UNIVERSITY AT ALBANY
State University of New York

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27 March 2016

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 29 February 2016. 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, third year graduate student Matthew Vaughan completed his Masters Degree on research related to *Severe Convection in Scenarios with Low Predictive Skill* (see Section 1a). To continue our research on severe weather in the Northeast U.S., co-PIs Bosart and Tang have recruited first year graduate student Pamela Eck, who has begun to examine the relationship between jumps in lightning flash rates and severe weather. Second year student Molly Smith continued her research on *Predictability of Heavy Precipitation associated with Tropical Moisture* by examining large ensembles of GFS and WRF forecasts of Hurricane Irene (2011) (see Section 1b). Her work is elucidating the synoptic and mesoscale features that produced wet and dry forecasts of Irene over the Catskill Mountains using an ensemble composite difference technique that we are beginning to transition into operations. Finally, second year student Rebecca Steeves analyzed major transition season Northeast snowstorms for her project*, Transition Season Northeast Storms and East Coast Atmospheric Rivers* (see Section 1c). She has created composites and performed exploratory event case studies of major transition season Northeast snowstorms falling into cool pool and baroclinic zone type categories.

The PI, co-PIs, graduate students, and NWS personnel participated in NROW XVI and the Fall 2015 CSTAR meeting, held at the NWS Albany offices during 4–6 November. Research results were presented and in-depth conversations on research methodologies, case studies, and pathways for research to operations (R2O) were conducted with NWS focal points and Eastern Region Scientific Services staff. PI Corbosiero organized, and co-PIs Bosart, Keyser, and Tang along with students Smith and Steeves presented at, the 17th Cyclone Workshop in Pacific Grove, California in October. Co-PI Tang, PI Corbosiero, and co-PI Bosart partnered with three NWS Albany forecasters to publish a paper on the long-lived supercell of 22 May 2014 that produced 4" hail and an EF3 tornado within the Albany County Warning Area in *Weather and Forecasting* in January. Further information on UAlbany CSTAR I–V related theses, presentations, and publications may be found on the following webpage: http://www.atmos.albany.edu/facstaff/kristen/CSTAR/CSTAR_CumulativePublications.pdf.

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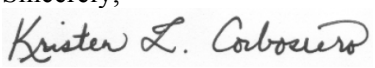
An NWS perspective on CSTAR V project activities is provided by NWS Albany Science Operations Officer Warren Snyder in Section 3. The CSTAR V projects continue to contribute to the legacy of completing operationally focused research, engaging the academic community, providing the NWS with top quality 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 R2O 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 from the NWS Albany office that explicitly refer to the UAlbany CSTAR program.

In summary, the UAlbany CSTAR V project has addressed 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
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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: 27 March 2016

1. SUMMARY OF GRADUATE STUDENT RESEARCH ACTIVITIES

a) Severe convection in scenarios with low predictive skill

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

Research Summary:

Matthew Vaughan finished his Master of Science thesis in December 2015. The main findings of his thesis include:

- An average of six low-probability-of-detection (POD), high-impact events (see previous CSTAR reports for definitions) occur annually and peak during June, July, and August. High-false-alarm-rate (FAR) events were more common in the 1980s and are rare in the past decade.
- Severe events under northwesterly and northerly 500-hPa flow have the lowest average threat scores (Figure 1). Low-POD, high-impact events are a greater percentage of total events under northwesterly and northerly flow regimes compared to other flow directions.
- The vertical wind shear magnitude between 1000–500 hPa is a discriminating factor in predictive skill. High-impact events with less than 31-kt shear have significantly lower threat scores than high-impact events with greater than 31-kt shear.
- Case study analyses of low-POD, high-impact events suggest the environment over which severe weather occurs is characterized by anomalously high downdraft convective available potential energy (DCAPE), steep low-level lapse rates, and high lifting condensation level (LCLs) that contribute to an elevated risk of severe wind.

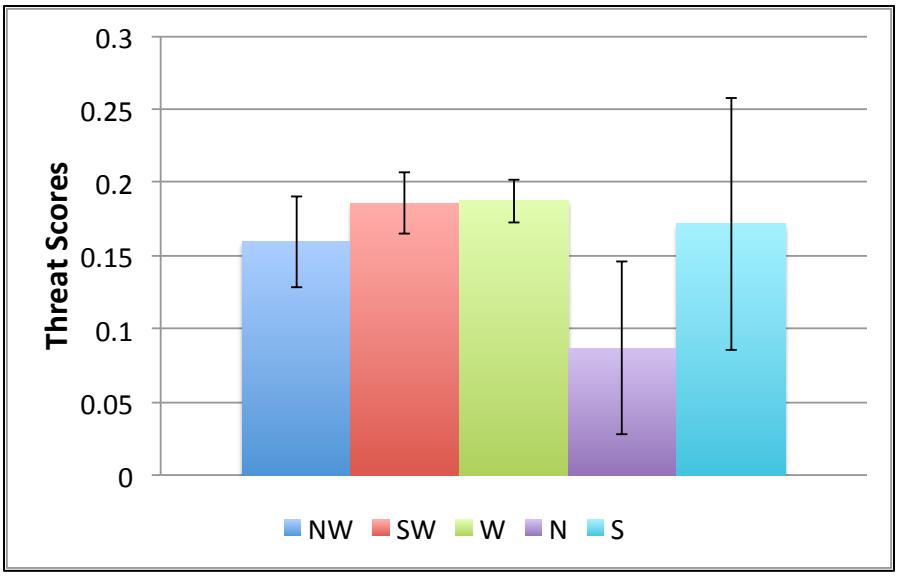

Figure 1. *Mean threat scores for all Northeast severe events (1980–2012) stratified by 500-hPa flow. Flow regimes are northwesterly (NW, n=95), southwesterly (SW, n=237), westerly (W, n=449), northerly (N, n=17), and southerly (S, n=17). 95% confidence intervals are also shown.*

An ancillary project was conducted to examine the environmental differences between severe weather events with large severe report coverage and those with small report coverage. The results suggest severe events with high severe report coverage are characterized by significantly higher DCAPE, steeper low-level lapse rates, and lower relative humidity values in the lowest 150-hPa layer than severe events with low severe report coverage.

Project findings suggest forecasters should increase their familiarity with scenarios that favor severe weather under northerly and northwesterly 500-hPa flow. Although such scenarios are less common, they potentially give forecasters trouble due to lack of familiarity. Additionally, during convectively active days with weak deep-layer vertical wind shear, forecasters should monitor areas with anomalously high DCAPE, high LCLs, and steep low-level lapse rates to identify where severe wind might materialize if convection grows upscale.

While some synoptic-scale factors do differentiate low-POD, high-impact events from well-predicted, high-impact events, such factors are limited. Rather than synoptic-scale factors, local mesoscale factors may be more important in such scenarios. A mesoscale examination of low-POD, high-impact events constitutes the next phase of the research. One mesoscale factor is the effect of complex terrain, which past research has shown to be important for significant severe events. Since surface observations are not dense enough to resolve important terrain-induced mesoscale features, and operational Doppler radars cannot sample valley areas below the radar beam or behind mountains where the beam is blocked, alternative methods for examining severe convection in areas of complex terrain are important to explore.

One alternative method for examining severe storms in complex terrain is ground-based lightning detection. A sudden increase in flash rate, or a lightning jump, may be indicative of a strengthening updraft. Hence, lightning flash-rate activity may key forecasters in on particular cells that have an increased probability of becoming severe. As a first step, we wish to assess the usefulness of total lightning data (intracloud and cloud-to-ground lightning) for severe weather forecasting in the Northeast. Pamela Eck began this investigation in September 2015.

A total of 392 storms that occurred on 13 days from June to August 2015 were analyzed. Lightning data for each storm was taken from the National Lightning Detection Network (NLDN) and was used to calculate lightning jumps using the algorithm of Schultz et al. (2011). Lightning jumps were verified against severe weather reports from SPC. If a lightning jump occurred within 45-min prior to a severe report, it verified as a hit. If a lightning jump occurred with no corresponding severe report, it was classified as a false alarm.

Our preliminary verification has a POD of 83% and a FAR of 54% for a σ-level of one (Table 1). Increasing the σ-level decreases the POD but has a similar FAR. In comparison, Schultz et al. (2011) found a POD of 79% and a FAR of 36% for a σ-level of two in a limited study using a lightning-mapping array. An updated, larger study by Schultz et al. (2016) found a POD of 76% and a FAR of 46%. The higher FAR in our preliminary results compared to Schultz et al. (2011, 2016) may be attributed to sub-severe storms that had lightning jumps, severe storms in remote locations that did not have a report, or a small sample size of cases.

Table 1. *POD and FAR of severe storm reports for different lightning jump sigma levels.*

Lightning jump sigma level	POD	FAR
1.0	0.83	0.54
1.5	0.76	0.53
2.0	0.66	0.54
2.5	0.53	0.55

"Worst offender" (WO) cases were then identified to investigate the relatively high FAR for our sample. WO cases are defined as being events that had an especially high number of false alarms (FAs). In order to qualify as a WO case, the event had to: 1) occur on a day with >100 FAs per day, and 2) have at least 10 FAs per event. Using these criteria, six WO cases were identified. Figure 2 shows the geographic location of the lightning jumps for each WO. WO3, WO4, and WO6 indicate that high FAR values may be due to the location of the lightning jumps in low population density regions. However, WO1, WO2, and WO5 all have lightning jumps that occur in highly populated areas, indicating that sub-severe storms can also produce lightning jumps.

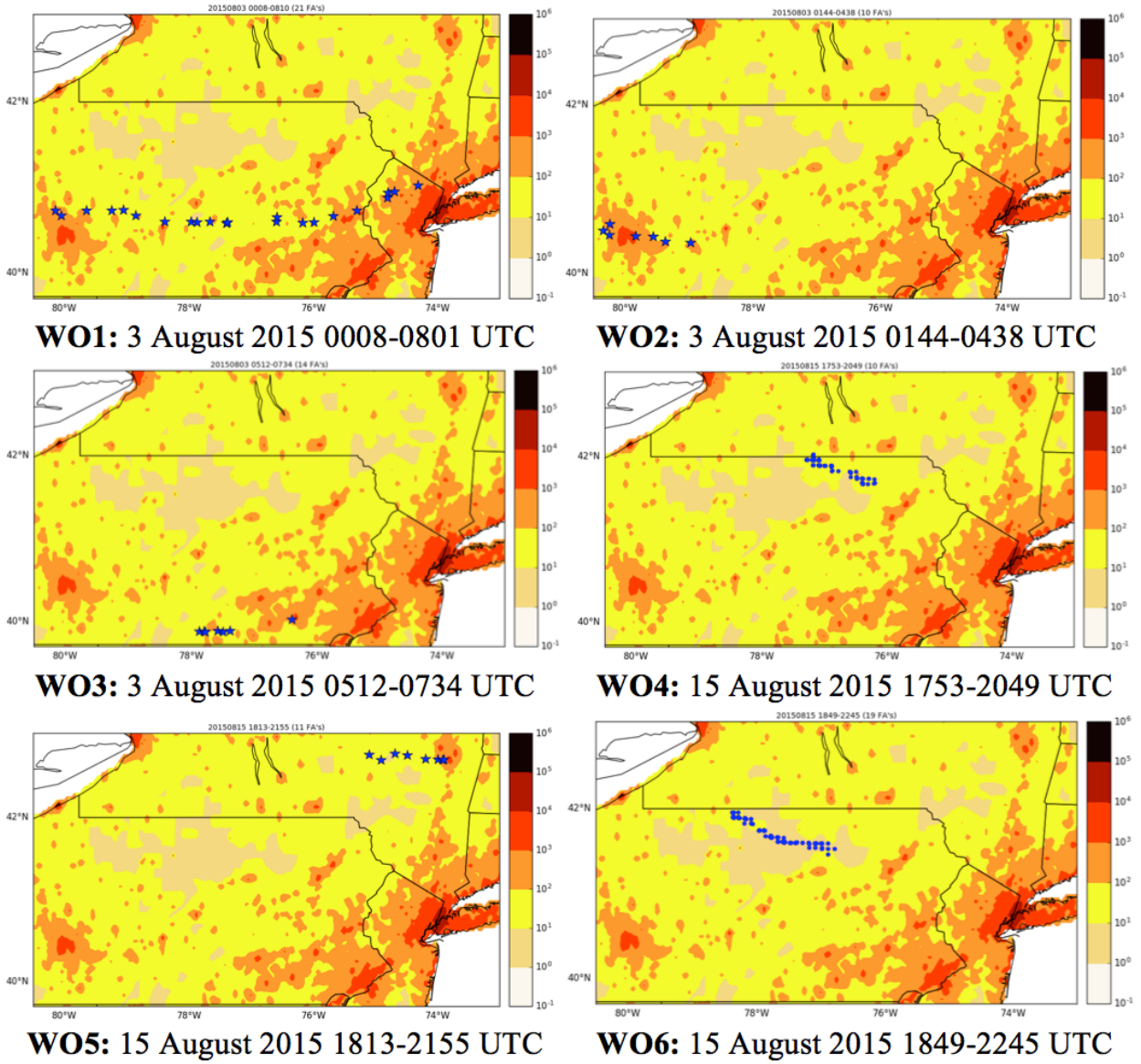

Figure 2. *Geographic maps for each of the six "worst-offender" cases. Population density is shaded, where light colors indicate low population and dark colors indicate high population. Lightning jumps are indicated with blue stars or dots.*

Future work will focus on including more severe convective days now that we have archived total lightning data from the NLDN back to 2013. We will also assess if lightning jumps can be tied to convective cells interacting with complex terrain, particularly areas of upslope flow. We will also examine the lightning behavior of individual severe cells constituting recent low-POD, high-impact events to assess whether the combination of radar data, synoptic observations, and lightning data can help forecasters better anticipate, and warn on, such events.

NOAA and NWS Interactions:

Brian Tang, Lance Bosart, and Matthew Vaughan attended the Binghamton Sub-Regional Workshop in September to share research results with NWS operational forecasters and other CSTAR researchers. In addition, Matthew is working with Michael Evans and Joe Villani to create a digital webinar of his Master's thesis work for training purposes within the NWS.

Brian Tang, Lance Bosart, Matthew Vaughan, and Pamela Eck attended the Fall CSTAR Meeting on 6 November 2016. Pamela was introduced to her focal points, who provided feedback on directions for the next phase of the research.

Presentations:

Tang, B. H., M. Vaughan, R. Lazear, K. Corbosiero, L. Bosart, T. Wasula, I. Lee, K. Lipton, 2014: Topographic and boundary influences on the 22 May 2014 Duanesburg, New York, tornadic supercell. Oral presentation at the Binghamton NWSFO Sub-Regional Workshop, 23 September, Endicott, NY.

Vaughan, M. T., B. Tang, and L. B. Bosart, 2015: Northeast severe convection: high-impact and low-impact events. Oral presentation at the Binghamton NWSFO Sub-Regional Workshop, 23 September, Endicott, NY.

Vaughan, M. T., B. Tang, and L. B. Bosart, 2015: A composite analysis of Northeast severe weather events with varying spatial impacts. Oral presentation at the 16th Northeast Regional Operational Workshop (NROW), 4–5 November, Albany, NY.

Citations:

Schultz, C. J., W. A. Petersen, and L. D. Carey, 2011: Lightning and severe weather: a comparison between total and cloud-to-ground lightning trends. *Wea. Forecasting*, **26**, 744–755.

Schultz, C. J., P. M. Bitzer, L. D. Carey, T. Chronis, and S. M. Stough, 2016: The temporal and probabilistic relationship between lightning jump occurrence and radar-derived thunderstorm intensification. 96th AMS Annual Meeting, 10–14 January, New Orleans, LA.

b) Predictability of heavy precipitation associated with tropical moisture

Graduate student: Molly Smith
Co-PIs: Kristen Corbosiero and Ryan Torn
NWS focal points: Steve DiRienzo (ALY) and Mike Jurewicz (BGM)

Research Summary:

Ensemble runs of weather models, such as the Global Forecast System (GFS), are an indispensable part of modern weather forecasting. Ensembles aid in the creation of probabilistic forecasts by illustrating several possible scenarios that can occur in a single time period. This

ensemble spread is especially apparent in precipitation forecasting, where slight perturbations in model initial conditions can produce vastly different rainfall distributions over a given area. Identifying the correct scenario is particularly vital in the case of extreme rainfall events fueled by tropical moisture, as these can lead to widespread, devastating floods. As part of the ongoing project to understand what modulates precipitation variability in ensemble modeling of heavy rainfall events, an in-depth case study of Hurricane Irene (2011) is being performed. The case study has two main goals: 1) determine what particular modeling scenarios produce the heaviest precipitation over the northeastern United States, and 2) ascertain what ensemble metrics, besides mean and standard deviation, are the most useful in predicting rainfall during such events.

An 80-member ensemble of the previous operational version of the GFS was initialized at 0000 UTC 27 August 2011, when Irene was situated off the coast of the Carolinas, and run through 0000 UTC 29 August 2011, when Irene became extratropical over New England. The ensemble members were then ranked by the amount of precipitation they brought to the Catskill region of New York (41.5–42.5°N, 73.5–75°W). The Catskills received some of the worst flooding associated with Irene, and are thus a good indicator of whether specific ensemble scenarios accurately captured the precipitation distribution associated with the heavy rainfall event. Next, in order to determine what large-scale patterns were behind each scenario's success or failure, the synoptic characteristics of the ten wettest members were compared to those of the ten driest members.

Our analysis revealed that the discrepancies that exist between the rainfall forecasts of the ten wettest and ten driest GFS ensemble members are almost entirely due to the forecast position of Irene. The wetter members tracked Irene farther to the west, while the drier members featured a more easterly path (Figure 3). Ultimately, differences in storm track appear to be related to differences in the 00 h potential vorticity (PV) to the southwest of Irene.

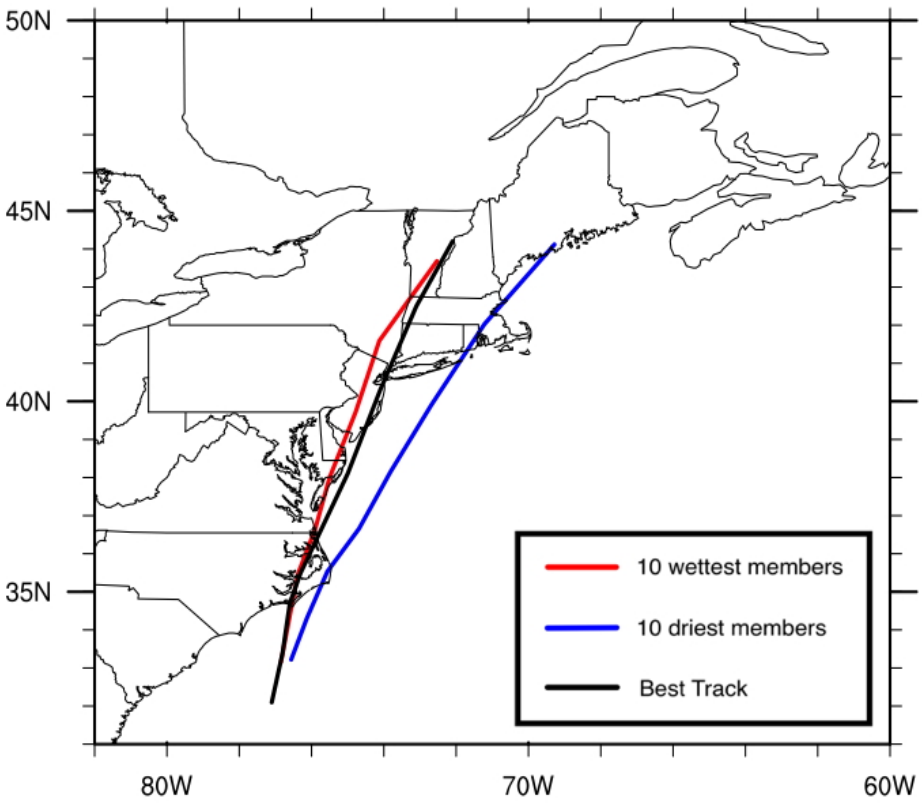

***Figure 3**. Comparison of the mean storm track of the ten wettest GFS ensemble members (red), the ten driest members (blue), and the Best Track for Hurricane Irene (2011).*

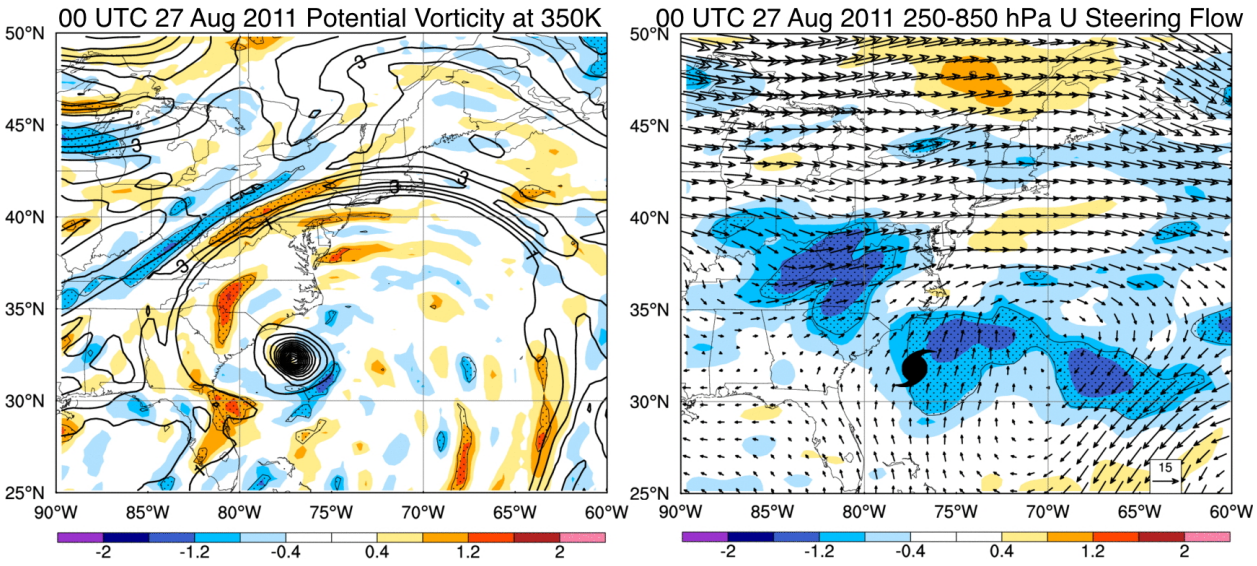

Figure 4. *Normalized differences in 350K PV and 250–850 hPa zonal steering flow between the ten wettest and ten driest GFS ensemble members at model initialization.*

Wetter members were characterized by greater cyclonic PV to the southwest of the storm center, along a tropopause-based trough over the southeastern U.S., which placed the hurricane in a region of anomalous easterly steering flow (Figure 4). This steering flow started Irene on a more westerly track, which slowed down an approaching upstream trough over the Great Lakes due to interaction with Irene's upper-tropospheric outflow. In turn, Irene was able to track even farther to the west, positioning the region of maximum rainfall directly over eastern New York and Vermont.

The 0.5° GFS output was then downscaled to 15 km and 3 km using the Weather Research and Forecasting (WRF) model, in order to allow a better representation of mesoscale processes and the effects of terrain on the precipitation distribution. The physics used for this downscaling were comparable to those used in High-Resolution Rapid Refresh (HRRR) model. Contrary to the GFS-based results, the 15 km WRF output does not show a relationship between storm track and precipitation over the Catskills, with the exception of a few ensemble members which tracked too far away from the Catskills, both to the east and west, to produce much rain (Figure 5). As reported previously, preliminary results indicate that rainfall is instead controlled by storm intensity. However, this dependence on intensity could be related to the ten driest members exhibiting the most extreme eastern and western tracks. When averaged, the east- and west-shifted storm circulation anomalies cancel each other out, allowing the more central, wet members to create the appearance of a stronger cyclonic circulation near the middle of the track envelope. In order to determine the underlying differences between the bulk of the wet and dry WRF members, the composites are being regenerated using only members that had an average storm longitude between 74°W and 75.5°W. This approach will remove the track dependency and reveal the dynamic causes behind the ~100 mm precipitation range of the remaining members with similar position forecasts. Composites are also being regenerated for the 3 km WRF ensemble, using only members which had an average storm longitude between 74°W and 75.5°W (Figure 6), which will preclude the appearance of the same false signal seen in the 15 km WRF simulation.

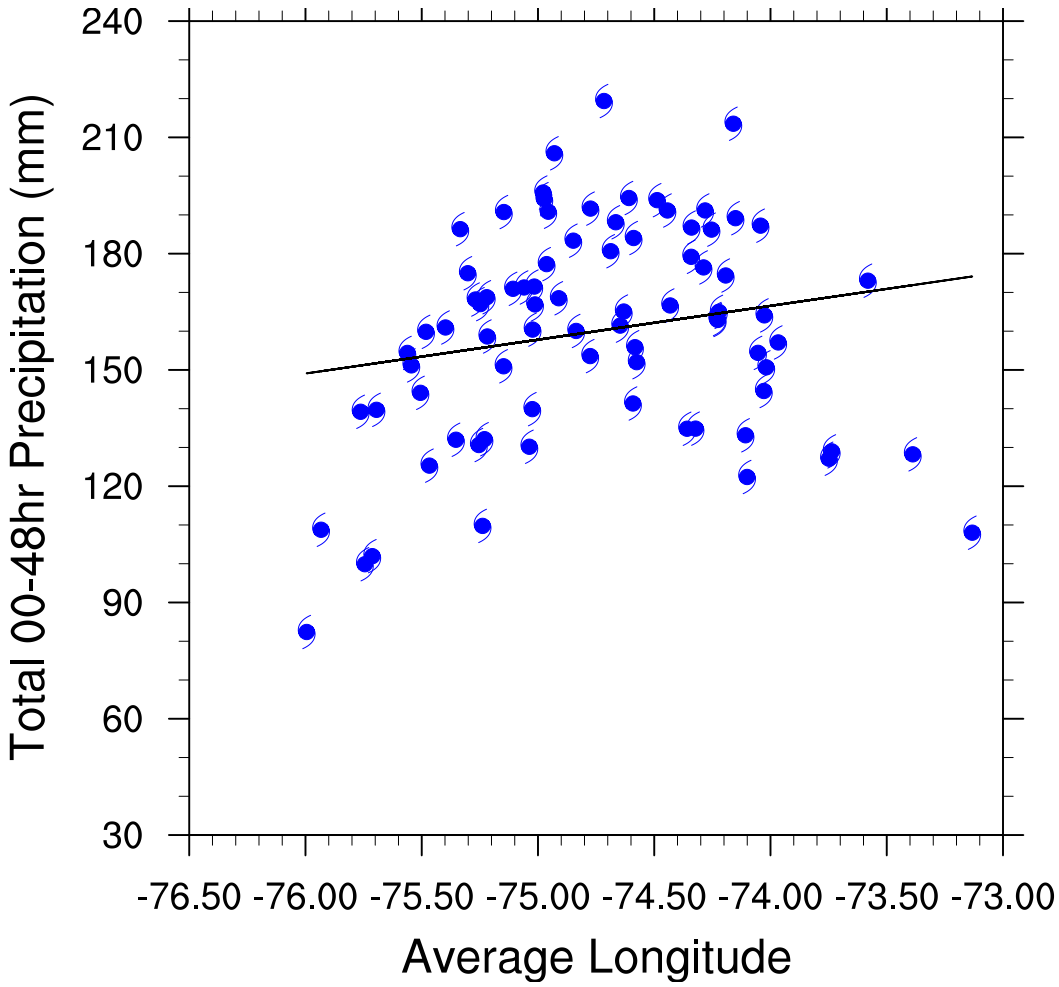

Figure 5. *WRF 15 km ensemble forecast rainfall over the Catskills between 0000 UTC 27 August and 0000 UTC 29 August 2011, shown as a function of average storm longitude for this time period.*

In addition to the continuing analysis of the Irene simulations, we are currently developing a prototype system that automatically generates composite differences of GEFS members based on Albany-based forecast metrics, including temperature and precipitation. This system will give the forecaster greater ability to evaluate why certain forecast scenarios may take place. We are currently working with Steve DiRienzo (WFO Albany) and Michael Jurewicz (WFO Binghamton) to flesh out the parameters of the system and expect to have it online in the next two to three months.

NWS Interactions:

Molly Smith presented on the Hurricane Irene GFS and WRF 15 km results at the WFO Binghamton Sub-Regional Workshop in Endicott, NY and took suggestions from the audience about what information forecasters would like to get from ensembles. She then presented an updated version of her results at the Spring 2015 CSTAR meeting in Albany, NY.

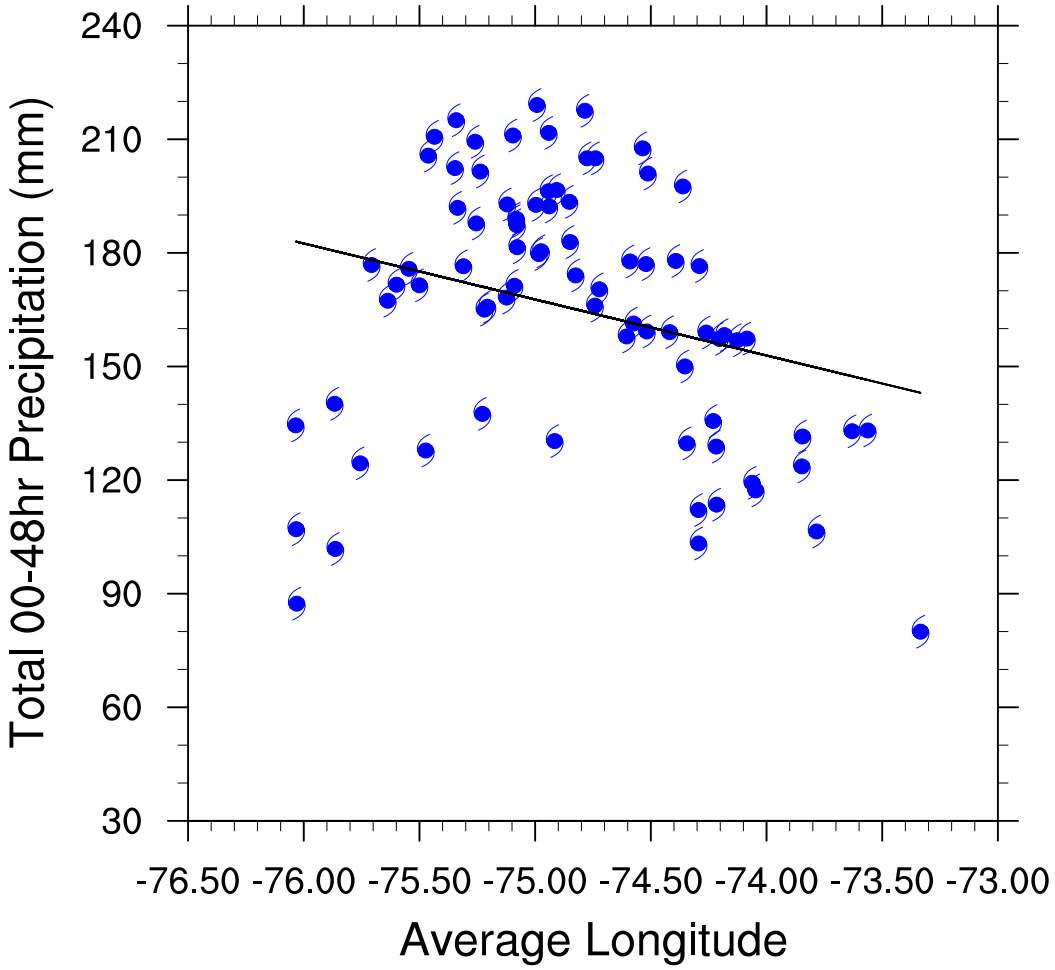

Figure 6. *WRF 3 km ensemble forecast rainfall over the Catskills between 0000 UTC 27 August and 0000 UTC 29 August 2011, shown as a function of average storm longitude for this time period.*

Presentations:

Smith, M. B., R. D. Torn, K. L. Corbosiero, and P. Pegion, 2015: Ensemble variability in GFS rainfall forecasts of Hurricane Irene (2011). Oral presentation at the WFO BGM Sub-Regional Workshop, 23 September, Endicott, NY.

Smith, M. B., R. D. Torn, K. L. Corbosiero, and P. Pegion, 2015: Ensemble variability in GFS rainfall forecasts of Hurricane Irene (2011). Oral presentation at the 17th Cyclone Workshop, 25–30 October, Pacific Grove, CA.

Smith, M. B., R. D. Torn, K. L. Corbosiero, and P. Pegion, 2015: Ensemble variability in GFS rainfall forecasts of Hurricane Irene (2011). Oral presentation at the16th Northeast Regional Operational Workshop (NROW), 4–5 November, Albany, NY.

c) Transition season Northeast storms and East Coast atmospheric rivers

Graduate student: Rebecca Steeves
Co-PIs: Andrea Lang and Daniel Keyser
NWS focal points: Thomas Wasula (ALY) and Neil Stuart (ALY)

Research Summary:

During the reporting period, work efforts were distributed between creating composites and performing exploratory event studies of major transition season Northeast snowstorms based on an objectively identified event list developed earlier in the project. As described in the previous CSTAR six-month report, a preliminary analysis for each of the 97 events on the event list was performed in an effort to identify similar synoptic-to-mesoscale patterns that could serve as the basis for compositing the events. The preliminary analysis revealed that the characteristic patterns of lower-tropospheric cold air that coincide with areas of heavy snowfall could serve as distinguishing characteristics for composite categories. The categories, which are provisional at the time of the writing of the report, include a cold pool type (19 events), a baroclinic zone type (42 events), a mixed type (30 events), and an other type (6 events). Using these provisional composite categories, the 97 events have been sorted into the aforementioned composite categories; however, the objective definitions to be used for the categories are still being refined. While the objective definitions for the categories are being refined, various ways of compositing the current categories in both space and time are being tested in order to find the optimal compositing methodology. In terms of compositing in space, composites have been created that are centered on the point of maximum snowfall and on the point of minimum MSLP. In terms of compositing in time, composites have been created that are centered at the midpoint of the event, at the beginning time of snowfall, and at the point of maximum snowfall.

The exploratory event studies are underway and were chosen based on the premise that they will likely be representative of the aforementioned composite categories, specifically the cold pool type (28–30 October 2011; Figure 7a) and the baroclinic zone type (8–9 March 2005; Figure 7b). For both events, 72-h kinematic backward trajectories were calculated to diagnose the evolution of selected thermodynamic quantities and to identify source regions of moist parcels in areas of heavy snowfall. Additionally, an objective atmospheric river (AR) detection algorithm, adapted from the methodology of Lavers and Villarini (2015), has been implemented in the exploratory event studies.

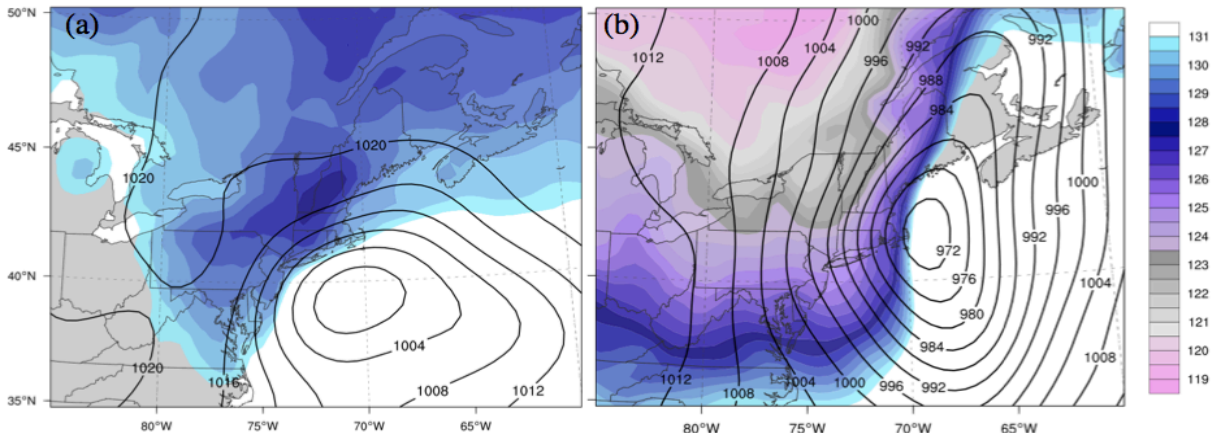

Figure 7. *1000–850-hPa thickness (shaded, dam) and MSLP (contoured, hPa) at (a) 0000 UTC 30 October 2011 and (b) 0000 UTC 9 March 2005.*

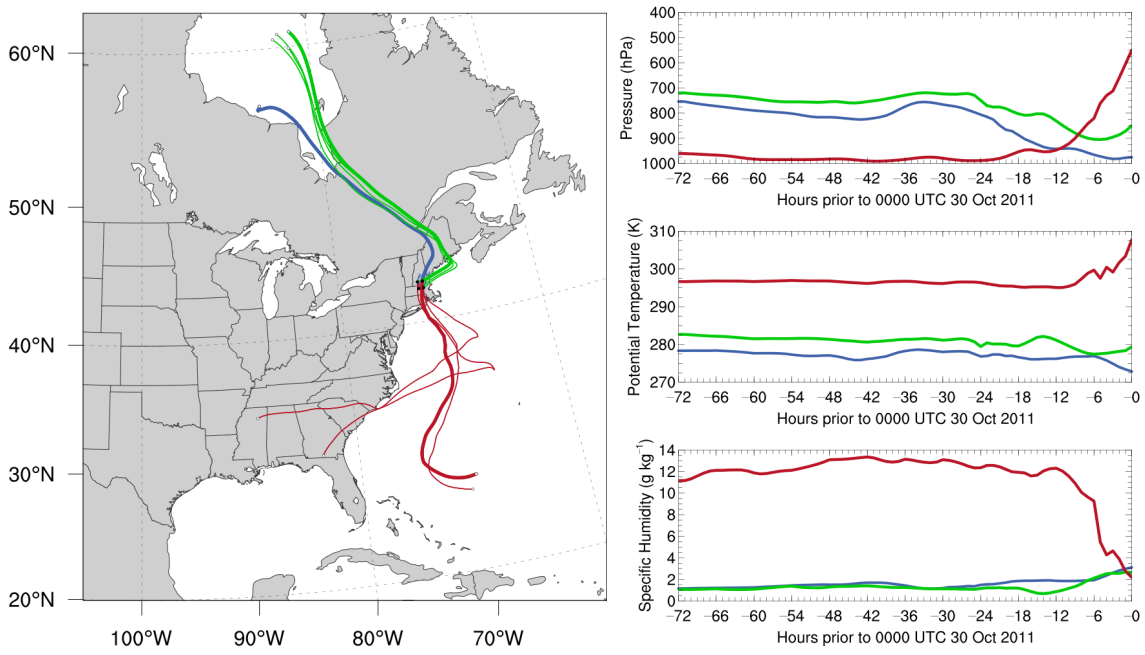

Figure 8. *72-h backward trajectories for 975 hPa (blue), 850 hPa (green), and 550 hPa (red) ending at 0000 UTC 30 October 2011 with representative trajectories bolded (left) and corresponding time series (right) for the representative trajectories.*

Beginning with the cold pool type event study, the configuration of the trajectories ending over Concord, NH, and the occurrence of heavy snow is suggestive of cold pool formation and maintenance through diabatic cooling due to evaporation and melting (Figure 8). Furthermore, the application of the objective AR detection algorithm to the cold pool type event reveals that an AR did not contribute to the heavy snowfall collocated with the cold pool, as the AR was identified only after heavy snow ended. A trajectory analysis of the baroclinic zone type event reveals that cold air originated from high latitudes (not shown). Furthermore, the application of the objective AR detection algorithm used in conjunction with a trajectory analysis (Figure 9) suggests that an AR was an important ingredient for the baroclinic zone type event for the following reasons: 1) an AR was objectively identified for the duration of the event, and 2) the parcels that end in an area of heavy snow (HS; referred to as HS trajectories) travel in close proximity to the AR axis. Future work will include developing an objective methodology to determine whether parcels spend some portion of their lifetime within an AR.

Following the completion of the exploratory event studies, composites for each category will be created after finding the optimal compositing method. After creating composites and ensuring that the composited fields are representative of the respective category, composite analyses will be performed for each of the categories. The composite analyses will focus on documenting: 1) the planetary-to-synoptic-scale flow patterns occurring prior to and during major transition season Northeast snowstorms, with emphasis on the role of moisture transport occurring within ARs, and 2) the synoptic-to-mesoscale flow patterns in the extratropics occurring prior to and during major transition season Northeast snowstorms, with emphasis on the formation and maintenance of regions of lower-tropospheric cold air that coincide with areas of heavy snowfall. Comprehensive event studies that are representative of the various composite categories will be conducted in conjunction with the composite analyses.

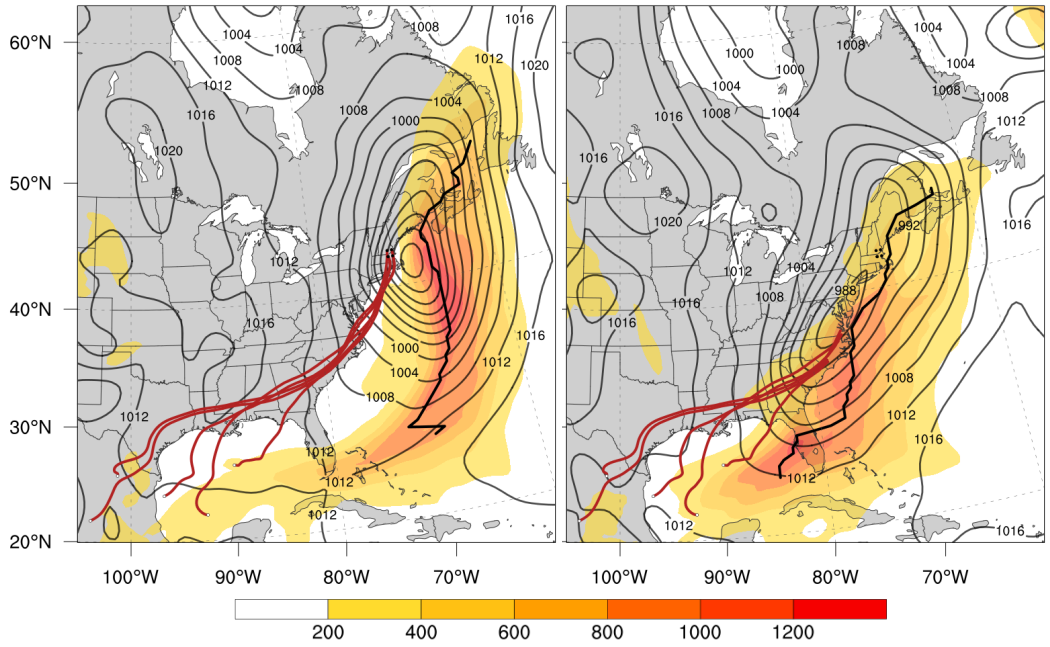

Figure 9. *Integrated vapor transport magnitude (shaded, kg m^{-1} s^{-1}), MSLP (contoured, hPa), AR axis (black line), and 72-h backward trajectories for the HS trajectories (red) ending at 0000 UTC 9 March 2005 (left) and 1200 UTC 8 March 2005 (right), with the latter corresponding to the end of the first 60 h of the trajectories.*

NWS Interactions:

Rebecca Steeves presented at the Fall 2015 CSTAR meeting on 6 November 2015, where a short discussion followed the presentation. Additionally during the past six-month period, Rebecca Steeves initiated the practice of sending monthly emails to NWS focal points Tom Wasula and Neil Stuart. The emails included research plans as well as progress completed during the previous month. As a result of the emails, discussion arose pertaining to the trajectory analysis in the event studies and how the trajectory analysis might be best applied in operational forecasting. A method for application was suggested by the NWS focal points, where the trajectory ending in the dendritic growth zone and the ending environment of this trajectory would be investigated to determine if conditions are optimal for enhancing precipitation production. This application has been implemented for one of the event studies at the time of writing of this report.

Presentations:

Rebecca Steeves presented at the 17th Cyclone Workshop on 29 October 2015, Northeast Regional Operational Workshop XVI on 4 November 2015, and the Fall 2015 CSTAR meeting on 6 November 2015. The presentations objectively defined a major transition season snowstorm and summarized results from the two aforementioned exploratory event studies.

Citation:

Lavers, D. A., and G. Villarini, 2015: The contribution of atmospheric rivers to precipitation in Europe and the United States. *J. Hydro.,* **522**, 382–390.

2. CSTAR V PROJECT THESES, PRESENTATIONS, AND PUBLICATIONS

a) Theses completed

Vaughan, M. T., 2015: An analysis of high-impact, low-predictive skill severe weather events in the Northeast U.S.. Master of Science Thesis, Department of Atmospheric and Environmental Sciences, University at Albany/SUNY, Albany, NY, 131 pp.

b) Presentations

Smith, M. B., R. D. Torn, K. L. Corbosiero, and P. Pegion, 2015: Ensemble variability in GFS rainfall forecasts of Hurricane Irene (2011). Oral presentation at the WFO BGM Sub-Regional Workshop, 23 September, Endicott, NY.

Tang, B. H., M. Vaughan, R. Lazear, K. Corbosiero, L. Bosart, T. Wasula, I. Lee, K. Lipton, 2014: Topographic and boundary influences on the 22 May 2014 Duanesburg, New York, tornadic supercell. Oral presentation at the WFO BGM Sub-Regional Workshop, 23 September, Endicott, NY.

Vaughan, M. T., B. Tang, and L. B. Bosart, 2015: Northeast severe convection: high-impact and low-impact events. Oral presentation at the WFO BGM Sub-Regional Workshop, 23 September, Endicott, NY.

Smith, M. B., R. D. Torn, K. L. Corbosiero, and P. Pegion, 2015: Ensemble variability in GFS rainfall forecasts of Hurricane Irene (2011). Oral presentation at the 17th Cyclone Workshop, 25–30 October, Pacific Grove, CA.

Steeves, R. B., D. Keyser, and A. L. Lang, 2015: A multiscale analysis of major transition season Northeast snowstorms. Oral presentation at the 17th Cyclone Workshop, 25–30 October, Pacific Grove, California.

Frugis, B. J., and T. A. Wasula, 2015: Updated radar-based techniques for tornado warning guidance in the Northeastern United States. Poster presentation at the 40th National Weather Association Annual Meeting, 17–22 October, Oklahoma City, OK.

Frugis, B. J., and T. A. Wasula, 2015: Updated radar-based techniques for tornado warning guidance in the Northeastern United States. Oral presentation at the 16th Northeast Regional Operational Workshop (NROW), 4–5 November, Albany, NY.

Smith, M. B., R. D. Torn, K. L. Corbosiero, and P. Pegion, 2015: Ensemble variability in GFS rainfall forecasts of Hurricane Irene (2011). Oral presentation at the 16th Northeast Regional Operational Workshop (NROW), 4–5 November, Albany, NY.

Steeves, R. B., A. L. Lang, and D. Keyser, 2015: A multiscale analysis of major transition season Northeast snowstorms. Oral presentation at 16th Northeast Regional Operational Workshop (NROW), 4–5 November 2015, Albany, NY.

Stuart, N. A., 2015: Analyzing the roles of low-level forcing and instability in significant severe weather outbreaks in the Eastern United States. Oral presentation at the 16th Northeast Regional Operational Workshop (NROW), 4–5 November, Albany, NY.

Vaughan, M. T., B. Tang, and L. B. Bosart, 2015: A composite analysis of Northeast severe weather events with varying spatial impacts. Oral presentation at the 16th Northeast Regional Operational Workshop (NROW), 4–5 November, Albany, NY.

Wasula, T. A., and N. A. Stuart, 2015: A multi-scale analysis of the 26-27 November 2014 pre-Thanksgiving snowstorm. Oral presentation at the 16th Northeast Regional Operational Workshop (NROW), 4–5 November, Albany, NY.

Bosart, L. F., 2016: Predictability challenges associated with significant North American weather events during winter 2014–2015. Invited seminar at NOAA/ESRL/PSD, 11 February, Boulder, CO.

c) Refereed publications

Tang, B., M. Vaughan, R. Lazear, K. Corbosiero, L. F. Bosart, T. A. Wasula, I. R. Lee, and K. S. Lipton, 2015: Topographic and boundary influences on 22 May 2014 Duanesburg, New York, tornadic supercell. *Wea. Forecasting*, **31**, 107–127.

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

CSTAR V is currently at a very active level of collaborative activities between NWS Albany and the University at Albany, as the grant moves into its final year. All three Major Projects are active and ongoing, and several of the Collaborative and Associate Projects have resulted in presentations and publications. A joint *Weather Analysis and Forecasting* paper between the University at Albany PIs and several NWS Albany staff (Tang et al. 2016: "Topographic and boundary influences on the 22 May 2014 Duanesburg, New York, tornadic supercell") has been published. This project involved several operational forecasters in University level research. Ongoing collaboration also fostered the development of the corollary, and ongoing, COMET Partners Project, "Severe convective storms in complex terrain".

The November 2015 CSTAR meeting was attended by NWS participants from NWS Albany and Binghamton, six University at Albany faculty and four current graduate students. The timeline for the rest of CSTAR V, and planning for a potential CSTAR VI, were discussed. Three current students presented their work, which is nearing completion: Molly Smith presented, "Ensemble variability in rainfall forecasts of Hurricane Irene", Rebecca Steeves discussed, "Transition season Northeast U.S. storms and East Coast atmospheric rivers", and Matt Vaughn showed, "A composite analysis of Northeast U.S. severe weather events with varying spatial impacts". Two reports on the Collaborative and Associative Projects were also given: 1) "Eastern region QPE field test update" by Tom Wasula, and 2) "From severe hail to severe fog: an update on CSTAR V research" by Ian Lee. Warren Snyder presented an overview of NWS Albany contributions to the CSTAR VI proposal, to which we are hoping for a positive response soon.

CSTAR continues to provide a large payback to the NWS for the modest amount expended. This grant's projects continue to build on CSTAR's legacy of completing operationally focused research, engaging the academic community with operational forecasters at a high level, providing the NWS with top quality applicants, and enabling the involvement of dozens of operational meteorologists in applied research and conferences 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 NWS Albany staff and UAlbany undergraduates in support of the CSTAR research.

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

This status report addresses 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 Collaborating Projects

1. Development of Improved WSR88D Warning Criteria

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

Part 1: Identifying new capabilities of dual-pol data

This work has been completed and summarized in previous reports.

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

a. The updated Vr-shear technique shows similar results as the previous study done by LaPenta et al. (2000), but now accounts for the improvements in radar resolution.
b. Strong tornadoes for the Northeast (EF2+) show a strong correlation between increasing amounts of low-level shear and increased strength within the mid-level mesocyclone.
c. Higher maximum TDS heights are correlated with an increase in tornado strength.
d. NROT is not always a clear discriminator on its own for tornadic vs. non-tornadic storms. There also isn't a strong signal seen in increasing tornadic strength with increasing NROT values.

2. Applications of mesoscale modeling

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

This project has ended with the NWS focus toward using local modeling only in support of research. Two versions of the WRF continue to run, one on the UAlbany RIT System, and the other on a local cluster.

3. Probabilistic QPF

Team: Neil Stuart* and Vasil Koleci (ALY)

This project has been superseded by national initiatives and has been cancelled.

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*, Hugh Johnson, and Ian Lee (ALY); Mike Evans (BGM); David Fitzjarrald (University at Albany's Atmospheric Sciences Research Center (ASRC))

Ian Lee developed a decision aide to assist forecasters in application of the methods he developed. A Java-based algorithm was developed, and used to create an AWIPS application to use this method operationally. In addition, a Google form was created to allow performance of the research to be verified. Operational staff entered feedback on its successes and failures during the fall 2015 fog season.

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

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

b. WFO Taunton has produced digital ceiling and visibility forecasts in support of its aviation forecast program since February 2010. Since there is currently no method to verify these fields in a gridded format, the office creates Virtual TAFs (VTAFs) for nearly two-dozen METAR locations that do not have an official TAF. These VTAFs are

created in the AWIPS background and are transmitted internally to the NWS Verification Branch for processing, to provide a measure of the quality of digital aviation forecasts.

c. Verification data was collected over the past six months for the VTAF sites as well as the nine official TAF sites. Data included POD and FAR of VFR, MVFR, IFR, LIFR, and VLIFR conditions within the first six hours of the forecast, as well as improvement over GFS LAMP guidance. The sites were grouped into two categories: "Coastal" for those locations within 15 miles of the coastline and "Inland" for those locations beyond 15 miles.
d. As is typical of the cool season, this period featured a higher frequency of conditions at or below IFR than what is seen in the warm season. The more common occurrences of IFR conditions and below occurred at the coastal sites due to stratus and fog from frequent coastal storms and onshore flow regimes.
e. Results from the past six months were consistent with previous studies. The highest scores were seen in the "Coastal" group, although there was a notable increase in skill for the "Inland" group. While this was partially due to more frequent sub-VFR conditions, there has been a comprehensive training effort at the NWS Taunton office to determine those situations where the forecaster can identify events where the high FAR bias in model guidance can be improved upon.
e. We plan to collect data through the upcoming 2016 warm season, which will give a better representation of forecast skill and better identify biases. In the warm season, scores tend to decrease due to the prevalence of convective regimes where IFR and lower conditions are less widespread and more localized. We also plan to take an initial look at gridded verification of ceiling and visibility by comparing forecasts with analyses from the RTMA, which is hoped to be available by late in the summer.

9/1/15 – 3/1/16 Verification Data

Coastal TAF	POD	FAR	% Improvement
VLIFR	0.26	0.57	58.9
LIFR	0.52	0.35	10.1
IFR	0.70	0.26	6.7
MVFR	0.81	0.23	5.6
VFR	0.93	0.06	1.4

Coastal VTAF	POD	FAR	% Improvement
VLIFR	*	*	*
LIFR	*	*	*
IFR	*	*	*
MVFR	*	*	*
VFR	*	*	*

Inland TAF	POD	FAR	% Improvement
VLIFR	0.29	0.37	41.4
LIFR	0.48	0.34	14.1
IFR	0.66	0.24	7.0
MVFR	0.78	0.24	4.0
VFR	0.94	0.06	1.9

Inland VTAF	POD	FAR	% Improvement
VLIFR	*	*	*
LIFR	*	*	*
IFR	*	*	*
MVFR	*	*	*
VFR	*	*	*

** Data incomplete due to a data outage*

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)

DSS continues to be at the forefront of our Weather Ready Nation (WRN) initiative. Our staff was recently deployed during the January 2016 blizzard that impacted the mid-Atlantic region and Northeast U.S. corridor. Most of our staff has completed the required training for active deployments with recent enhancements to local checklists, which are available on our Google site's intranet to ensure all items for deployment are available. The most recent addition, under local union review, is the addition of Skype. We first utilized Skype during a television interview with the Weather Channel on 16 February 2016. The teams' aspiration is to incorporate Skype into more media interviews, training opportunities (Skywarn), and work with our emergency managers during active weather. For example, emergency managers can Skype live impacts to our office during flooding situations to better ascertain impacts between the NWS and issuance of public products.

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. Improving forecasts of snow along the west facing slopes of the Appalachians

Lead: Matt Kramar (PIT)

This project has been moved to the CSTAR VI proposal. Ancillary work on Appalachian lee troughs is being developed into teletraining by NWS forecaster Thomas Wasula.

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

Team: Kevin Lipton* and Neil Stuart (ALY)

a. On February 18, 2016 project participants and Steve DiRienzo met with 5 representatives from the UAlbany School of Public Health. Research collaboration between the UAlbany School of Public Health and WFO Albany was discussed. The School of Public Health has conducted research into extreme cold and how different demographics in New York are affected by extreme cold, particularly those with chronic health conditions including cardio vascular issues. The School of Public Health proposed some joint publications we could write together and some additional research into extreme cold and extreme heat. The School of Public Health will send an outline of a paper of their

research results so that we can fill in our description of heat and cold temperature thresholds and the appropriate headlines along with the typical calls to action. In addition a paper is planned for publication focused on the meteorology of these events.

b. On Monday February 22 participants met with additional representatives from the NYS DOH. Collaboration between the NYS DOH and our office based on a research grant analyzing NASA satellite temperature data at a 10 Km horizontal resolution, combining with U.S. Census data for determining vulnerabilities of different demographics in each grid box to extreme heat was discussed. DOH researchers are also working with Florida State University and NWS Offices in Florida, along with New York City health departments and the NWS in Upton to compare the differences in heat tolerance in different regions of the U.S. Once they have completed their research, we will look into the various temperature thresholds that affect emergency department visits and different chronic health issues such as cardiovascular issues. Ultimately, we will work with the NYS DOH to develop public service information in multiple formats, graphical and text, some information directly from us and some linked to the NYS DOH portals. In the future, additional research may be conducted that could support changing temperature or apparent temperature thresholds for our heat and cold related headlines.

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

Computing infrastructure continues to play an important role in this collaborative effort. 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 4 TB of disk space on the UAlbany 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 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 603 members, more than ¼ are from NOAA), allowing discussion of CSTAR-related research among many more people.

NWS Albany 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. NWS Albany also runs a CSTAR forum and discussion group at *http://infolist.nws.noaa.gov/read/?forum=cstar_ne*. The DAES web server (*http://www.albany.edu/atmos*) and ftp server (*ftp://ftp.atmos.albany.edu*) are used to facilitate the exchange of large datasets between CSTAR collaborators. The DAES computing resources available for CSTAR-related research include a Sun server (with 8 CPUs and 16 GB RAM), a Linux server (with 16 CPUs and 256 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 CSTAR research by providing much faster 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 Research Information Technology (RIT) services.

In particular, Warren Snyder (SOO NWS Albany) is using the RIT 144 CPU Linux cluster for Weather Research and Forecasting (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 the collaborative ensemble and to generate higher resolution runs for research purposes. Thus far, this facility has been made available at no cost to CSTAR researchers.

6. CSTAR PROJECT RESEARCH IN NWS AFDs

Saturday 21 November 2015

CSTAR lake effect snow research was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 212119
AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
415 PM EST SAT NOV 21 2015

.SHORT TERM /6 AM SUNDAY MORNING THROUGH TUESDAY/...

WHILE MOST OF THE AREA WILL BE DRY WITH PARTIAL SUNSHINE...LAKE ENHANCED CLOUDS AND PERHAPS SOME SNOW SHOWERS WILL PERSIST OVER THE ADIRONDACKS. EVEN IF SURFACE TEMPERATURES ARE ABOVE FREEZING ON SUNDAY...THE AIR WILL BE QUITE CHILLY ALOFT AND CERTAINLY VERTICAL INSTABILITY AND UPSLOPE COULD GENERATE THESE SNOW SHOWERS EVEN IN THE ABSENCE OF ANY PURE LAKE EFFECT.

HOWEVER...AFTER EXAMINING THE **EXPERIMENTAL KVIE CSTAR PROGRAM**... IT NOW APPEARS THE INLAND LAKE EXTENT OFF OF ONTARIO WILL ONLY BE ABOUT 50 MILES...LIMITED DUE TO SOME SHEAR IN THE COLUMN AND DRY AIR IN THE MID LEVELS. THEREFORE PURE LAKE EFFECT SNOW PLUMES MIGHT ONLY GRAZE HERKIMER AND LIKELY NOT EVEN REACH HAMILTON COUNTIES. THEREFORE NO HEADLINES WERE ISSUED. IF CONDITIONS LOOK DIFFERENT LATER ON...HEADLINES WILL BE RECONSIDERED.

SHORT TERM...HWJIV

Thursday 17 December 2015

CSTAR lake effect snow research was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 172100
AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
400 PM EST THU DEC 17 2015

.SHORT TERM /6 AM FRIDAY MORNING THROUGH SATURDAY NIGHT/...

WITH THE UPPER LEVEL TROUGH MOVING OVERHEAD FOR FRIDAY NIGHT...TEMPS ALOFT WILL CRASH. 850 HPA TEMPS WILL FALL TO -10 TO -12 DEGREES C BY SATURDAY MORNING. MEANWHILE...WITH WATER TEMPS ON LAKE ONTARIO STILL AROUND +7 TO +8 DEGREES C...THERE WILL PLENTY OF A TEMP DIFFERENTIAL TO ALLOW LAKE EFFECT SNOW TO OCCUR. WITH A MULTI-LAKE CONNECTION IN PLACE...INVERSION HEIGHT ALL THE WAY UP TO 600 HPA....AND WIND ORIENTATION TO REMAIN FAIRLY STEADY /GENERALLY 280 TO 285 DEGREES FOR THE 0-3 KM LAYER/...A BAND OF STEADY LAKE EFFECT SNOW LOOKS TO IMPACT THE TUG HILL PLATEAU INTO THE WESTERN ADIRONDACKS FOR FRIDAY NIGHT THROUGH MUCH OF THE DAY ON SATURDAY. AREAS AROUND OLD FORGE CAN EXPECT AT LEAST 6 INCHES OF SNOW...AND AREAS THAT REMAIN UNDER THE CORE OF THE BAND WILL HAVE THE POTENTIAL TO SEE OVER 9 INCHES. AS A RESULT...A LAKE EFFECT SNOW WATCH HAS BEEN ISSUED FOR NORTHERN HERKIMER COUNTY. **THE KVIE INLAND EXTENT TOOL AVAILABLE THANKS TO CSTAR RESEARCH** SUGGESTS THE LAKE BAND COULD REACH AS FAR AS 120 MILES INLAND FROM THE LAKESHORE WITH A MULTI LAKE CONNECTION IN PLACE...SO THERE/S THE POTENTIAL FOR THE BAND TO REACH INTO THE CENTRAL ADIRONDACKS. WILL MENTION THE POTENTIAL IN THE HWO FOR LAKE EFFECT HEADLINES TO BE NEEDED INTO HAMILTON COUNTY AS WELL.

SHORT TERM...FRUGIS

Friday 18 December 2015

CSTAR lake effect snow research was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 180925

AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
425 AM EST FRI DEC 18 2015

.SHORT TERM /6 PM THIS EVENING THROUGH SUNDAY/...

TONIGHT...INVERSION HEIGHTS WILL RISE TO 3 KM...WITH A 265-275 DEGREE TRAJECTORY FAVORING AN INTENSE SINGLE BAND DEVELOPING NEAR OLD FORGE AND AFFECTING MUCH OF NORTHERN HERKIMER COUNTY. THE FLOW PATTERN ALSO FAVORS A MULTI-LAKE CONNECTION, WHICH WILL ENHANCE THE INLAND EXTENT. THE BAND SHOULD START TO ORGANIZE THIS EVENING...AND BECOME ESTABLISHED OVERNIGHT. AS A RESULT...THE WATCH NORTHERN HERKIMER HAS BEEN UPGRADED TO A WARNING. PART OF THE BAND WILL LIKELY EXTEND EASTWARD INTO HAMILTON COUNTY...AS THE **LOCAL KVIE INLAND EXTEND INDEX FROM CSTAR RESEARCH** IS INDICATING THE BAND EXTENDING FAR ENOUGH INTO WESTERN HAMILTON COUNTY TO WARRANT THE ISSUANCE OF AN ADVISORY. ELSEWHERE TONIGHT...ISOLATED TO SCATTERED SNOW SHOWERS WILL BE POSSIBLE...ESPECIALLY OVER THE EASTERN CATSKILLS THERE A FEW FRAGMENTS OF LAKE ERIE SNOW BANDS MAY DRIFT OVER THE MOUNTAINS...AND SOME UPSLOPE SNOW SHOWERS ACROSS THE SOUTHERN GREEN MOUNTAINS IN VERMONT. IT WILL BE NOTICEABLY COLDER TONIGHT WITH A BRISK W-NW WIND DEVELOPING.

SHORT TERM...JPV

Friday 18 December 2015

CSTAR lake effect snow research was cited in the near-term section of the NWS ALY AFD.

FXUS61 KALY 182040
AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
340 PM EST FRI DEC 18 2015

.NEAR TERM /UNTIL 6 AM SATURDAY MORNING/...

OVERNIGHT...THE APPROACH OF THE UPSTREAM WAVE /APPROACHING CHICAGO/ WILL FURTHER ENTRENCH THE COLD ADVECTION UNDERWAY TO

FURTHER ENHANCE LAKE EFFECT SNOW. THIS TOO MAY TOUCH OFF A RA/SN SHOWER ACROSS THE REMAINDER OF THE REGION. AS FOR THOSE BOUNDARY LAYER WINDS...THERMALLY INDUCED LAKE TROUGH WILL SET UP JUST NORTH OF THE LAKE SHORE ALONG THE U.S. SIDE WITH MEAN DIRECTION FROM 290 TO 270 DEGREES OVERNIGHT. MINIMAL DIRECTIONAL SHEAR IS FORESEEN AT THIS TIME PER THE HOURLY HIRES NUMERICAL OUTPUT. **PER THE EXCELLENT CSTAR RESEARCH...INLAND LAKE PENETRATION** SHOULD BE BETWEEN 70-100 MILES SO NO CHANGES TO THE CURRENT HEADLINES AT THIS TIME. OVERNIGHT LOWS IN THE 20S ACROSS MOST OF THE REGION.

NEAR TERM...BGM

Saturday 19 December 2015

CSTAR lake effect snow research was cited in the near-term section of the NWS ALY AFD.

FXUS61 KALY 190913
AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
413 AM EST SAT DEC 19 2015

.NEAR TERM /UNTIL 6 PM THIS EVENING/...

THE MAIN CHANGE TO THE CURRENT HEADLINES IS THE ADDITION OF SRN HERKIMER TO A LAKE EFFECT SNOW ADVISORY BEGINNING AT 4 AM TODAY...AND RUNNING UNTIL 7 AM SUNDAY. CURRENTLY...A LONG FETCH LAKE EFFECT BAND CONTINUES TO IMPACT THE SRN AND WRN DACKS INTO THE NRN SARATOGA REGION/LAKE GEORGE REGION...AND INTO SRN VT. THIS BAND IS JUST GRAZING THE NRN-SRN HERKIMER CTY ZONE SPLIT. THE LATEST NAM/HRRR...AND BUFKIT TRENDS ARE FOR POTENTIALLY A SINGLE LAKE EFFECT BAND TO FORM DOWNWIND OF ONTARIO DUE TO THE FAVORABLE LOW LEVEL TRAJECTORY OF 270-280 DEGREES...FAVORABLE DELTA T/S FROM THE SFC TO H850/H700 COUPLED WITH MODERATE TO EXTREME INSTABILITY DUE TO THE WARM LAKE TEMPS FOR MID-DEC /AVG TEMP IS 46F BASED ON GLERL SITE/...AND THE INVERSION HEIGHTS ABOVE 7KFT AGL. **LOCAL CSTAR RESEARCH WITH THE KVIE INDEX** SUPPORTS INLAND EXTENT INTO THE ADIRONDACKS AND MOHAWK VALLEY. SNOW RATES OF 1-2 INCHES AN HOUR WILL BE POSSIBLE ACROSS PORTIONS OF N-CNTRL HERKIMER COUNTY INTO EXTREME WRN PORTIONS OF HAMILTON COUNTY. THE BAND WILL GRADUALLY SINK S/SE INTO THE MOHAWK VALLEY AND SOUTHERN HERKIMER CTY LATE

THIS AFTERNOON INTO TONIGHT...AS THE LOW-LEVEL FLOWS VEERS MORE TO A 280-290 DEG TRAJECTORY. WE ARE EXPECTING AT LEAST 6-8 INCHES OF SNOW IN THE WARNING AREA TODAY...AND 2-6 INCHES IN THE ADVISORY AREA.

NEAR TERM...WASULA

Saturday 19 December 2015

CSTAR lake effect snow research was cited in the near-term section of the NWS ALY AFD.

FXUS61 KALY 191431
AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
931 AM EST SAT DEC 19 2015

.NEAR TERM /UNTIL 6 PM THIS EVENING/...

THE LOW TO MID LEVEL WESTERLY FLOW OVER LAKE ONTARIO CONTINUES TO ALLOW FOR A PLUME OF LAKE EFFECT SNOW SHOWERS ACROSS THE ADIRONDACKS. **AS ANTICIPATED BY CSTAR RESEARCH...THE BAND EXTENDS WELL INLAND** THANKS TO FAVORABLE SHEAR...DEEP INSTABILITY AND UPSTREAM MULTI-LAKE CONNECTION...WITH THE ACCUMULATING SNOW EXTENDING ALL THE WAY INTO WARREN COUNTY. ADDITIONAL SNOWFALL IS OCCURRING IN SRN VT...AS THE REMAINING MOISTURE UPSLOPES THE HIGH TERRAIN OF THE SRN GREENS. SO FAR...ABOUT 1-4" OF SNOW HAS OCCURRED ACROSS THE ADIRONDACKS...WITH 1-3" OVER SRN VT. EVEN A COATING TO AN INCH OR TWO HAS FALLEN IN THE UPPER HUDSON VALLEY AREA AROUND GLENS FALLS...QUEENSBURY AND FORT EDWARD.

NEAR TERM...FRUGIS/WASULA

Thursday 24 December 2015

CSTAR research on ice storms was cited in the long-term section of the NWS ALY AFD.

FXUS61 KALY 242114

AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
414 PM EST THU DEC 24 2015

.LONG TERM /SUNDAY NIGHT THROUGH THURSDAY/...

TUESDAY AND TUESDAY NIGHT LOOK TO BE VERY INTERESTING AS MIXED PRECIPITATION IS EXPECTED. WITH HIGH PRESSURE DRIFTING NORTHEAST FROM THE CANADIAN MARITIMES AND A LOW PRESSURE SYSTEM WITH A COMPLEX FRONTAL BOUNDARY LIFTING NORTHEAST THROUGH THE FA LATE TUESDAY NIGHT EXPECT A WINTRY MIX OF PRECIPITATION GOING FROM SNOW TO SLEET AND FREEZING RAIN DURING THE DAY ON TUESDAY AND LINGERING INTO TUESDAY NIGHT. BOTH PARTIAL THICKNESS VALUES AND MODEL SOUNDINGS FAVOR THIS SCENARIO WITH A WARM NOSE ON THE 18Z SOUNDING AT KALB SHOWING THE WARM NOSE OF ABOUT 3C WITH THE SURFACE STILL AT OR BELOW FREEZING. **THIS SCENARIO FITS WITH THE CSTAR STUDY ON ICE STORMS** IN TERMS OF THE POSITIONING OF THE MAIN SYSTEMS AS WELL AS THE STRONG NORTH TO NORTHEASTERLY AGEOSTROPHIC FLOW AT 925 MB ALLOWING THE COLD AIR TO BLEED DOWN THE VALLEYS. IN ADDITION THERE WILL BE THE POTENTIAL FOR SOME STRONG WIND GUSTS WITH THIS SYSTEM AS A STRONG PRESSURE GRADIENT REMAINS IN PLACE ACROSS THE REGION WITH 925 MB WINDS AT KALB AT 55 KTS TUESDAY AFTERNOON. AT THIS POINT IN TIME WILL CONTINUE TO MENTION THE WINTRY MIX OF PRECIPITATION IN THE HWO. EXPECT HIGHS ON TUESDAY IN THE MID 20S TO MID 30S WITH LOWS TUESDAY NIGHT ALSO IN THE MID 20S TO MID 30S.

LONG TERM...11

Friday 25 December 2015

CSTAR research on ice storms was cited in the long-term section of the NWS ALY AFD.

FXUS61 KALY 252139
AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
439 PM EST FRI DEC 25 2015

.LONG TERM /MONDAY NIGHT THROUGH FRIDAY/...

THE SYNOPTIC SETUP FEATURES SIGNALS OF A MILLER-TYPE B STORM AS THE LOW PRESSURE CENTER TRACKING UP THE GREAT LAKES WILL LIKELY TRANSFER ITS ENERGY TO A DEVELOPING COASTAL LOW DURING THE DAY TUESDAY. THERE ARE ALSO SIGNALS OF A COLD AIR TRAPPING EVENT AS THE RELATIVE LOCATION OF THE HIGH...ALTHOUGH LOCATED QUITE FAR NORTH TO ALLOW FOR THE CLASSIC COLD AIR DAMMING/TRAPPING SYNOPTIC SIGNATURE...WILL PROMOTE THE ENTRENCHMENT OF LOW-LEVEL COLD AIR RESULTING FROM A STRONG LOW-LEVEL NORTHERLY AGEOSTROPHIC FLOW...15-30 KNOTS...AIDED BY THE ENHANCING BAROCLINICITY ALONG THE WARM FRONT AND ISALLOBARIC RESPONSE INDUCED BY THE DEVELOPING COASTAL WAVE. THIS ALSO FITS IN WELL **WITH PREVIOUS CSTAR RESEARCH ON ICE STORMS** REGARDING THE POSSIBILITY OF MIXED PRECIP...ICING FROM FREEZING RAIN.

LONG TERM...IRL

Monday 28 December 2015

CSTAR research on ice storms was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 280903
AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
403 AM EST MON DEC 28 2015

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

HOWEVER...CRITICAL PARTIAL THICKNESS...THERMAL PROFILES FROM THE NAM/GFS/ECMWF...AND BUFKIT SOUNDINGS FROM THE NAM/GFS ALL INDICATE A TRANSITION TO SLEET/FREEZING RAIN INITIALLY SOUTH AND WEST OF THE CAPITAL REGION BETWEEN 06Z-09Z...AS WARM AIR /ABOVE 0C/ IN THE H850-700 LAYER MOVES OVER THE SUBFREEZING LATER CLOSE TO THE GROUND. THE SLEET GETS INTO THE CNTRL PORTIONS OF THE FCST AREA BTWN 09Z-12Z INCLUDING THE CAPITAL REGION. THE GFS/ECMWF THERMAL PROFILES WERE FAVORED FOR THIS FORECAST...AS THE NAM AND SREFS WARMED THINGS UP MUCH QUICKER. THE SFC ANTICYCLONE WILL BE FUNNELING THE SHALLOW ARCTIC AIR INTO THE REGION...AS THE AREA OF UPPER LEVEL DIFFLUENCE MOVES OVER THE NORTHEAST WITH STRONG LIFT AHEAD OF THE WARM FRONT TAPPING INTO AN ANOMALOUS H850 LLJ INCREASING TO 45-60 KTS BY 12/TUE.

THE +V COMPONENT OF THE WIND /SOUTHERLIES/ WILL BE 2-3 STD DEVS ABOVE NORMAL ACCORDING TO THE LATEST GEFS. THIS EVENT SHOWS SIMILAR CHARACTERISTICS TO A **COOL SEASON CSTAR ICE STORM CONCEPTUAL MODEL**...EXCEPT A GOOD AMOUNT OF SLEET MAY OCCUR AHEAD OF THE ICE.

SHORT TERM...WASULA

Saturday 2 January 2016

CSTAR lake effect snow research was cited in the near-term section of the NWS ALY AFD.

FXUS61 KALY 020850
AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
350 AM EST SAT JAN 2 2016
.NEAR TERM /UNTIL 6 PM THIS EVENING/...

THE KVIE CSTAR PROGRAM DOES INDICATE THE INLAND EXTEND OF THE LAKE BAND OFF ONTARIO WILL DIMINISH FROM ABOUT 90 TO 50 MILES LATER THIS MORNING AS THE SUBSIDENCE INVERSION LOWERS.

NEAR TERM...HWJIV

Saturday 9 January 2016

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

FXUS61 KALY 090924
AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
424 AM EST SAT JAN 9 2016

.SHORT TERM /6 PM THIS EVENING THROUGH MONDAY/...

SUNDAY NIGHT...THE COLD/OCCLUDED FRONT AND STRONG UPPER LEVEL ENERGY SHOULD MOVE ACROSS THE REGION IN THE EVENING. ADDITIONAL SHOWERS WILL BE POSSIBLE...AND CANNOT RULE OUT A FEW LOW TOPPED CONVECTIVE CELLS. BEHIND THIS...EXPECT WINDY AND COLDER CONDITIONS TO OVERSPREAD THE REGION. WEST WINDS SHOULD INCREASE TO 15-25 MPH WITH GUSTS OF 35-45 MPH POSSIBLE...HIGHEST ACROSS THE WESTERN ADIRONDACKS...AND THROUGH THE MOHAWK VALLEY REGION. THESE WEST WINDS COULD APPROACH ADVISORY LEVELS...AND ADDITIONAL WIND STATEMENTS MAY BE NEEDED FOR PORTIONS OF THE REGION. IT APPEARS THAT THE BEST ISALLOBARIC PRESSURE RISES WILL BE MAINLY N AND W OF THE REGION...AS THE TRACK OF THE MAIN SFC LOW TRANSLATES NNE ACROSS THE EASTERN GREAT LAKES AND INTO WESTERN QUEBEC. THIS TRACK...**IN ACCORDANCE WITH PAST CSTAR RESEARCH...WOULD SUGGEST THAT THE STRONGEST WINDS MAY PASS JUST N AND W OF THE ALY FORECAST AREA**...PERHAPS BRUSHING THE WESTERN ADIRONDACKS. TEMPS SHOULD FALL INTO THE 20S FOR MOST AREAS BY DAYBREAK MONDAY...WITH SOME TEENS POSSIBLE ACROSS HIGHER TERRAIN OF THE ADIRONDACKS AND CATSKILLS. ALSO...LAKE EFFECT SNOW SHOULD DEVELOP ACROSS THE WESTERN ADIRONDACKS LATE AT NIGHT...WITH UP TO A FEW INCHES POSSIBLE BY MONDAY DAYBREAK.

SHORT TERM...KL

Wednesday 13 January 2016

CSTAR lake effect snow research was cited in the near-term section of the NWS ALY AFD.

FXUS61 KALY 130932
AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
432 AM EST WED JAN 13 2016

.NEAR TERM /THROUGH TONIGHT/...
LAKE EFFECT SNOW DOWNWIND OF LAKE ONTARIO WITH CONTRIBUTIONS FROM GEORGIAN BAY CONTINUES THIS MORNING. PER BUFKIT PROFILES...EXTREME INSTABILITY AS DELTA T/S WERE CLOSE TO 20C AS WIND TRAJECTORIES FROM THE 290-300 DIRECTION. THIS TRAJECTORY PLACES THE BAND BETWEEN SYR-RME WITH USUAL FLUCTUATIONS EXPECTED THROUGH THE MORNING HOURS. **PER CSTAR RESEARCH...INLAND EXTENT** WOULD BE

AROUND 80 MILES...WHICH PLACES OUR SOUTHERN HERKIMER COUNTY INTO THE SCHOHARIE VALLEY UNDER THE THREAT FOR ACCUMULATING SNOWFALL TODAY. HAVE NOT MADE ANY CHANGES TO THE LAKE EFFECT SNOW HEADLINES. PER BUFKIT RAP/NAM4KM/HRRR...THE BAND WILL SLOWLY DRIFT NORTHWARD LATER THIS AFTERNOON AS WIND MAGNITUDES DECREASE FURTHER LIMITING INLAND PENETRATION OF THE LAKE BANDS. SO WE WILL GRADUALLY DIMINISH THE POPS/WX ACROSS HERKIMER COUNTY. ELSEWHERE...MIXING LAYER HEIGHTS TAP INTO THE 30-40 KTS AS WE WILL KEEP THE WIND ADVISORY IN PLACE AT THIS TIME. NOT MUCH CHANGE TO THE TEMPERATURES THROUGH THE DAY WITH CONTINUED COLD ADVECTION AS TEENS TO MID 20S ARE EXPECTED. WIND CHILL VALUES RANGING FROM BELOW ZERO ACROSS THE HIGHER TERRAIN TO BETWEEN 10-15 FOR VALLEY LOCATIONS.

NEAR TERM...BGM

Friday 15 January 2016

CSTAR research on cutoff cyclones was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 150709
AFDALY

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE ALBANY NY
209 AM EST FRI JAN 15 2016

.SHORT TERM /SATURDAY NIGHT THROUGH MONDAY NIGHT/...

AWAY FM THE LK IMPACTS THE NW FLOW WILL JUST POUR COLD AIR INTO THE RGN. PASSING SHORT WVS AND TRRN WILL RESULT IN **NW FLOW AS PER DAN ST.JEAN CSTAR PROJECTS OF THE EARLY 2000S** OVER THE HIR TRRN. ELSEWHERE VRBL CLOUDS. AFT SUN TEMPS WILL TREND BLO NORMALS FOR A WEEK FOR THE FIRST TIME IN MONTHS.

SHORT TERM...SNYDER