5 km and mesocylonic circulation, led to the formation of large hail as the storm passed through the valley around 1900 UTC. Falling surface pressures to the west of the boundary led to increased backing of surface winds over the Hudson and extreme eastern Mohawk Valleys, providing an enhanced region of >10 m s^{-1} 0–1 km, and >20 m s^{-1} 0–6 km, vertical wind shear that created a localized environment favorable for the reinvigoration of the mesocyclone and formation of the tornado between 1900–2000 UTC (Fig. 2 inset). Interaction of the mesoscale flows, such as the rear flank downdraft, with the terrain may have also played a crucial role in the storm evolution. This unexpected case highlights the challenge of severe convective forecasting in the Northeast, particularly due to the complex interaction of synoptic, mesoscale, and terrain features.

In order to examine the 22 May 2014 case more in depth, we have collected various sources of data to begin a detailed mesoscale analysis of the event. Dual-polarization data from the Albany radar will be used to examine the three-dimensional structure of the supercell. Lightning data from the National Lightning Detection Network will be examined to assess the lightning density over the lifetime of the supercell. High-Resolution Rapid Refresh (HRRR) data has been obtained from the Earth System Research Laboratory (ESRL), courtesy of Eric James and Curtis Alexander, to examine model analyses of mesoscale flow features and convective parameters. Additionally, we have obtained wind data from an aircraft departing Albany

International Airport to supplement missing low-level wind data from the 1200 UTC Albany sounding.

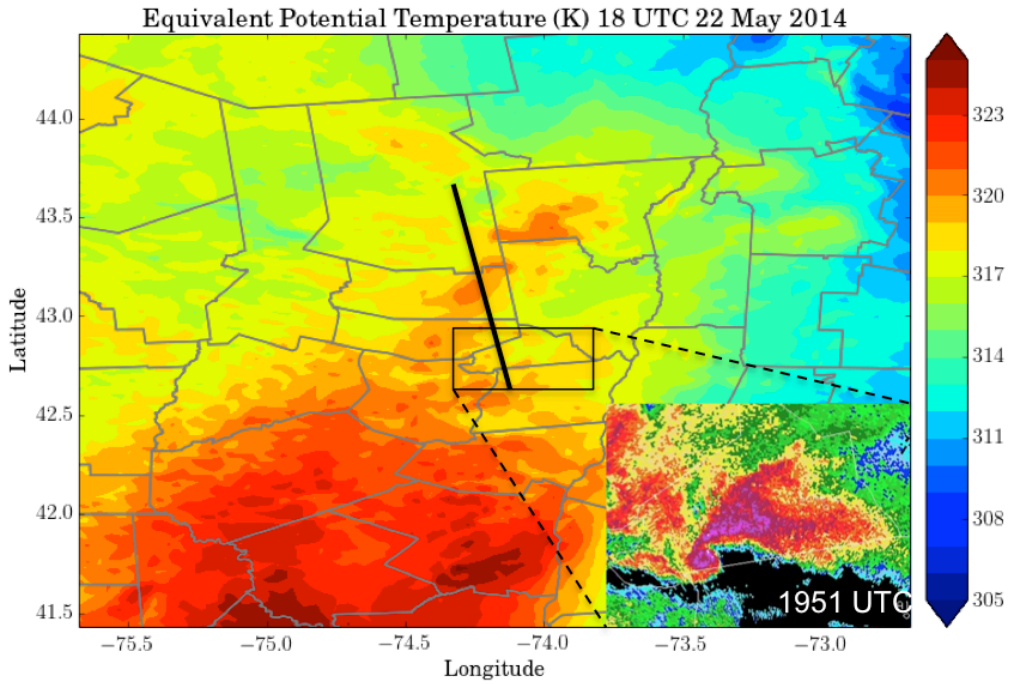

Fig. 2. Two-meter equivalent potential temperature (shaded, K) from the 1800 UTC 22 May 2014 HRRR analysis. Black line shows the approximate path of the supercell. Radar inset is the reflectivity from the KENX radar at 1951 UTC.

NOAA and NWS Interactions:

Mike Evans (BGM) and Joe Villani (ALY) completed local predictability studies for their respective county warning areas. Their findings were shared via email and during a research group conference call on 19 June 2014 with the co-PIs and Matthew Vaughan. Hazardous Weather Outlooks were used to subjectively identify days in which severe weather was anticipated. CAPE and shear values were computed from BUFKIT sounding data to determine which environmental conditions led to poor severe weather forecast performance. Matthew Vaughan, Lance Bosart, and Mike Evans participated in the 2014 Hazardous Weather Testbed Spring Experiment and discussed research ideas with SPC scientists, including Steve Weiss. Through this collaboration, we were able to gain access to SPC forecast data back to 1980 to expand the database of poorly predicted severe weather events. Finally, Brian Tang worked with Eric James and Curtis Alexander to obtain HRRR data for the 22 May 2014 case.

Presentations:

Matthew Vaughan presented the algorithm to objectively identify severe weather events with low predictive skill and a case study of the 4 May 2010 underpredicted severe weather event at the 2014 Northeast Storms Conference in Rutland, VT on 9 March 2014. In addition, Matthew presented skill scores for the Northeast and the CONUS from 2009–2013 at the Spring 2014 CSTAR meeting on 2 May 2014 with NWS focal points Joe Villani and Mike Evans in attendance.

Brian Tang, Matthew Vaughan, Kristen Corbosiero and Lance Bosart will present findings from the 22 May 2014 case study at the upcoming American Meteorological Society

Severe Local Storms Conference in Madison, WI in November. Matthew will present his long-term database of poorly predicted severe weather events at the same conference.

b) Predictability of heavy precipitation associated with tropical moisture

Graduate student: Molly Smith

Co-PIs: Kristen Corbosiero and Ryan Torn

Progress on this project has increased over the past six months as graduate student, Molly Smith, arrived in late August. In preparation for Molly's arrival, forecast datasets were generated and downloaded by the co-PIs for cases of heavy precipitation associated with tropical moisture that fall within the parameters of the project. One of these cases is Hurricane Arthur of early July 2014, which passed close to the New England coast and led to rainfall totals in excess of 2" over a large part of eastern Massachusetts and eastern Maine, with isolated values of up to 8" (Figure 3). Given the large societal impact along the Eastern Seaboard and the fit of this case within the scope of this project, we asked Phil Pegion (NOAA/ESRL) to generate 80-member Global Forecast System (GFS) ensemble forecasts for Hurricane Arthur initialized at 0000 UTC 4 July 2014. This large ensemble size will allow us to provide a quantitative assessment of why some members produced larger precipitation amounts relative to others over New England. Molly Smith is currently evaluating various forecast metrics that describe the precipitation distribution (e.g., mean value over an area and empirical orthogonal functions of the precipitation) before computing the sensitivity of the forecast metric to fields such as moisture, synoptic-scale flow pattern and vertical wind shear, which may modulate the precipitation. In addition, we have acquired the 51-member European Center for Medium-Range Weather Forecasts ensemble for the same initialization time and will carrying out a similar analysis with the dataset.

During the next month, we will ask our ESRL collaborators to generate GFS ensemble forecasts for the 12 August 2014 historic flooding along Long Island, NY, which had precipitable water amounts that were characteristic of the deep tropics, with values greater than the 99th percentile for rawinsonde stations along the East Coast. Moreover, we will also request forecasts for Hurricane Irene (2011). We anticipate having at least a preliminary analysis of Hurricane Arthur finished by the Fall 2014 CSTAR meeting in November and will begin meeting with our NWS focal points, Steve DiRienzo and Mike Jurewicz, regularly.

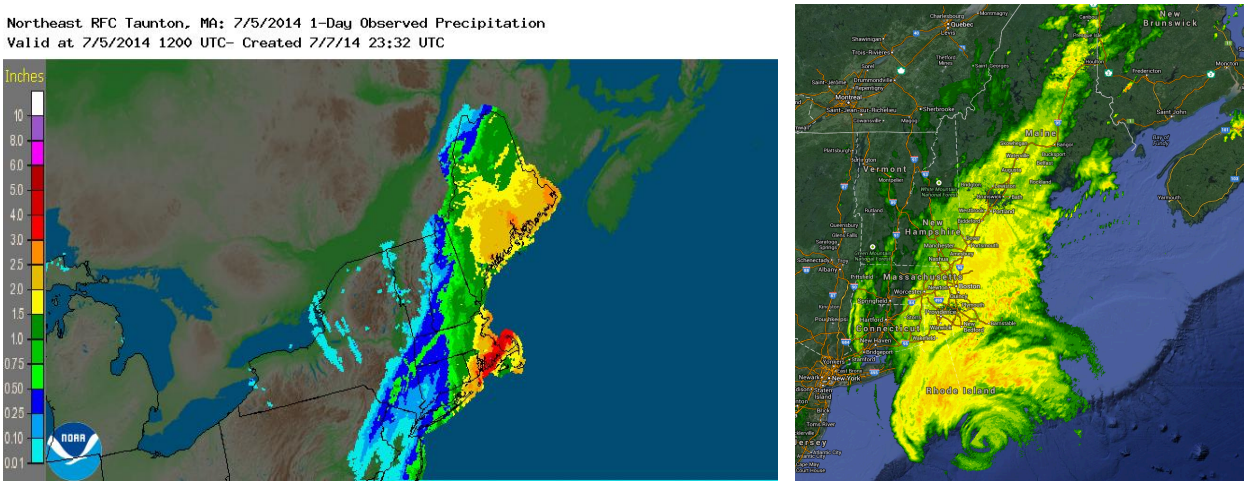

Fig. 3. Left: Total rainfall (in.) for the 24-h period ending 5 July 2014 associated with Hurricane Arthur (from http://water.weather.gov/precip/rfc.php). Right: Composite radar reflectivity at 2200 UTC 4 July 2014 (from http://www.wunderground.com/wundermap).

c) Transition season Northeast storms and East Coast atmospheric rivers

Graduate student: Rebecca Steeves

Co-PIs: Andrea Lang and Daniel Keyser

Major transition season storms with frozen precipitation have the potential to cause widespread socioeconomic disruption in ways including, but not limited to, multi-car pileups, road closures, and power outages impacting tens of thousands. This project is concerned with major Northeast transition season storms that are difficult to forecast and that result in significant socioeconomic impacts such as those listed above. The envisioned research will focus on documenting: 1) the synoptic-to-mesoscale atmospheric conditions in the extratropics occurring prior to, and during, transition season storms, with emphasis on the formation and maintenance of lower-tropospheric cold pools, which are hypothesized to be a key ingredient of this class of high-impact weather events; and 2) the role of tropical moisture transport occurring within atmospheric rivers in the formation and evolution of transition season storms.

Work on this project, dating back to the arrival of Rebecca Steeves in mid-July 2014, has focused on developing an objective definition of major transition season storm events, and on compiling a list of all transition season events featuring the occurrence of frozen precipitation during fall (September–November) 2002–2012 and spring (March–May) 2003–2013. Because heavy, wet snow tends to occur in transition season events, lesser accumulations can result in greater disruption than if the same accumulation occurred in winter season events. Therefore, compiling cases of all transition season events featuring frozen precipitation will aid in determining the thresholds needed to categorize storms as major events specific to the transition season. The Monthly National Climatic Data Center Storm Data (SD) Publication provides the basis for case compilation. Cases identified thus far are listed in Table 1 below. The SD Publication also includes socioeconomic impacts (e.g., power outage, infrastructure damage, and transportation reports) in addition to storm characteristics, such as precipitation amount and type, areas affected, and surface storm evolution. The corresponding upper-air storm evolution is derived from SPC's Surface and Upper Air Map Archive. Finally, forecast challenges and additional storm characteristics are drawn from CSTAR's Post-Mortems and Significant Storm Summaries webpage with links to individual Northeast NWS offices (http://cstar.cestm.albany.edu/PostMortems/CSTARPostMortems/cstarpostmortemindex.htm).

Table 1. Major transition season events.

Fall Events	Spring Events
5–7 November 2002	6 March 2003
16–18 November 2002	1–2 March 2005
25–26 October 2005	8–9 March 2005
28–29 October 2008	16–17 March 2007
28–30 October 2011	15–17 April 2007
7–8 November 2012	1–3 March 2009
	6–7 March 2011
	1–2 April 2011
	22–24 April 2012
	7–8 March 2013
	17–20 March 2013

Completion of case compilation is planned for the fall of 2014, and prior to the completion of case compilation, the NWS focal points, Tom Wasula and Neil Stuart, will be consulted for their input on event definition and case identification. Consultation with the NWS focal points also will ensure that this project will result in improvements to existing conceptual models and forecast methodologies for localized heavy snow and ice events in the northeastern United States that occur in conjunction with transition season storms. During the final stages of case compilation, we will formulate specific plans and protocols to document and diagnose dynamical and microphysical processes that can affect the evolution of transition season storms through case studies and composite analyses. These plans will include the documentation and diagnosis of tropical moisture transport occurring within atmospheric rivers located along the East Coast, and the investigation of the role that these features play in the formation and evolution of transition season storms impacting the Northeast. Tropical moisture transport occurring within an atmospheric river is hypothesized to have played a prominent role in the formation and evolution of the 28–30 October 2011 fall event. Figure 4 consists of the Climate Forecast System Reanalysis (CFSR) precipitable water and mean sea level pressure fields at 0000 UTC 30 October 2011. Consistent with this hypothesis, the analysis suggests the presence of an atmospheric river, corresponding to the corridor of high precipitable water located off the East Coast, extending equatorward from the extratropical cyclone centered over the Northeast to an apparent source in the tropics.

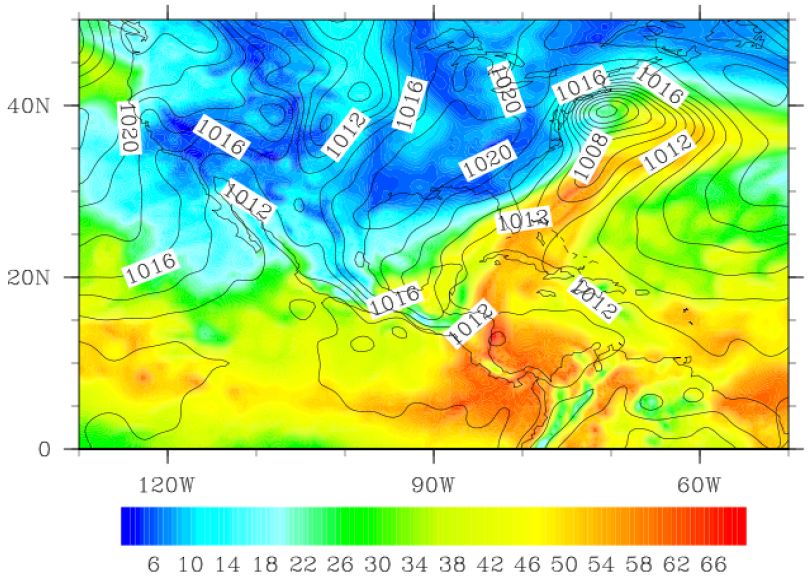

Fig. 4. CFSR precipitable water (shaded, mm) and mean sea level pressure (contoured, hPa) at 0000 UTC 30 October 2011.

2. CSTAR V PROJECT THESES, PRESENTATIONS AND PUBLICATIONS

a) Theses completed

None

b) Presentations

Vaughan, M. L., L. F. Bosart, and B. Tang, 2014: Forecast busts: A methodology and case study. Oral presentation at the 39th Annual Northeastern Storm Conference, 7–9 March, Rutland, VT.

c) Refereed publications

None

3. NWS PERSPECTIVE ON CSTAR V PROGRESS *(Warren Snyder)*

NWS leadership support for CSTAR remains unequivocal. NWS director Louis Uccellini has made it a budget priority and in 2014 all CSTAR projects were fully funded. NWS Eastern Regional (ER) director Jason Tuell further reinforced NWS support for CSTAR in his Fall 2013 visit to UAlbany. With this level of support from above, considerable progress has been made with the Collaborative and Associate Projects of CSTAR V, as NWS employees did many of these in house with local involvement from UAlbany faculty, students and Research Information Technology (RIT) computer resources. Progress on, and results of, these projects are summarized below in Section 4.

The Spring 2014 CSTAR meeting was held on 2 May 2014 and was attended by five UAlbany faculty members, and several WFO Albany and WFO Binghamton staff. Near final project reports were given on the CSTAR IV projects, "*Northeast cool season cyclones associated with significant upper-level easterly wind anomalies*" and "*Dynamic and thermodynamic processes contributing to thundersnow events*". Matthew Vaughan presented preliminary work on the first CSTAR V project, "*An overview of SPC predictive skill over the Northeast for severe convection*". He presented a methodology for identifying potential cases, which led to a lively discussion of potential approaches. Following the discussion, NWS focal points Mike Evans and Joe Villani met with the researchers and Matthew. Since both focal points have prior experience with similar projects on severe convection, they worked with Matthew to develop some criteria for determining how predictable significant convective events are in the 6–24 hour time frame, and identified scenarios and environments that appear to be favorable for accurate prediction in comparison to scenarios and environments that appear to be unfavorable for accurate prediction. Matt Kramer, Lance Bosart and Mike Evans attended the NOAA Hazardous Weather Testbed Spring Forecasting Experiment in Norman in May and discussed the project further. Matt and Mike gave a webinar in June showing some preliminary results from the work to other NWS offices interested in the project. An abstract on this preliminary work was submitted to the National Weather Association's (NWA's) Annual Meeting and has been accepted as a poster. We are also exploring presenting this preliminary work in the ER Science Sharing webinar series.

"*The transition season (autumnal/vernal) Northeast storms and East Coast atmospheric rivers*" project was discussed briefly at the Spring 2014 CSTAR meeting, but new graduate student Rebecca Steeves had not yet arrived at the university. In preparation for her beginning the research, the NWS focal points on the project have been working to put together a comprehensive case list for the study with ten potential cases selected since 2006.

In addition to the work on CSTAR V projects described above, the CSTAR IV project, "*Forecasting distributions and modes of precipitation associated with warm season 500 hPa cutoff cyclones*", Articulate Teletraining session was completed and is ready for distribution.

CSTAR continues to provide a large payback to the NWS for the modest amounts expended. This grant's projects continue to build on CSTAR's legacy of completing operationally focused research, engaging the academic community, providing the NWS with top quality applicants, and enabling the involvement of dozens of operational meteorologists in applied research from numerous NWS offices across the Northeast United States. CSTAR

resources in the NWS Collaborative and Associate Projects of this grant also raise the level and sophistication of involvement by UAlbany undergraduates in support of CSTAR research.

4. STATUS OF "SNYDER PLAN IV" PROJECTS *(Warren Snyder and focal points)*

This status report addresses preliminary work on CSTAR V projects, which began on 1 October 2013. The project descriptions are available in the grant, and have been omitted to conserve space. (* Denotes the Team Lead of each project)

CSTAR V Collaborative Projects

1. Development of improved WSR-88D warning criteria

Team: Thomas Wasula*, Ian Lee, Brian Frugis and Luigi Mecarriello (ALY); Robert LaPlante and Sarah Jameson (CLE); Mark McKinley (ZOB)

Part 1: Identifying new capabilities of dual-pol data

1. Much of the work on this project has been completed. Several case studies combining dual-pol capabilities with updated criteria for warning for 1" hail were finished, including the 1 June 1 2011 "Hail Monster" event across eastern NY and western New England, the 21 May 2013 severe weather event across eastern New York and western New England, the 29 May 2013 tornado event across east central New York, and the 22 May 22 2014 severe outbreak.
2. Dual-pol differential reflectivity (ZDR) columns were shown to increase confidence in issuance of 1" hail warnings in conjunction with the legacy/traditional radar data and hail study criteria. It remains difficult to identify the actual size of hail with dual-pol data, but hail identification has definitely improved.
3. Ian Lee has completed a paper entitled, "*A comparison of polarimetric radar and legacy-based radar techniques from the 21 May 2013 severe weather event across eastern New York and western New England*", which is in review. The methods described in the paper have been shown to improve lead times up to 45 min depending on storm severity.
4. WFO ALY, CLE, CTP, OKX, RNK, and BUF are participating in the ER quantitative precipitation estimation (QPE) field test. The new dry snow and crystals multiplier coefficient was found to be 1.9 for Albany after the initial study of events. These new QPE values will be assessed over the next several months by the team, and the other participating offices will corroborate them.

Part 2: Establish modern Vr-shear tornado warning thresholds for the Northeast

1. Work on an updated version of the rotational velocity (Vr)-shear technique for issuing tornado warnings using 8bit high-resolution data has largely been completed, except for testing against an even larger regional dataset.
2. This work was used to confidently upgrade the severe thunderstorm warning to a tornado warning in the 22 May 2014 EF3 tornado event and was also invoked during the event of 13 July. The research allowed the Albany office to successfully identify borderline tornadic storms and only issue severe thunderstorm warnings. During such events, no tornadoes occurred.
3. WFO ALY staff was updated and trained on this method during the WFO Spring Meeting on 26 March 2014.

2. Applications of mesoscale modeling

Team: Warren Snyder*, Ian Lee and Vasil Koleci (ALY); Mark McKinley (ZOB); Mike Evans (BGM); David Knight (UAlbany)

Part 1: Development and verification of high-resolution local WRF data

The WRF hardware at WFO ALY was upgraded in February 2014 as noted in the previous six-month report. A 3 km WRF over the immediate county warning area is being run twice per day in the office, and we continue to run a regional 5 km simulation covering approximately one-third of the northeast quadrant of the United States on the UAlbany RIT system. These WRF simulations were integrated into the forecast process on many occasions to increase short-term forecast accuracy. Examples of increased accuracy include rainfall with tropical system remnants, various aspects of lake effect events during the 2013–2014 winter, the timing and intensity of large-scale precipitation systems, and heavy snowband placement. The WRF composite reflectivity was successfully used to identify modes of convection and, with adjustments, the timing of numerous convective events during the 2014 season. WRF output is being used to generate soundings for the boundary layer ensemble fog system algorithm being developed by Ian Lee to improve fog forecasts in TAFs. An outgrowth of this work was the development of a methodology to import/display many new variables from the WRF into AWIPS.

Part 2: Use high-resolution models for short term forecasting of banded heavy snowfall

Work on this project has not yet begun.

3. Probabilistic QPF

Team: Neil Stuart* and Vasil Koleci (ALY)

Work on this project has not yet begun.

4. Improvement of forecasts of IFR ceilings and visibility in TAFs: Develop methods to improve IFR forecasts of TAFs and improve accuracy in forecasting flight categories

Team: Kevin Lipton*, Ian Lee and Hugh Johnson (ALY); Mike Evans (BGM); David Fitzjarrald (UAlbany Atmospheric Sciences Research Center)

1. Ian Lee's extensive database has been used to develop an algorithm for improving the prediction of warm season fog from boundary layer parameters. This work has transitioned to preparing a manuscript for publication.
2. Ian Lee is scheduled to present, "*An ensemble-based algorithm to predict warm season fog occurrence across the Hudson Valley in east central New York*," at the 2014 AMS Annual Meeting in Phoenix in January 2015.

5. Graphical TAF verification of ceiling and visibility forecasts at Taunton, Massachusetts

Team: Joseph Dellacapini*, Kevin Cadima and Frank Nocera (BOX)

1. Verification data was collected over the past six months for 22 METAR sites in the WFO BOX county warning area that do not have official TAFs and for the ten official TAF sites. Data included detection of VFR, MVFR, IFR, and LIFR conditions within the first six hours of the forecast and improvement over GFS LAMP guidance for that location. However, due to processing issues at the NWS Verification Branch, the data collected

was limited to 1 March 2014 to present. Nearly all of the cool season (October 2013 to March 2014) was not available, which was a significant limitation. In addition, two of the METAR sites were not used due to an extended communication outage (Orange, MA; KORE) and unreliable data (Marshfield, MA; KGHG).

2. Preliminary results show similar trends between the METAR sites and official TAF sites. The greatest skill and improvement over guidance was for VFR conditions. Scores gradually declined as conditions lowered to MVFR, IFR, LIFR, and VLIFR. However, there was a notable improvement over guidance for the official TAF sites when compared with the METAR sites, which was believed to be due to more familiarity with these locations.
3. We plan to collect data for the upcoming 2014–2015 cool season, which will give a better representation of forecast skill and better identify biases. Typically, scores during the warm season decline due to a lack of widespread IFR conditions (or lower), as convection tends to produce more localized conditions. In the cool season, scores tend to increase due to the prevalence of synoptic-scale systems.
4. We may present these initial findings at the Fall 2014 CSTAR meeting.

6. Using and assessing new technology to provide decision support service (DSS) to a variety of customers as part of Weather Ready Nation initiative

Team: Brian Montgomery and Steve DiRienzo (ALY)

1. New laptop configurations, along with associated training, with the installation of the "thin client" AWIPS software, BUFKIT, GR2Analyist and other software to facilitate deployments, was completed.
2. DSS support provided to New York State Office for Emergency Management for the mid-April 2014 floods.
3. Training guidance for DSS provided to ER.

7. An evaluation of winter weather warning and advisory criteria in the NWS Eastern Region from a scientific and societal impact perspective

Lead: John Quinlan (ALY)

Work on this project has not yet begun.

CSTAR V Associate Projects

1. Integration of research into operations

Team: Vasil Koleci and Warren Snyder (ALY)

1. WFO ALY hosted the CSTAR presentation via GoTo Meeting of, "*The motion of mesoscale snowbands in Northeast U.S. winter storms*", by CSTAR-funded graduate student Jaymes Kenyon. Sixteen offices in the Eastern and Central Region participated. Feedback and use from participating offices included, from WFO PHL, "I thought this was an excellent presentation". Indeed, SOO Alan Cope gave the presentation again in February 2014 to his staff. He added some slides at the end showing a quasi-stationary mesoscale snowband across his area on 21 January 2014. For that case, the patterns of two-dimensional frontogenesis, 850–700-hPa temperature advection, Q_n/Q_s vectors, etc., seemed to fit the quasi-stationary model of Kenyon fairly well. Mike Evans (WFO BGM), a focal point of the project, is pursuing having WDTB include this material in the next update to AWOC. At WFO ALY, the methodology was applied to the 13–14

February 2014 winter storm, by mentioning 3+" per hour snowfall rates in Winter Storm Warning statements 24 to 36 hours ahead of time.

2. "*Forecasting distributions and modes of precipitation associated with warm season 500 hPa cutoff cyclones*" Articulate Teletraining session, based on CSTAR work, has completed ER review and is in final form to be distributed.

2. Improving forecasts of snow along the West-facing slopes of the Appalachians

Lead: Matt Kramar (PIT)

Work on this project has not yet begun.

3. Heat waves/extreme heat events in the Northeast United States

Team: Kevin Lipton* and Neil Stuart (ALY)

Neil Stuart met with several representatives of the New York Department of Health in July to begin a cross disciplinary project on Heat Impacts.

5. COMPUTER AND TECHNOLOGY TRANSFER ISSUES *(David Knight)*

The results described herein would not have been possible without appropriate computing infrastructure. Students are exposed to NWS facilities and software, and NWS staff has access to capabilities not available in the local office. Both groups benefit from this interaction and sharing of facilities. Several Sun workstations and PCs are available for use by CSTAR participants. Approximately 3 TB of disk space on the UAlbany Department of Atmospheric and Environmental Sciences (DAES) servers is dedicated to storing CSTAR related data and software. This disk space is available on all DAES 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 or Mac laptop, which enables them to take familiar computers with them when visiting NWS staff, and provides them ready access to the DAES UNIX machines.

CSTAR email lists, originally created on the DAES computers at the beginning of the project, have been superseded by the "map" listserv (map@listserv.albany.edu). The "map" listserv reaches a much larger audience (out of 450 members, roughly ¼ are from NOAA), allowing discussion of CSTAR related research among many people. Albany WFO 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 WFO also runs a CSTAR forum and discussion group at http://infolist.nws.noaa.gov/read/?forum=cstar_ne. The DAES web server (http://www.atmos.albany.edu) and ftp server (ftp://ftp.atmos.albany.edu) are being used to facilitate the exchange of large datasets between CSTAR collaborators.

The DAES computing resources are available for CSTAR related research including a Sun server (with 8 CPUs and 16 GB RAM), a Linux server (with 16 CPUs and 128 GB RAM) and two large network attached disk storage arrays (85 TB total usable space). While CSTAR money was not used for this, and the machines were not bought specifically for CSTAR use, they nonetheless directly benefit the CSTAR research by providing fast servers for computation and storage space for commonly used datasets.

In addition to DAES and NWS computing facilities, the formal CSTAR collaborative grant effort has allowed access to University RIT services. In particular, Warren Snyder (Albany WFO SOO) is using the RIT 144 CPU Linux cluster for WRF model simulations. This computing facility allows him to perform computations not possible at the local office. The facility is used to generate additional members for a WRF ensemble, and to generate higher

resolution runs for research purposes. So far this facility has been made available at no cost to the CSTAR project.

6. SELECT CSTAR PROJECT RESEARCH IN NWS AFDs

Saturday 29 March 2014

CSTAR cutoff low research was cited in the near term section of the NWS ALY AFD.

FXUS61 KALY 292016
AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
416 PM EDT SAT MAR 29 2014

.NEAR TERM /UNTIL 6 AM SUNDAY MORNING/...
AS FOR RAINFALL...IMPRESSIVE ISENTROPIC LIFT...H850-700 FGEN FIELDS INCREASING...PWAT ANOMOLIES REMAIN 1-3 STANDARD DEVIATIONS ABOVE NORMAL AND INCREASING LOW LEVEL SOUTHEAST JET ALL POINT TOWARD MODERATE TO HEAVY RAIN. **PER CSTAR RESEARCH**...THE SYNOPTIC PATTERN RESEMBLES THAT OF A HP NEUTRAL CUT OFF UPPER LOW WHICH IS HIGHLY SUSCEPTIBLE FOR FLOODING ACROSS OUR SERVICE AREA. WE WILL RETAIN THE FLOOD WATCH AS THE COMBINATION OF RUN OFF /NEARLY FROZEN GROUND DESPITE THE FIRST COUPLE OF INCHES LIKELY DEFROSTED AT THIS TIME/ AND POTENTIAL FROM ICE JAMS WILL BE ON THE INCREASE. SEE THE HYDROLOGY DISCUSSION BELOW FOR FURTHER DETAILS.
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NEAR TERM...BGM

Sunday 6 April 2014

CSTAR high-wind research was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 060831
AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
430 AM EDT SUN APR 6 2014

.SHORT TERM /6 PM THIS EVENING THROUGH TUESDAY NIGHT/...

BY AFTERNOON...IT SHOULD TURN RATHER WINDY ONCE MORE AS LOW PRESSURE TRACKS THROUGH THE SAINT LAWRENCE VALLEY. **LOCAL CSTAR STUDIES** HAVE INDICATED THAT WHEN A DEEP LOW TRACKS THROUGH THE SAINT LAWRENCE VALLEY ALONG WITH GOOD COLD AIR ADVECTION (WORKING IN DURING THE AFTERNOON) THERE IS A POTENTIAL FOR STRONG...PERHAPS SOME DAMAGING WIND GUSTS IN OUR FORECAST AREA. WHILE NO HEADLINES WILL BE ISSUED WITH THIS PACKAGE...WE WILL ADDRESS THE CONCERN IN OUR HAZARDOUS WEATHER OUTLOOK (HWO). FOR NOW...WE GENERICALLY ADDED WIND GUSTS OF 35 MPH IN ALL VALLEY AREAS LATE TUE INTO TUE EVENING...45 MPH ACROSS THE HIGHER TERRAIN.
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SHORT TERM...HWJIV

Tuesday 17 June 2014

CSTAR research on Appalachian lee troughs (ALTs) was cited in the near term section of the NWS PBZ AFD.

FXUS61 KPBZ 171852
AFDPBZ

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE PITTSBURGH PA
252 PM EDT TUE JUN 17 2014

.NEAR TERM /THROUGH WEDNESDAY NIGHT/...
CSTAR ALBANY PROJECT STUDYING APLCN LEE TROF RELATIONSHIP WITH SVR WX YIELDED FOUR DOMINANT WX PATTERNS. THE PATTERN TODAY IS DECENTLY DESCRIBED BY PATTERN TYPE TWO...WITH AN APLCN LEE TROF BUT NO FRONTAL INTRUSION. THIS PATTERN TENDED TO YIELD A SVR WX LOCAL MAXIMUM IN NWRN PA AND NERN OH...GIVING SLGTLY HIGHER CONFIDENCE TO HI-RES MDL OUTPUT.
&&
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KRAMAR/34

Wednesday 25 June 2014

CSTAR warm-season cutoff low research was cited in the near term section of the NWS ALY AFD.

FXUS61 KALY 250911
AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
500 AM EDT WED JUN 25 2014

.NEAR TERM /UNTIL 6 PM THIS EVENING/...
WHILE THE REMAINDER OF THE COUNTY WARNING AREA IS CERTAINLY SUSCEPTIBLE TO FLASH FLOODING...THE THREAT AND COVERAGE APPEARS LOWER. **CSTAR STUDIES** INDICATE THAT THE SYNOPTIC PATTERN IS NOT QUITE CONDUCIVE FOR ISSUING A FFA FOR THESE AREAS SINCE THERE IS NOT A CUTOFF LOW WITH THIS SYSTEM.
&&
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NEAR TERM...HWJIV

Thursday 26 June 2014

CSTAR research on the Hudson-Mohawk convergence zone was cited in the near term section of the NWS ALY AFD.

FXUS61 KALY 260907
AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
445 AM EDT THU JUN 26 2014

.NEAR TERM /UNTIL 6 PM THIS EVENING/...
CSTAR STUDIES INDICATED WHEN WE HAVE LOW LEVEL MOISTURE (WE DO) AND DEPARTING LOW PRESSURE TO OUR EAST WITH A NORTHWEST WIND TO THE WEST OF THE HUDSON VALLEY...NORTH WIND AT ALBANY AND A NORTHEAST WIND AT GLENS FALLS...SURFACE CONDITIONS CAN BE REALIZED AS THE WIND FIELDS CONVERGE INTO THE CAPITAL REGION. WE DO HAVE A NORTHWEST WIND AT ROME...AND A NORTH NORTHWEST WIND AT ALBANY. GLENS FALL REPORTED NO WIND THE LAST HOUR...AND SO FAR...MHC HAS NOT ACTUALLY DEVELOPED RIGHT IN THE CAPITAL REGION. HOWEVER...AS THE GRADIENT STEEPENS JUST A LITTLE...WE COULD VERY SEE THIS SIGNATURE DEVELOP LATER THIS MORNING THROUGH MIDDAY AND THEREFORE WE HAVE ASSIGNED LIKELY POPS TO THE CAPITAL REGION AND POINTS TO THE

NORTHEAST AS WE WILL LIKELY HAVE AN UP SLOPE FLOW WHICH COULD HELP PRODUCE MORE SHOWERS.
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NEAR TERM...HWJIV

Thursday 26 June 2014

CSTAR research on the Hudson-Mohawk convergence zone was cited in the near term section of the NWS ALY AFD.

FXUS61 KALY 261508
AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
1108 AM EDT THU JUN 26 2014

.NEAR TERM /UNTIL 6 PM THIS EVENING/...
STILL HAVE LINGERING DRIZZLE/LIGHT RAIN SHOWERS IMPACTING MAINLY THE GREATER CAPITAL DISTRICT. **CSTAR RESEARCH** HAS SHOWN WHEN THERE IS ABUNDANT LOW LEVEL MOISTURE (CHECK OUT THE 12Z/ALY UPPER AIR SOUNDING) AND A DEPARTING LOW PRESSURE TO OUR EAST ALONG WITH NORTHWESTERLY FLOW TO THE WEST OF THE HUDSON RIVER VALLEY...NORTHERLY FLOW IN THE CAPITAL DISTRICT AND A NORTHEASTERLY FLOW AT GLENS FALLS CONVERGENCE OCCURS PRODUCING LIGHT PRECIPITATION ACROSS THE GREATER CAPITAL DISTRICT.
&&
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NEAR TERM...IAA/HWJIV

Wednesday 2 July 2014

CSTAR research on both Appalachian lee troughs (ALTs) and predecessor rain events (PREs) was cited in the near term section of the NWS ALY AFD.

FXUS61 KALY 021818
AFDALY

AREA FORECAST DISCUSSION

NATIONAL WEATHER SERVICE ALBANY NY
218 PM EDT WED JUL 2 2014

.NEAR TERM /UNTIL 6 PM THIS EVENING/...
ATMOSPHERE IS PRIMED FOR SEVERE WEATHER AT THIS TIME WITH AN ABUNDANCE OF SFC BASED INSTABILITY WITH THE LATEST SPC MESOANALYSIS INDICATING 1500-3500+ J/KG OVER THE REGION. THE GREATER AMOUNTS ARE FROM THE CAPITAL REGION...UPPER HUDSON VALLEY...ERN CATSKILLS SOUTH AND EAST. THE 0-6 KM BULK SHEAR VALUES ARE RAMPING UP TO 35-50 KTS. THE MID LEVEL LAPSE RATES CONTINUES TO STEEPEN TO 6.5-7 C/KM AHEAD OF THE PREFRONTAL SFC TROUGH. **WARM SEASON CSTAR WORK** HAS SHOWN THE POTENTIAL INCREASES FOR SEVERE CONVECTION WITH A PREFRONTAL AND/OR LEE TROUGH IN THE MID ATLANTIC REGION AND NORTHEAST IN THE RIGHT PRECONVECTIVE ENVIRONMENT. THIS LOOK LIKE A POTENTIAL CASE. DEEP ORGANIZED SEVERE CONVECTION WITH POTENTIAL BOWING SEGMENTS...AND LARGE HAIL ARE POSSIBLE. WILL ALSO MONITOR FOR ANY ROTATING UPDRAFTS WITH ANY SUPERCELLS THAT MAY FORM. THE 0-1 KM BULK SHEAR VALUES CONTINUE TO BE 10 KTS OR LESS. PWATS ARE RUNNING 1-2+ STANDARD DEVIATIONS ABOVE NORMAL. LOCALLY HEAVY RAINFALL IS ALSO A THREAT IF RAINFALL RATES APPROACH 1 -2+ INCHES IN A HOUR ESPECIALLY WITH TRAINING CONVECTION. WE WILL MONITOR FOR ANY ISOLD-SCT FLASH FLOODING. TA1600 UTC SPECIAL KALY SOUNDING WAS DONE.

PER **CSTAR STUDIES**...IT LOOKS AS SOME OF THE KEY INGREDIENTS WILL COME TOGETHER TO SUPPORT A PRE DEVELOPING ALONG THE FRONT AS IT ADVANCES TOWARDS EASTERN NEW YORK AND ADJACENT WESTERN NEW ENGLAND. THERE WILL BE A STRONG UPPER LEVEL JET WITH MAX WINDS LIKELY OVER 100KTS (AND SLIGHTLY ANTICYCLONIC CURVED) TO THE WEST OF THE FORECAST AREA. OUR REGION WILL BE UNDER THE MAXIMUM JET ENTRANCE REGION.
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NEAR TERM...WASULA

Thursday 3 July 2014

CSTAR research on predecessor rain events (PREs) was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 030539
AFDALY

AREA FORECAST DISCUSSION

NATIONAL WEATHER SERVICE ALBANY NY
138 AM EDT THU JUL 3 2014

.SHORT TERM /6 AM THIS MORNING THROUGH FRIDAY NIGHT/...
SOME OF THESE INGREDIENTS ARE FAVORABLE FOR A PREDECESSOR RAIN EVENT /PRE/ WELL IN ADVANCE OF ARTHUR...BUT PERHAPS TODAY WAS A PRE TOO. WE BELIEVE THE BEST CHANCE OF A PRE IS FURTHER SOUTH OF OUR AREA BASED ON THE **CSTAR RESEARCH** IN NJ AND THE MID ATLANTIC REGION. HOWEVER...A STRIPE OF VERY HEAVY RAINFALL IS POSSIBLE FROM SOUTH AND EAST OF KALB...AND OVER PART OF WRN NEW ENGLAND BASED THE CANADIAN...RFC AND NAM GUIDANCE. TRAINING LOOKS POSSIBLE AGAIN TOO...SO WE WILL HAVE TO MONITOR FOR POTENTIAL FLASH FLOODING AGAIN. IT IS INTERESTING BEST JET DYNAMICS ARE DISPLACED FURTHER NORTH AND WEST OVER WRN-NRN NY WITH A JET STREAK OF 75-100 KTS. SOME OF THE FCST AREA WILL BE NEAR THE RIGHT REAR QUAD. POPS WERE KEPT IN THE HIGH LIKELY RANGE TOMORROW...AND THE HEAVY RAIN WAS EMPHASIZED IN THE GRIDS. WILL MENTION THE POTENTIAL FOR LARGE HAIL AND DAMAGING WINDS IN THE HWO FOR TOMORROW.
&&
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SHORT TERM...WASULA

Thursday 3 July 2014

CSTAR research on predecessor rain events (PREs) was cited in the near term section of the NWS ALY AFD.

FXUS61 KALY 031222
AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
822 AM EDT THU JUL 3 2014

.NEAR TERM /UNTIL 6 PM THIS EVENING/...
THE REASONING BEHIND ISSUING A FLASH FLOOD WATCH FOR ALL BUT LITCHFIELD WAS AS FOLLOWS.

1) MOST OF OUR REGION RECEIVED QUITE A BIT OF RAINFALL YESTERDAY...GENERALLY AROUND 1-2 INCHES WHICH HELPED TO SATURATE THE GROUND.

2) THE WEATHER PREDICTION CENTER (WPC) HAS PLACES ALL OF OUR REGION IN SLIGHT RISK FOR FLASH FLOODING.

3) PWATS LOOK TO RAMP UP TO AROUND 2 INCHES LATER TODAY. IN ADDITION WE HAVE A SLOW MOVING COLD FRONT BEGINNING TO PLOW INTO THIS AIR MASS.

4) PER **CSTAR STUDIES**...MANY SYNOPTIC INGREDIENTS ARE THERE FOR A POSSIBLE PREDECESSOR RAINFALL EVENT (PRE) WELL NORTH AND EAST OF THE FIRST NAMED HURRICANE OF THE YEAR...ARTHUR. A DEEP TROUGH LIES TO OUR WEST. A STRENGTHENING AND SLIGHTLY ANTICYCLONIC UPPER JET WILL MAXIMUM WILL DEVELOP TO OUR WEST AND WE WILL BE UNDERNEATH THE RIGHT ENTRANCE REGION OF IT...WHICH WILL ENHANCE LIFT (INITIALLY SPAWNED BY LOW LEVEL CONVERGENCE OF THE COLD FRONT). THE ONLY INGREDIENT NOT QUITE IN PLACE WOULD BE A SOUTHEASTERLY FLOW NORTH OF THE TROPICAL ENTITY. HOWEVER...THE FLOW WILL BE SOUTHERLY AND AGAIN PWATS LOOK TO PEAK AROUND 2 INCHES OR MAYBE A LITTLE BETTER...ESPECIALLY SOUTH AND EAST OF ALBANY.
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NEAR TERM...HWJIV

Friday 4 July 2014

CSTAR research on the Hudson-Mohawk convergence zone was cited in the near term section of the NWS ALY AFD.

FXUS61 KALY 041501
AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
1101 AM EDT FRI JUL 4 2014

.NEAR TERM /UNTIL 6 PM THIS EVENING/...
AS ARTHUR MOVES TO OUR EAST AND THE COLD FRONT MOVES TO OUR EAST...THE SURFACE WIND WILL TURN NORTHERLY DOWN THE HUDSON VALLEY AND NORTHWEST TO THE WEST OF THE HUDSON RIVER VALLEY LATER TODAY. THIS COULD SET THE STAGE FOR MOHAWK HUDSON CONVERGENCE (MHC) SINCE THERE WILL BE PLENTY OF LOW LEVEL MOISTURE REMAINING. **CSTAR STUDIES** HAVE INDICATED WHEN A NORTHERLY FLOW ENSUES IN THE HUDSON VALLEY...AND NORTHWEST TO THE WEST OF THE HUDSON VALLEY...AND IF THERE IS A STABLE COLUMN WITH LOTS OF LOW LEVEL

MOISTURE...LOW LEVEL CONVERGENCE CAN INDUCED LIGHT (OR EVEN MODERATE PRECIPITATION) RIGHT IN THE CAPITAL REGION.
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NEAR TERM...HWJIV/WASULA

Tuesday 15 July 2014

CSTAR warm-season cutoff low research was cited in the near term section of the NWS ALY AFD.

FXUS61 KALY 152032
AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
432 PM EDT TUE JUL 15 2014

.NEAR TERM /UNTIL 6 AM WEDNESDAY MORNING/...
AS OF 432 PM EDT...AN INITIAL BATCH OF SHOWERS WITH A FEW RUMBLES OF THUNDER HAS MOVED NORTH AND EAST OF THE MAJORITY OF THE FCST AREA THIS AFTERNOON. TWO AREAS OF SHOWERS AND THUNDERSTORMS ARE MOVING TOWARDS THE REGION IN THE S/SW FLOW ALOFT. THE CONVECTION OVER THE DELMARVA REGION...NJ...AND THE NYC CORRIDOR IS ASSOCIATED WITH A SFC TROUGH...AND AN ELONGATED OR STRETCHED VORTICITY AXIS ON THE ERN SIDE OF THE UPPER LEVEL TROUGH WITH THE CUTOFF LOW APPEARS TO BE A POSITIVELY TO NEUTRAL TILTED CUTOFF WITH SOME **CSTAR RESEARCH** INDICATING SOME FLASH FLOODING AND SEVERE POSSIBLE. FURTHER UPSTREAM OTHER SCT SHOWERS AND THUNDERSTORMS ARE AHEAD OF THE SFC COLD FRONT DRAPPED OVER NRN AND WRN NY. SFC DEWPTS BEHIND THIS FRONT ARE IN THE 50S.
&&
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NEAR TERM...WASULA