

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

***Development of Improved Diagnostics, Numerical Models, and Situational Awareness of
High-Impact Cyclones and Convective Weather Events***

University: University at Albany

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1. SUMMARY OF STUDENT RESEARCH ACTIVITIES

a) Forecast and model diagnostics for severe convective weather events in complex terrain

Graduate student: William Flamholtz

PI and co-PIs: Brian Tang, Lance Bosart, and Kristen Corbosiero

NWS focal points: Thomas Wasula (ALY), Michael Evans (ALY), and Matthew Kramar (PIT)

Research summary:

Past studies have shown that increased low-level, directional shear due to terrain-induced flow channeling may play a role in greater convective organization and intensity in valley locations (Lapenta et al. 2005; Bosart et al. 2006; Katona et al. 2016). William Flamholtz developed and used an idealized WRF model framework to study the effects of terrain-induced flow channeling on convective organization and intensity. The model framework has a north–south oriented, idealized valley, similar to the idealized modeling study of Markowski and Dotzek (2011). Three simulations were conducted with varying valley depths (or equivalently, plateau heights) to achieve different degrees of flow channeling: one simulation without a valley (control), and two simulations with plateau heights of 300 m and 500 m (Fig. 1).

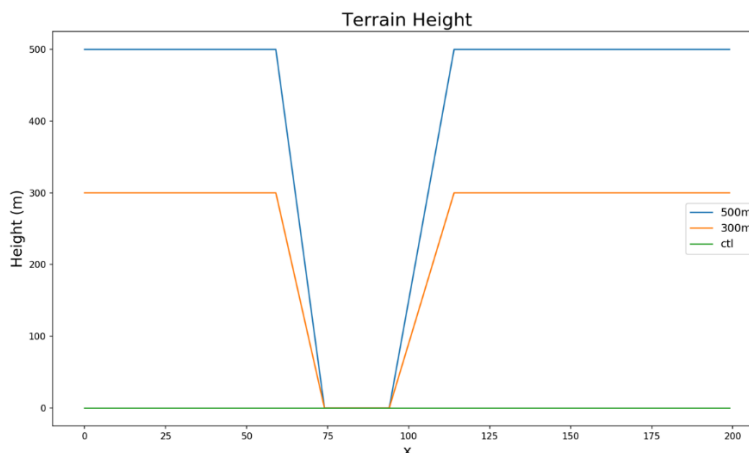


Figure 1: Terrain height in the east–west direction of the control (green), 300-m (orange), and 500-m (blue) simulations.

All three simulations were initialized with a modified HRRR sounding from Poughkeepsie, NY (KPOU) at 1800 UTC 15 May 2018, representing a pre-convective environment of a past severe weather outbreak in the Northeast. Our goal is to initialize the wind profile to be representative of non-valley locations while retaining the thermodynamic environment at KPOU. To accomplish this goal, the vertical wind profile was altered in the lowest kilometer to remove the directional shear. Convection was initiated with a warm bubble to the west of the valley, with the placement of the warm bubble chosen so that convection would not reach the valley before 90 min, allowing flow channeling to develop and reach equilibrium within the valley.

Figure 2a shows the wind direction for the control simulation, and Figs. 2b and c show differences between the control and terrain simulations as a function of height and time. Both terrain simulations develop south-southwesterly flow below a height of 1.25 km, with the 500-m simulation producing the greatest differences in direction when compared to the control simulation (~10 degrees at the surface). The channeling also extends higher up in the boundary layer in the

500-m simulation. The 500-m simulation has greater lee troughing in the valley, resulting in a greater isallobaric response in the low-level flow that directs the flow up the axis of the valley.

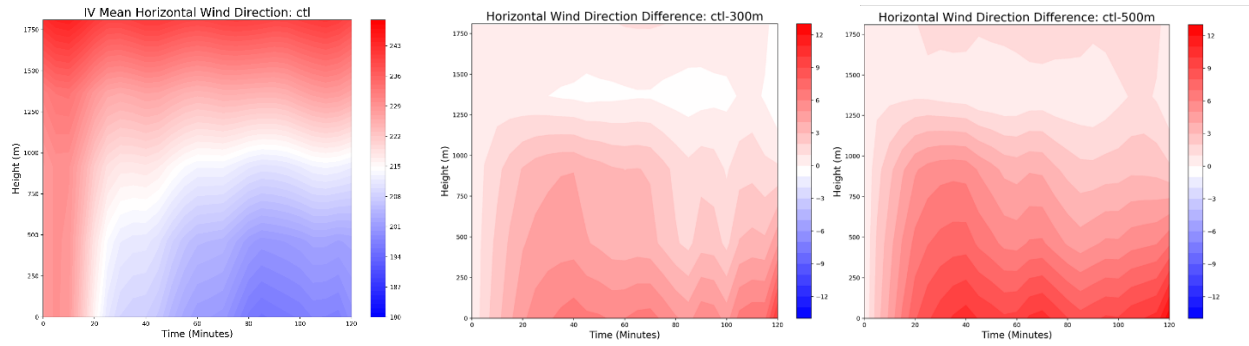


Figure 2. Wind direction (degrees) as a function of height and time for the control simulation (left) and wind direction differences in the valley between the 300-m simulation and control simulation (middle), and the 500-m simulation and the control simulation (right).

Figure 3 shows the convective evolution for all three simulations, which produce splitting supercells, with the left-moving cell quickly dissipating as it moves northward. The control simulation has the highest reflectivity during most of the simulation, likely due to greater boundary-layer CAPE, due to having a deeper boundary layer in the absence of terrain, in the control simulation. We will attempt to address this issue in future simulations, since it makes for a somewhat apples-to-oranges comparison between these three simulations. Despite these differences in CAPE, both supercells in the terrain simulations have a spike in reflectivity when they interact with the upslope (east) side of the valley. Additionally, both supercells appear to be fairly steady while traversing the valleys. These behaviors will be investigated in more depth.

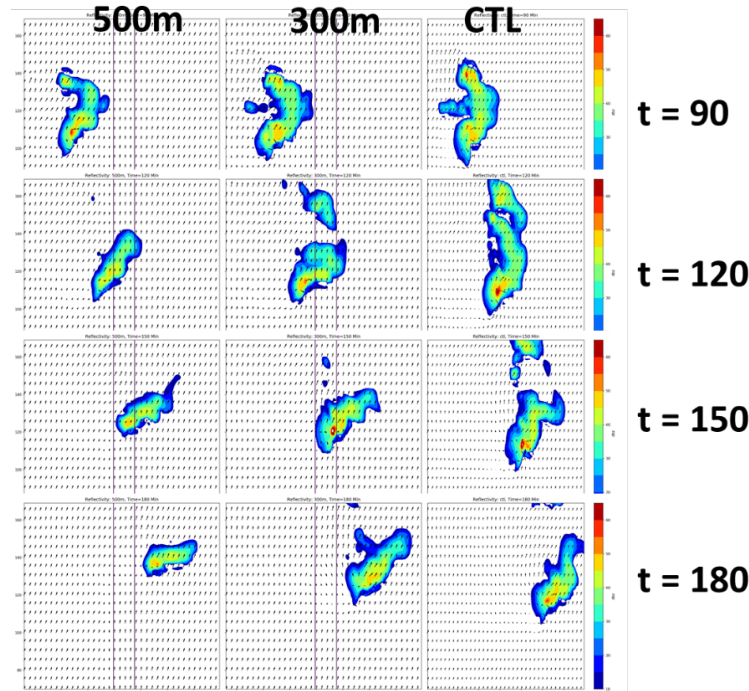


Figure 3. Simulated radar reflectivity for the 500-m (left column), 300-m (middle column), and control (right column) simulations, plotted every 30 minutes starting at 90 minutes and ending at 180 minutes into the simulations. The black vertical lines in the left and middle column denote the location of the valley.

During the next few months, we will continue to refine the current experimental design and run more simulations. We will determine how to initialize the environment in plateau locations and valley locations in a more robust manner. After doing so, we will investigate the sensitivity of simulated convective evolution to differences in wind shear, thermodynamic environments, and storm modes (e.g., supercells, QLCs, and squall lines). While these simulations are idealized, they will provide valuable scientific and operational insight. The latter will be achieved by supplying forecasters with conceptual models and information on the combinations of environmental conditions and storm modes that may lead to an enhancement of convective intensity as convection interacts with terrain, along with the reasons for these enhancements.

NWS Interactions:

William Flamholtz, Brian Tang, and Lance Bosart all attended the 19th Northeast Regional Operational Workshop (NROW) 7–8 November 2018 and the 44th Northeastern Storm Conference (NESC) 8–10 March 2019. At NROW and NESC, William presented his research that was detailed in the previous six-month report. Luke LeBel, who is an undergraduate student working with Brian Tang and Ross Lazear, also presented his research on terrain and boundary influences on the Mechanicville, New York supercell and two other more recent severe weather events in the Northeast. At each of these meetings, we had discussions with National Weather Service forecasters who were in attendance.

William Flamholtz also presented a research update to NWS Focal Points at the Fall CSTAR Meeting on 9 November 2018. The NWS Focal Points provided feedback on the work done so far, and made suggestions for future research directions, particularly involving the selection of case studies for future analysis, and how the information gained from this research will be operationally useful.

References:

- Bosart, L. F., A. Seimon, K. D. LaPenta, and M. J. Dickinson, 2006: Supercell tornadogenesis over complex terrain: The Great Barrington, Massachusetts, tornado on 29 May 1995. *Wea. Forecasting*, **21**, 897–922.
- Katona, B., P. Markowski, C. Alexander, and S. Benjamin, 2016: The influence of topography on convective storm environments in the eastern United States as deduced from the HRRR. *Wea. Forecasting*, **31**, 1481–1490.
- LaPenta, K., L. Bosart, T. Galarneau, and M. Dickinson, 2005: A multiscale examination of the 31 May 1998 Mechanicville, New York, tornado. *Wea. Forecasting*, **20**, 494–516.
- Markowski, P. M., and N. Dotzek, 2011: A numerical study of the effects of orography on supercells. *J. Atmos. Res.*, **100**, 457–478.

b) High-resolution numerical forecasts of lake-effect snowstorms: model performance, physics sensitivities, and synoptic predictability

Graduate student: Massey Bartolini

PIs and co-PIs: Justin Minder, Daniel Keyser, and Ryan Torn

NWS focal points: Joseph Villani (ALY) and David Zaff (BUF)

Research summary:

During the past six months, Massey Bartolini, the graduate student assigned to this project, has continued to make progress. Research is nearly complete on constraining the model physics uncertainties within the microphysics (MP) and planetary boundary layer/surface layer (PBL/SL) parameterization schemes from our WRF simulations of OWLeS IOP2b. Massey presented his master's thesis results on 6 March 2019, and an abbreviated version of the thesis presentation at the Northeastern Storm Conference. Justin presented an overview of the work associated with this grant at as part of an invited seminar presentation in the McGill University Atmospheric and Oceanic Sciences Department.

Current efforts are focused on thesis completion during summer 2019 and adapting the MP portion of the thesis into a manuscript for submission to an AMS journal. As described in the previous report, a second manuscript focused on the PBL/SL research for the OWLeS IOP2b and 11 February 2016 case studies is nearly complete and will be ready for submission to an AMS journal within the next few weeks.

Massey also met with Ross Lazear in April to begin discussion of the operational takeaways from our work and will be working with Ross over the summer to summarize our key results in VLab. In late July, Massey will be presenting some of the MP results as an oral presentation at the AMS Mesoscale Processes conference in Savannah, GA.

c) Applying forecast track and intensity diagnostics to high-impact Northeast winter storms

Graduate student: Tomer Burg

PI and co-PIs: Andrea Lang, Ryan Torn, and Kristen Corbosiero

NWS focal points: Neil Stuart (ALY), Joseph Dellicarpini (BOX), and Justin Arnott (GYX)

Research summary:

The goal of this project is to identify and quantify any systematic biases with forecasts of high-impact Northeast U.S. winter cyclones to improve situational awareness during the forecast process. Over the six-month reporting period, work consisted of creating additional composites of cases as categorized by forecast track bias, intensity bias and position variability, as well as completing and submitting the master's thesis supporting this project and presenting the thesis research results.

The key research accomplished in the six-month reporting period centered on creating synoptic composites for groups of Northeast cyclones showing: (a) left of track (LOT) vs. right of track (ROT) biases, (b) weak intensity (WB) vs. strong intensity (SB) bias, (c) small across-track (SV) vs. large across-track (LV) variability, and (d) small along-track (SV-L) vs. large along-track (LV-L) variability in the GEFS reforecast data. Events were sorted into the composite groups base on the bias quantified at a day 3 lead time, then the composites were created using the CFSR verification data. Day 3 lead time was chosen as this was the forecast lead time which exhibited the strongest negative correlation between across-track and intensity bias; specifically, that a weak bias is correlated with a ROT bias and a strong bias is correlated with a LOT bias. Cases that exhibited the bias for 12 consecutive hours surrounding the time the cyclone was closest to the benchmark were retained, to ensure spatial and temporal consistency of the bias, as well as cases that tracked within 250 km of the benchmark.

These composite groups show that for ROT vs. LOT composite differences (Fig. 4), cases that exhibit ROT biases in the GEFS are associated with a higher amplitude flow at 500-hPa over the U.S. than LOT cases, with a higher amplitude western U.S. ridge and eastern U.S. trough. The ROT cases also exhibited higher MSLP than LOT cases across the Rockies into the Plains and Gulf of Mexico, along with a stronger jet circulation with both the downstream polar jet streak and upstream subtropical jet streak stronger in magnitude in the ROT composite. For GEFS intensity biases (Fig. 5), WB cases similarly exhibited a higher amplitude flow over the U.S. than SB cases. MSLP was higher in the WB cases over the Gulf of Mexico than the SB cases, and the jet circulation is similarly stronger in WB than SB cases, with the downstream polar jet streak also displaced poleward in the WB composite relative to the SB composite.

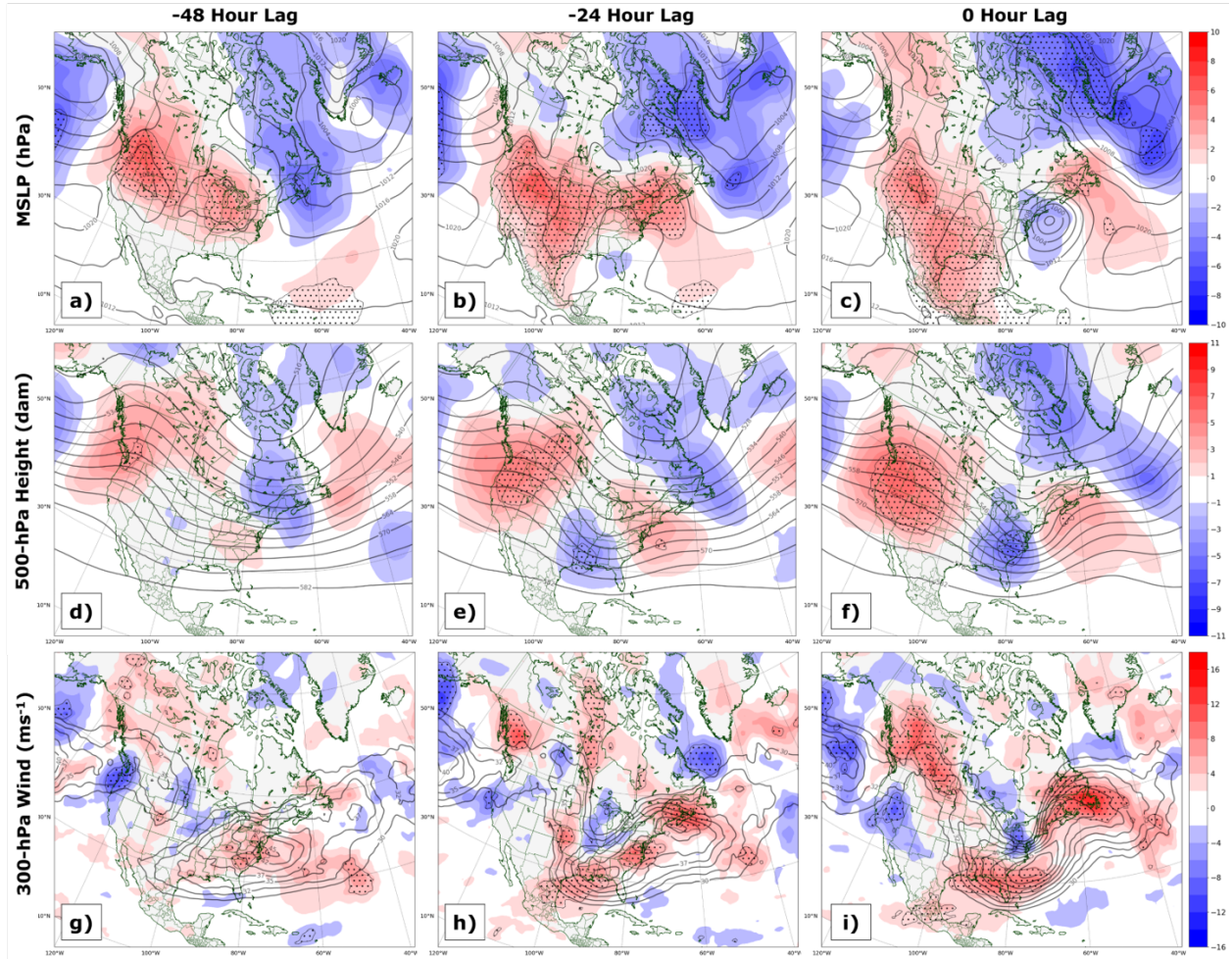


Figure 4. Difference plots of ROT minus LOT bias composites for (a,b,c) MSLP (hPa), (d,e,f) 500-hPa height anomaly (dam), and (g,h,i) 300-hPa wind (m/s). The difference plots are presented for (a,d,g) -48 hour lag time, (b,e,h) -24 hour lag, and (c,f,i) 0 hour lag, with 0-hour lag composite centered at the time of peak impact. For each panel, the difference field is shaded, with warm colors indicating the ROT composite has a higher value than the LOT composite. The mean value of both ROT and LOT composites is contoured in black lines, and black stippling indicates statistical significance at the 95% confidence level.

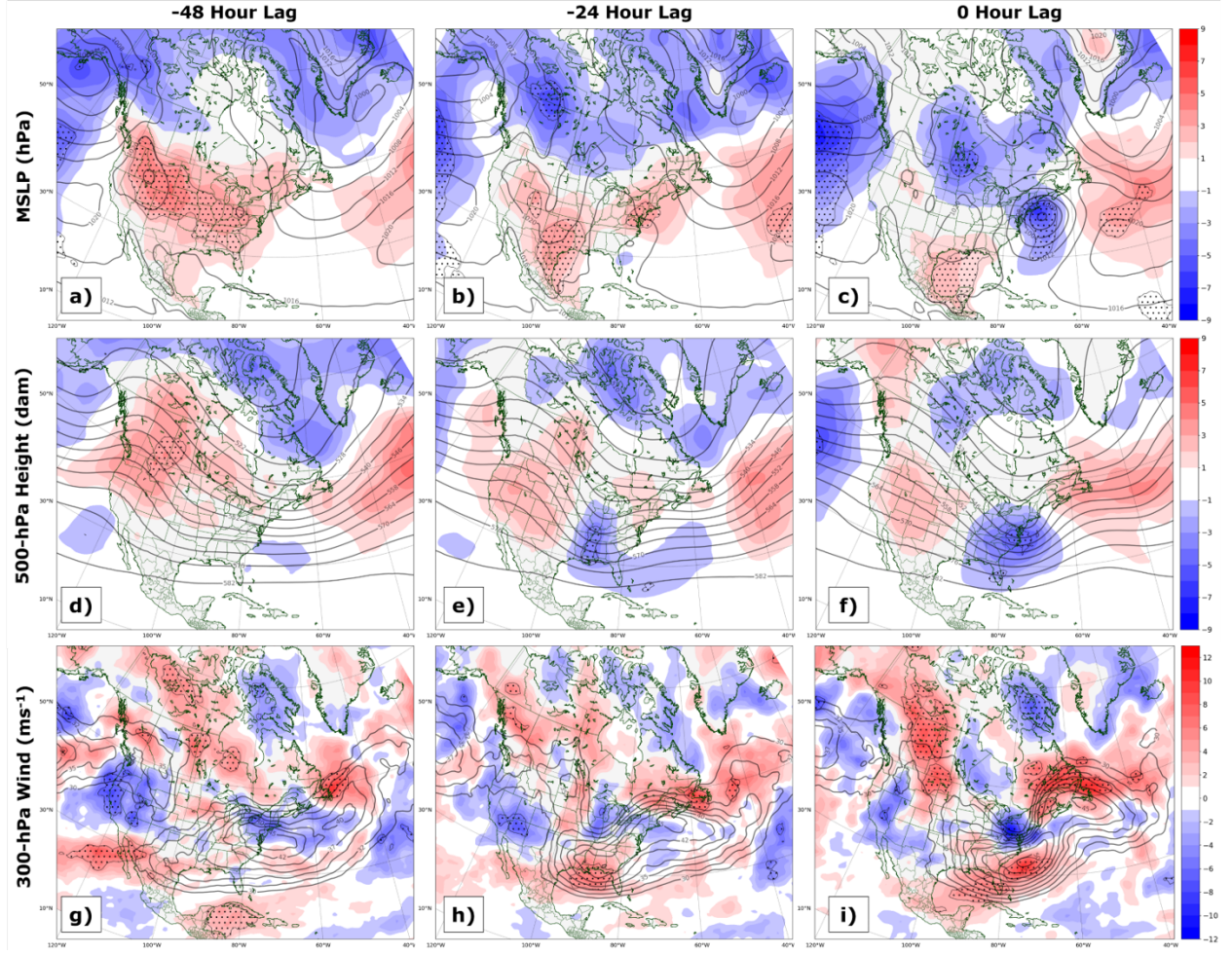


Figure 5. Same as Fig. 4, but for composite differences of WB minus SB cases.

For the across-track position variability composites (Fig. 6), SV cases exhibited higher MSLP across much of western North America than LV cases, with the SV composite exhibiting persistently higher 500-hPa heights over western Canada, northern Canada and the northwest U.S. through at least 3 to 4 days prior to the event, relative to the LV composite. For along-track variability (Fig. 7), the SV-L composite exhibited lower 500-hPa heights across the western U.S and over the western Atlantic Ocean downstream of the composite cyclone location through 3 days prior to the event, relative to the LV-L composite. 500-hPa heights over central Canada were also higher in the SV-L relative to the LV-L composite from 1 through 4 days prior to the event. These composites are described in more details in the thesis summarizing this work.

For across-track variability, the composite MSLP differences suggested a possibility of a linkage to cold air outbreaks, which are associated with more upstream ridging and higher MSLP downstream of the Rockies. Several teleconnection indices have been linked to cold air outbreaks in the U.S. and North America, such as the positive phase of the Pacific North American pattern (PNA). The PNA is positive for both SV and LV cases on average, but with SV cases exhibiting a more positive PNA in the two days prior to the event than LV cases (Fig. 8). This is similarly evident for SV-L composites exhibiting a more positive PNA than LV-L composites for the majority of the 14 days preceding the event (Fig. 9).

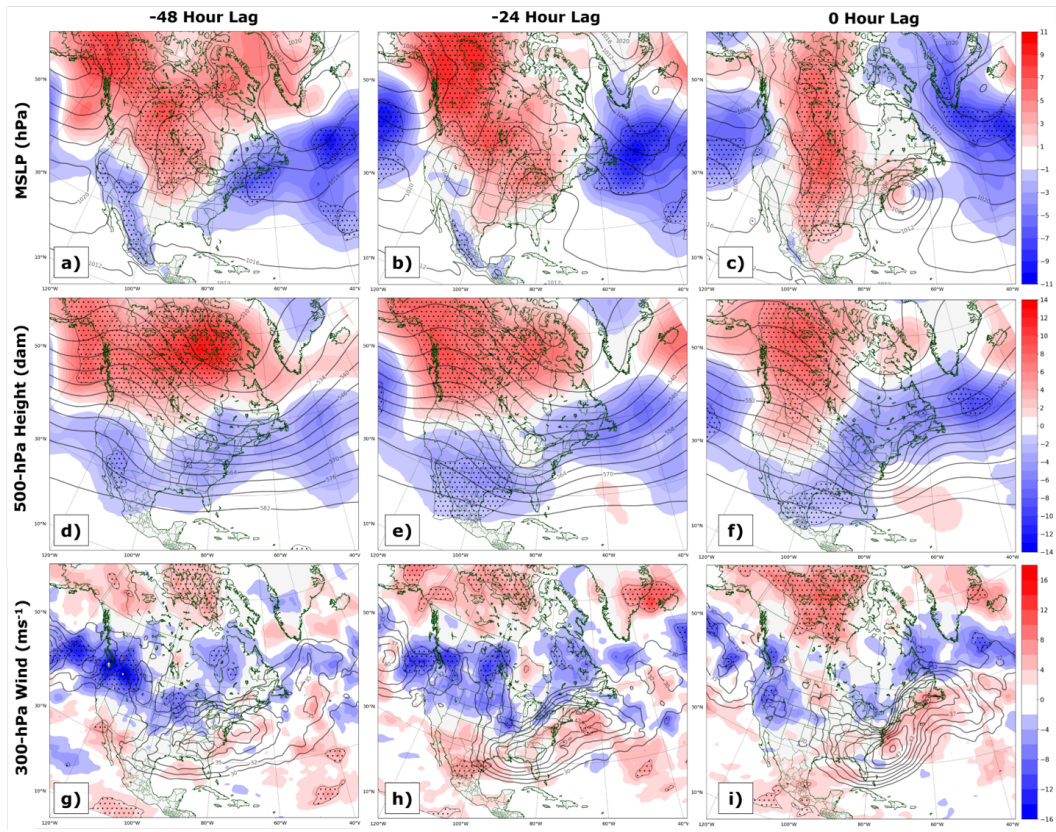


Figure 6. Same as Fig. 4, but for composite differences of small minus large across-track variability cases.

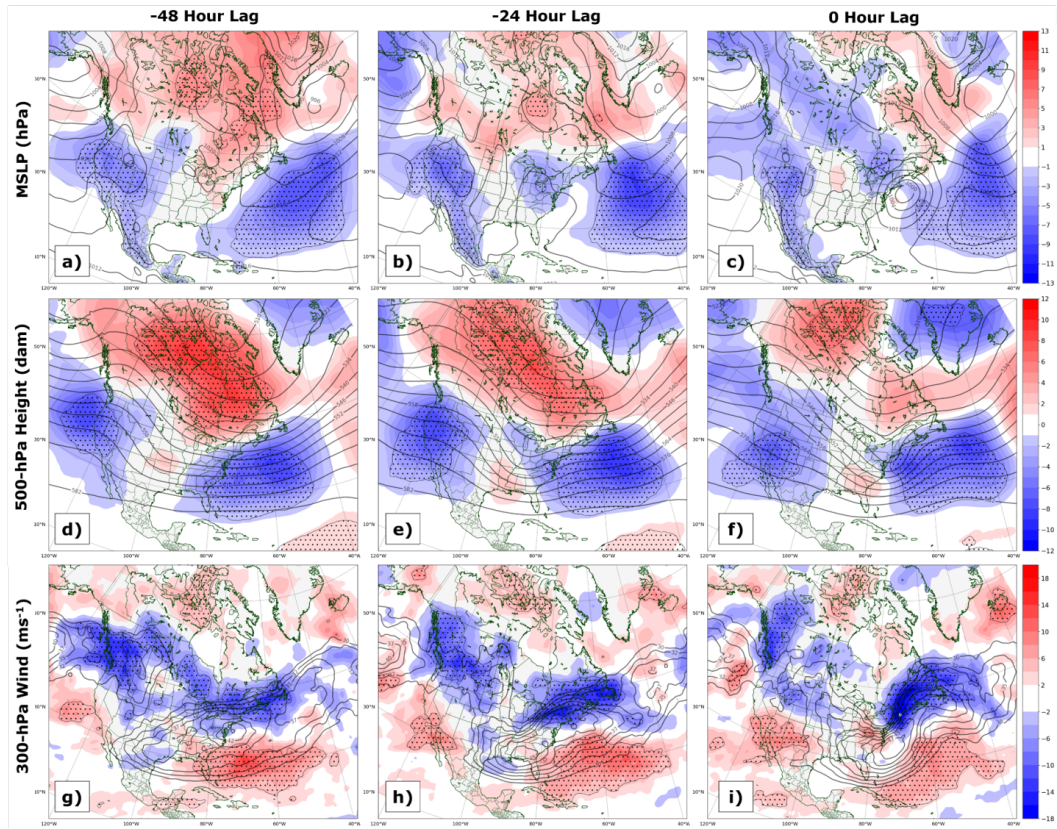


Figure 7. Same as Fig. 4, but for composite differences of small minus large along-track variability cases.

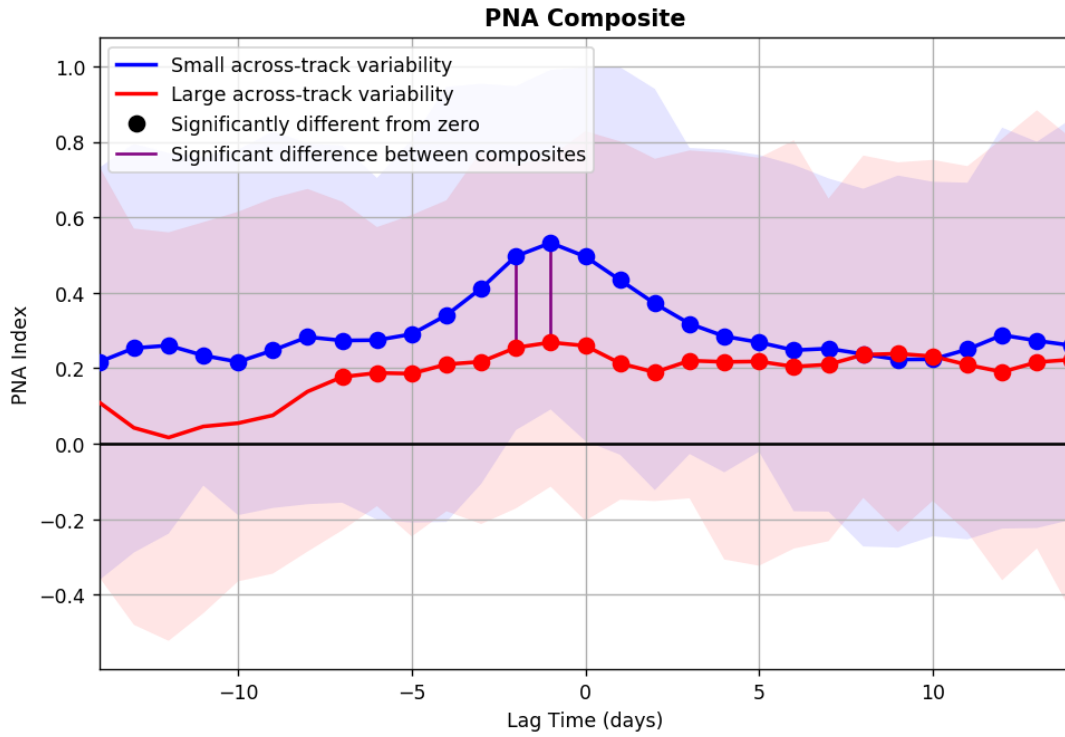


Figure 8. Teleconnection comparisons of PNA for -14 to 14 day lag times centered at the time of peak impact. Blue lines denote small across-track variability composite with light blue shading denoting the Interquartile range (IQR), with the same for red denoting large across-track variability. Statistical significance is tested at the 95% confidence level.

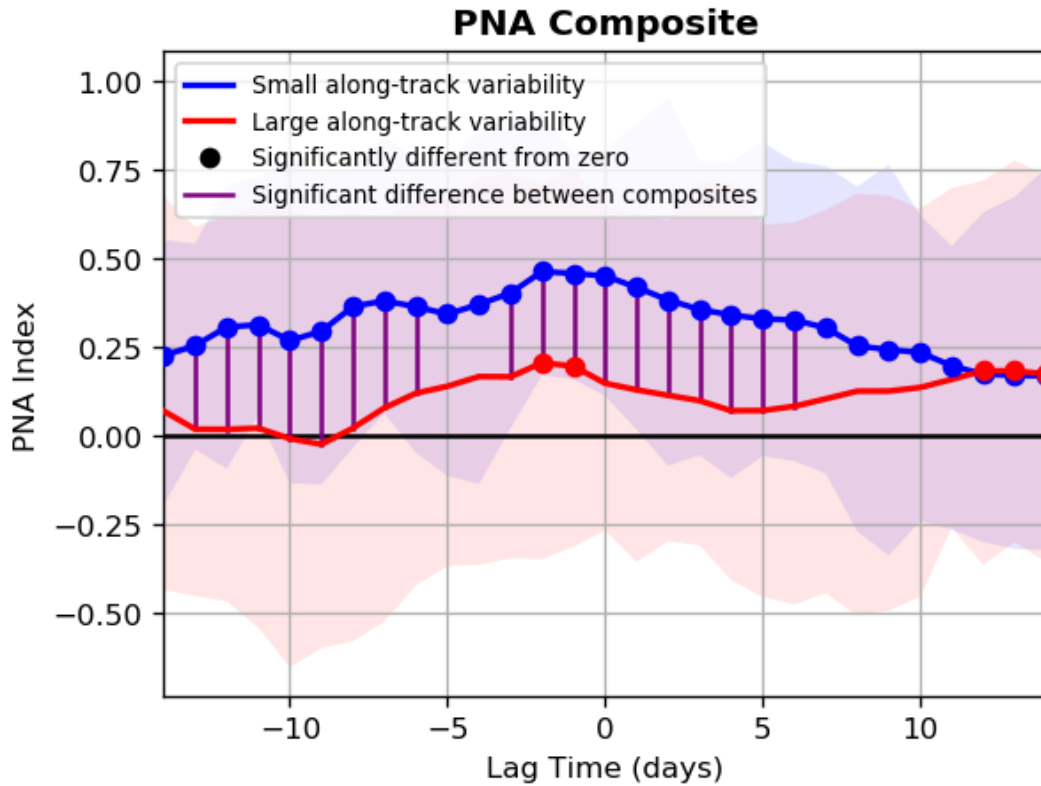


Figure 9. Same as Fig. 8, but for along-track variability.

The thesis summarizing this work has been written and presented. Tomer Burg successfully presented and defended his master's thesis research on 1 May 2019, which was attended by several NWS employees. Tomer graduated with his master's this May. Ongoing and additional future work will focus on transitioning to R2O and be transitioned to Ross Lazear and NWS focal point Neil Stuart. It is anticipated that these thesis results will be submitted to an AMS journal.

2. CSTAR VI PROJECT THESES, PRESENTATIONS, AND PUBLICATIONS

a) Theses completed

Burg, T., 2019: Applying forecast track and intensity diagnostics to high-impact Northeast winter storms. M.S. Thesis, Dept. of Atmospheric and Environmental Sciences, University at Albany, State University of New York, 77 pp.

b) Presentations

Bartolini, W. M., and J. R. Minder, 2018: Convection-permitting ensemble forecasts of the 10–12 December 2013 lake-effect snow event: Sensitivity to initial and boundary conditions. *19th Northeast Regional Operational Workshop*, Albany, NY.

Bartolini, W. M., and J. R. Minder, 2019: Convection-permitting ensemble forecasts of the 10–12 December 2013 lake-effect snow event: Sensitivity to microphysical parameterizations. *99th AMS Annual Meeting*, Phoenix, AZ.

Bartolini, W. M., and J. R. Minder, 2019: Convection-permitting ensemble forecasts of the 10–12 December 2013 lake-effect snow event: Sensitivity to microphysical parameterizations. *44th Annual Northeastern Storm Conference*, Saratoga Springs, NY.

Burg, T., A. L. Lang, K. L. Corbosiero, and R. D. Torn, 2018: Applying forecast track diagnostics to high-impact Northeast winter storms. *19th Northeast Regional Operational Workshop*, Albany, NY.

Burg, T., A. L. Lang, K. L. Corbosiero, and R. D. Torn, 2019: Applying forecast track diagnostics to high-impact Northeast winter storms. *44th Northeastern Storm Conference*, Saratoga Springs, NY.

Flamholtz, W., B. Tang, and L. Bosart, 2018: Evaluating the effects of terrain-channeled, low-level flow on convective organization. *19th Northeast Regional Operational Workshop*, Albany, NY.

Flamholtz, W., B. Tang, and L. Bosart, 2019: Simulating the effects of terrain-induced perturbations on severe convection using an idealized valley. *44th Northeastern Storm Conference*, Saratoga Springs, NY.

LeBel, L., B. Tang, and R. Lazear, 2018: Examining terrain effects on the 31 May 1998 Mechanicville, New York supercell. *19th Northeast Regional Operational Workshop*, Albany, NY.

LeBel, L., B. Tang, and R. Lazear, 2019: The Mohawk–Hudson dryline: The effects of a terrain-influenced boundary on three severe weather events. *44th Northeastern Storm Conference*, Saratoga Springs, NY.

- Minder, J. R., W. M. Bartolini, 2018: Convection-permitting ensemble forecasts of the 10–12 December 2013 lake-effect snow event: Sensitivity to microphysical and surface-layer parameterizations. *19th Northeast Regional Operational Workshop*, Albany, NY.
- Minder, J. R., and W. M. Bartolini, 2019: Towards improved understanding and prediction of intense lake-effect snowstorms. *Atmospheric and Oceanic Sciences Department Seminar*, McGill University, Montreal, QC, Canada.
- Wasula, T. A., and B. J. Frugis, 2018: Albany forecast area significant hail climatology and case studies. *19th Northeast Regional Operational Workshop*, Albany, NY.
- Wasula, T. A., 2019: The 4 August 2018 severe weather event across east-central New York. *44th Northeastern Storm Conference*, Saratoga Springs, NY.

c) Refereed publications

None

3. RESEARCH TO OPERATIONS

Updates to the Albany CSTAR Virtual Lab (VLab) community page are ongoing. Because the page was recently made publicly viewable, the legacy CSTAR page now directs all web traffic to the VLab, enhancing the linkage between the research and operations communities. Recent CSTAR research has resulted in the development of web-based tools; specifically:

- Massey Bartolini's lake-effect forecasting webpage (operational only in-season)
<http://www.atmos.albany.edu/student/mbartolini/les.php>
- Tomer Burg's GEFS reforecast cyclone tracking page:
<http://www.atmos.albany.edu/student/tburg/research/cases.php>

Both pages have been added as links on the VLab community page through a new subpage entitled *Web Tools*.

Additional information has been placed on the *M.S. Theses* subpage. The page was alphabetized by author and a detailed overview of the research results also exists under links to each M.S. thesis. CSTAR research has resulted in the creation of several training modules and a new VLab community subpage has been created in order to make these modules more readily available to the community.

The VLab page is now being monitored through Google Analytics in order to more easily track traffic to each page, both via the web and through the AWIPS Interactive Reference tool.

Finally, with Massey Bartolini and Tomer Burg having recently presented their M.S. theses, Ross Lazear met with each of them to begin developing quick references highlighting the most operationally relevant research results from each project. These will be completed and placed on VLab in Summer 2019.

4. NWS PERSPECTIVE ON CSTAR VI PROGRESS *(Michael Evans, SOO WFO ALY)*

Progress continues on the initiative to migrate Albany CSTAR training materials and research findings to NOAA's VLab, in order to facilitate increased research to operations for our projects. Ross Lazear is working with our information technology officer Vasil Koleci on the

CSTAR VLab page. This page now contains reports, Master's theses, and web tools derived from previous and ongoing projects. In addition, cold-season and warm-season quick reference graphics are available on the page. Links to recorded training will also be added to the page later in 2019. Reference material from the research is also available to forecasters via the AWIPS Interactive Reference Tool. This tool allows operational forecasters to access VLab material with a mouse click on a product legend.

In addition, research continued on the CSTAR VI project with Tomer Burg titled "Applying forecast track and intensity diagnostics to major northeast winter storms". NWS focal points for this project are Neil Stuart from NWS Albany, Joe Dellicarpini from NWS Taunton, and Justin Arnott from NWS Grey. The goal of this research is to compare observed low pressure tracks to GEFS forecast tracks for a large number of storms, in an effort to identify patterns that may help forecasters to better utilize the ensemble data to determine the most likely storm tracks within ensemble track envelopes. Tomer has developed a diagnostic tool that will aid forecasters with this effort. The tool will be available to forecasters on the VLab page.

Tomer's project examined model forecast position and intensity errors for eastern CONUS surface cyclones, and built composites of scenarios with high and low predictability. Recent storms were added to the database of storms used by former CSTAR student, Rebecca Steeves, using the GEFS for the initial analysis. Work was supplemented with the TIGGE database for recent storms, applying Tom Hamill's ellipticity techniques, and developing conceptual models for forecasters on model trends as events unfold.

Tomer completed his master's degree and his defense on 1 May 2019. His thesis will be the basis for creating forecast techniques for operational forecasters. Neil Stuart, Joe Dellicarpini, and Justin Arnott will be coordinating the operationally relevant themes and producing operational guidance for predicting track and intensity of major northeast winter storms. The guidance will be made available on VLab for access by all operational forecasters.

Mike Evans (NWS Albany SOO) notes that findings from this work will be highly relevant to operational forecasters, as there is a belief among forecasters that the operational forecast models have a "right-of-track" bias for eastern CONUS cyclones. The results from Tomer's work indicate that that no such bias exists when a comprehensive collection of eastern CONUS surface cyclones were examined; however, there may be synoptic patterns that are favorable for a right of track bias. In particular, Tomer demonstrated that amplified midlevel flow patterns with strong western CONUS ridges may be favorable for a right of track bias. The NWS focal points for this project will be examining the results from Tomer's project and working to organize it in a format that will be easy for forecasters to interpret. Once this is done, his findings should result in improved forecasts for east coast winter storms.

The second major project of CSTAR VI is "Predictability and variability of lake effect snow events", conducted by Massey Bartolini. This study is under the guidance of Co-PIs Dr. Justin Minder, Dr. Daniel Keyser, and Dr. Ryan Torn. NWS focal points are David Zaff (BUF) and Joe Villani (ALY). Massey is looking at how well high-resolution models simulate severe lake-effect storms. In particular, he is investigating model physics sensitivity, multi-scale predictability, and ultimately model performance. He is using extensive observational datasets gathered during OWLeS.

As part of the project, Joe Villani is planning on conducting a local study with regards to high-resolution model output (from the NAM and HRRR) and the inland extent of lake effect snow bands. This would be an extension of his prior lake effect snow research mentioned in his NWA JOM paper, https://member.nwas.org/sites/default/files/nwa_pubs/2017-JOM5.pdf. This project

will utilize GAZPACHO (<https://vlab.ncep.noaa.gov/redmine/projects/nwsscp/wiki/Gazpacho>; Version 4.0 released February 2019) that computes gridded verification of snowfall from the HRRR and NAM. Over the duration of an event, the program compares the observed snowfall to the positive snow depth change in the NAM and HRRR.

Massey's project has included findings that will be useful to NWS operations. These include: 1) The choice of microphysics in high-resolution modelling appears to affect the intensity of forecast lake effect snow bands more than positioning; and, 2) the high resolution models run by Massey did not appear to exhibit a consistent southward bias, which has been noted by forecasters in operational models for many years.

Mike Evans (NWS Albany SOO) notes that findings from Massey's work will be useful for operational meteorologists forecasting lake effect snow over the eastern Great Lakes. Massey's work shows that large differences in intensity and timing of lake effect snow can occur in high-resolution forecast models when changes are made to microphysics schemes. Importantly, there has been a long-held belief by forecasters that operational models have a southward bias in their forecasts of lake effect snow. It appears that, in the case that Massey studied, this bias was not evident. This result is an indication that high-resolution modeling may finally be overcoming this southward bias. This improvement would be a major advancement for operational forecasters, as forecasting the southward extent of lake effect snow has been a consistently difficult challenge for decades.

The final major project of CSTAR VI, "The effects of mesoscale inhomogeneities on severe convection in complex terrain", is being conducted by William Flamholtz. The PI on the project is Dr. Brian Tang, with NWS focal points Tom Wasula and Michael Evans. Kat Hawley from NESDIS is also working with William and supplied satellite imagery for the project. William's research is examining the effects of flow channeling by terrain on severe weather evolution by simulating events with a high-resolution model. There are indications that severe wind may be more likely in terrain-channeled locations when environmental shear is increased.

Tom Wasula put together a case study web write-up, "A multi-scale analysis of the 18 May 2017 severe weather event across eastern New York and western New England". This case study addresses some of the themes in this Major Research Project and the NWS Collaborative Project, "The development of improved WSR-88D warning criteria using dual pol datasets". The case study was posted to the WFO Albany web page in early January: https://www.weather.gov/media/aly/LocalResearch/Online%20LocalResearch/Case_Studies/Wasula_NROW_XVIII_2017_final_notesV2.pdf.

Tom and Mike attended Will Flamholtz's 44th Northeastern Storms Conference presentation in March. The title of his talk was, "Simulating the effects of terrain-induced perturbations on severe convection using an idealized valley". Will focused on one convective inhomogeneity that arises where low-level flow occurs in valleys, with localized backed flow, and subsequent increases of low-level wind shear that may develop ahead of convection. With the 13–14 August 2016 case, a number of WRF simulations were done to test how convective organization changes with different low-level wind profiles (in the 0–1.5-km layer). In-valley (channeled) vs. out-valley (non-channeled) location parameters were compared with 0–1-km storm-relative helicity perturbations of $40 \text{ m}^2\text{s}^{-2}$. In-valley perturbations were critical for convective organization to be determined. Analysis of maximum vertical vorticity, vorticity tendency and pressure perturbations fields were shown similar to his 22–26 October 2018 AMS Severe Local Storms Conference talk.

Mike Evans (NWS Albany SOO) notes that Will's project is ongoing. He believes that the most useful results from this study would be for William to develop a conceptual model for forecasters that would identify areas in the Albany county warning area that are favorable for enhancement of severe threats associated with convection based on characteristics of the environment. For example, in environments with high shear, perhaps certain areas of the Hudson Valley are favored for enhancement of the severe weather threat due to flow channeling, while other areas are less favored. By way of contrast, in environments with low shear but large CAPE, maybe these favored areas shift or disappear. A conceptual model including maps highlighting favored areas would be very helpful for forecasters.

5. STATUS OF “SNYDER PLAN V” PROJECTS *(Michael Evans and focal points)*

Work continues on the Collaborative and Associate Projects of CSTAR VI, details of which are presented below. Six NWS offices are participating in this work.

CSTAR VI Collaborating and Associate Projects

1. Assessment of polygon-based lake effect warnings

Team lead: Jon Hitchcock (BUF)

Dave Zaff at WFO Buffalo is leading the effort to expand polygon-based warnings for lake effect snow to other sites within the National Weather Service. Dave worked with Jeff Waldstreicher at Eastern Region Headquarters, Jared Klein at WFO Binghamton, and Michael Evans at WFO Albany to develop an experiment where BGM and ALY began issuing polygons this winter in collaboration with BUF. Forecast staff was trained, and forecasters at BGM and ALY began issuing the polygons in December 2018. At ALY, only two significant lake effect snow events occurred; however, in those cases the issuance of polygons effectively reduced false alarm areas for areas near the lake effect snow bands. This effort will ultimately become part of a nation-wide National Weather Service effort to increase collaboration of issuance of high-impact weather information across multiple forecast offices. In addition, verification of polygons will continue this winter, with verification efforts beginning at ALY, as well as continuing at BUF.

2. Expansion of Buffalo high wind study and decision aide to other offices

Team lead: Shawn Smith (BUF)

The project completed last year and an NWS technical attachment was published.

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

Team lead: Matt Kramer (PIT)

Work has not yet begun on this project.

4. Integrating advanced boundary layer physics and theory into operations

Team lead: Ian Lee (DTX)

Nothing new to report.

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

Team leads: Neil Stuart and Kevin Lipton (ALY)

- a. A research article titled, “Estimating policy-relevant health effects of ambient heat exposures using spatially contiguous remote sensing reanalysis data”, was published in the journal *Environmental Health* in April 2019. The corresponding authors were from the NY State Dept. of Health (NYSDOH), while Neil Stuart and Steve DiRienzo are co-authors.
- b. Dr. Shao Lin and her colleagues at the UAlbany Dept. of Environmental Health Sciences have written a paper titled, “Winter storms and power outages on multiple health outcomes in New York State: A window of opportunity for preparedness and education”. Neil Stuart and Steve DiRienzo are co-authors, along with authors from the UAlbany Dept. of Health Policy, Management, and Behavior; UAlbany College of Emergency Preparedness, Homeland Security, and Cybersecurity; Kent State University; the NYSDOH; Peking University; and, Sun-yat Sen University in China. The paper is under internal review with the intention of submission to the journal *Environmental Health Perspectives*.
- c. The NYSDOH is in the early stages of a study on the health effects of extreme precipitation. This is an extension of the satellite temperature study. They are consulting with us on how best to use the satellite data to evaluate extreme precipitation. They are determining whether there is a correlation between satellite and airport data. They may look into adding radar data or multi-sensor data for their analyses. Winter is a challenge, especially with snow measurement and conversions of snow to liquid equivalent.
- d. The NYSDOH will be analyzing the 90th percentile of the maximum rainfall for each day and each month. They will eventually try to relate extreme precipitation with health issues similar to the temperature studies. They will also consult the Northeast Regional Climate Center for their methodology in past studies of the 90th percentile for precipitation in some of their past studies.
- e. Dr. Shao Lin has sent a draft proposal for a new National Institute of Health research grant to assess how multi-weather factors or large temperature variation and air pollution jointly affect human health. Neil, Steve, and Kevin would act as consultants providing weather data and analysis if this proposed research grant becomes funded. The Atmospheric Science Research Center and the NYDOH are also included in this proposed research grant.
- f. Kevin Lipton has proposed a workshop or seminar on extreme heat in 2019. This workshop would be a collaboration with the UAlbany Departments of Atmospheric Science and School of Public Health and Public Policy. Local media and other NWS offices in the region would also participate. This possible workshop or seminar is in the very early planning stages.

6. Develop methods/best practices for development of conceptualized models for (parameter) use by operational forecasters using previous event analysis/reanalysis

Team lead: Alan Cope (PHL)

Nothing new to report. Alan has retired.

7. Development of IFR climatologies for inland TAF sites

Team lead: Joseph Dellicarpini (BOX)

Discontinued due to short-staffing and other commitments.

8. Development of improved WSR-88D warning criteria using dual polarization datasets

Team leads: Tom Wasula and Brian Frugis (ALY)

- a. Tom attended and presented at the 19th Northeast Regional Operational Workshop on 7–8 November 2018. The title of his talk was, “Albany forecast area significant hail climatology and case studies”. Brian Frugis was a co-author. Tom’s talk included updated results from previous work shown and included the 15 May 2018 case study, where six additional significant hail events occurred.
- b. An extensive KALY observational sounding analysis on all the hail event days (32 days), excluding 15 May 2018, was done. 16–18 UTC and 00 UTC KALY soundings were analyzed and key parameters were used to make box and whisker diagrams.
- c. The significant severe weather events of 1 June 2011 and 15 May 2018 were also briefly reviewed where 12 significant hail reports occurred (six in each case).
- d. Justin Templer, UAlbany student intern, worked on expanding the significant hail database for the rest of New York (County Warning Areas outside of WFO Albany) and New England for this past winter into the spring. He was gathering the reports from NCEI. He completed New York and was working on the rest of New England.
- e. Brian Frugis continues research on the relationship between elevated cores of KDP and significant convective wind events. Brian has finished writing a draft paper on the KDP research for publication. The paper has already undergone a local review and has been sent to Eastern Region Scientific Services Division for further review. Brian hopes to have it published as an Eastern Region Technical Attachment.

9. Assessing the relationship between flash flooding verification and values of instantaneous precipitation rate (DPR)

Team lead: Ian Lee (DTX)

Due to time constraints, this project has been discontinued.

10. Explore and assess use of MRMS in warning operations

Team lead: Ian Lee (DTX)

Nothing new to report at this time.

11. Verification of gridded ceiling and visibility forecasts at Taunton, MA

Team lead: Joseph Dellicarpini (BOX)

The group at BOX has started to use BOIVerify and the NBM Viewer to capture data for selected events in order to get a sense of the validity of the RTMA and URMA for analysis of both fields. We are currently in the very early stages of gathering data and hope to have some initial verification statistics in the fall.

12. Expanding Decision Support Services

Team lead: Brian Montgomery (ALY)

The main accomplishment in this area was the rollout of national IDSS training in September 2018. The plan moving forward is to continue to evolve our decision support services independently from the CSTAR program.

13. *A climatology of damaging QLCS storms that produce mesovortices*

Team lead: Matt Kramer (PIT)

Nothing to report at this time.

14. *Expressing uncertainty with lake-effect snow in the ER probabilistic snow project*

Team lead: Matt Kramer (PIT)

Work has not yet begun on this project.

15. *An expanded analysis of BUFKIT methodologies to forecast wind and wind gust speed for the upper Ohio River Valley*

Team lead: Matt Kramer (PIT)

Nothing new to report at this time.

16. *R2O and CSTAR project support by UAlbany undergraduate interns*

Team lead: Vasil Koleci and Michael Evans (ALY)

Ross Lazear and Vasil Koleci continue to work on the VLab page, which will act to transition findings related to the CSTAR research to operations. All past CSTAR theses and some conceptual models have been added to the page. Recorded training based on CSTAR research will be added in 2019. The AWIPS Interactive Tool has been setup with CSTAR projects that have been uploaded to VLab.

6. 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 Linux workstations and PCs are available for use by CSTAR participants. Approximately 9 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 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 830 members, more than 1/4 are from NOAA), allowing discussion of CSTAR related research among many more people.

The DAES web (<http://www.albany.edu/atmos>) and ftp (<ftp://ftp.atmos.albany.edu>) servers are being used to facilitate exchange of large datasets between CSTAR collaborators. The DAES computing resources are available for CSTAR related research including a Linux server (with 32 CPUs and 256 GB RAM) and two large network attached disk storage arrays. 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 much faster servers for computation and storage space for commonly used datasets. A Linux server (Peebles) with 48 compute cores and 128 GB RAM dedicated to CSTAR computations was recently purchased. This computer will facilitate increasingly complicated computations.

In addition to DAES and NWS computing facilities, the formal CSTAR collaborative grant effort has allowed access to University Academic and Research Computing Center (ARCC) Services. In particular, NWS Albany is using the ARCC 144 CPU Linux cluster for Weather Research and Forecasting (WRF) model simulations. This computing facility allows them 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. So far, this facility has been made available at no cost to the CSTAR project. The ARCC group has also made an additional 10 TB of disk space available for CSTAR data storage.

7. CSTAR PROJECT RESEARCH IN NWS AFDs

Tuesday 6 November 2018

CSTAR research on the inland extent of lake effect snowbands was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 062001
AFDALY

Area Forecast Discussion
National Weather Service Albany NY
301 PM EST Tue Nov 6 2018

.SHORT TERM /WEDNESDAY THROUGH THURSDAY NIGHT/...

Wednesday night, lake effect response should be at its greatest through the evening hours with continued cold advection and enhanced delta t/s over 15c. **Inversion heights near 1.5km and steep lapse rates should also aid in lake effect with CSTAR Research Lake Effect Inland Extent of about 90 miles.** So we will place likely PoPs for rain/snow to snow with minor accumulations expected. Then those inversion heights lower quickly overnight into Thursday morning as surface high and ridge axis noses further northeast. Otherwise, remainder of the region dry and chilly as overnight lows dip back into the 30s.

SHORT TERM...Thompson

Monday 12 November 2018

CSTAR research on the inland extent of lake effect snowbands was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 120919
AFDALY

Area Forecast Discussion
National Weather Service Albany NY
419 AM EST Mon Nov 12 2018

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

Tuesday night, cold advection quickly takes hold as the upper trough axis pivots overhead. 850 mb temps will fall to around -14C on average by 12Z Wed. **Per CSTAR research, parameters look favorable for large inland extent of a lake effect band or bands from Lake Ontario with the flow direction targeting the Mohawk Valley, Schoharie County, and portions of the eastern Catskills.** There is a multi-lake connection upstream from Georgian Bay/Lake Superior, inversion heights rise to 3 km, surface to 850 mb delta-Ts reach 20-25C, and there is little speed shear but strong directional shear in the lowest 3 km. Local inland extent program suggests inland extent of around 170 mi late Tuesday night, which means lake effect could reach all the way to the Hudson Valley and perhaps even into the Berkshires. Additional headlines are possible, especially for the Mohawk Valley. Wind chills will fall into the teens for much of the area, with single digits over the southern Adirondacks.

SHORT TERM...Thompson

Tuesday 13 November 2018

CSTAR research on the inland extent of lake effect snowbands was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 131143
AFDALY

Area Forecast Discussion
National Weather Service Albany NY
643 AM EST Tue Nov 13 2018

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

Much colder air will pour into the region beginning tonight as an upper trough axis pivots overhead. 850 mb temps are forecast to fall to -12 to -16C by 12Z Wednesday. As the leading edge of this colder air arrives this evening, it could be accompanied by a few rain and snow showers as low level lapse rates steepen. As cold advection continues, lake effect processes will start up. Forecast soundings at SYR/UCA suggest inversion heights rise to 2.5-3km from 06-18Z Wed when the lake effect is expected to be most robust. Surface to 850 mb delta-Ts increase to 20-25C,

and there is strong speed shear but little directional shear in the lowest 3 km. **Per CSTAR research, these parameters are favorable for large inland extent of lake effect bands. Local program suggests up to 170 miles from Lake Ontario is possible, which would extend to near the Hudson River in Greene County given the flow trajectory.** One negative aspect in any area receiving advisory-level snow is that the low-level winds appear to oscillate somewhat, which would tend to not focus a dominant band over one particular area. Flow trajectories favor greatest accumulations of 1-3 inches over Schoharie County into the far western Mohawk Valley, with around an inch possible over portions of the eastern Catskills and Helderbergs. Outside of the lake effect band, it will be chilly and blustery with partly cloudy skies. Wind chills late tonight into Wednesday morning are expected to bottom out in the single digits in the Adirondacks to the teens over much of the Hudson and Mohawk Valleys. High temps Wednesday will be not far above average lows for this time of year.

SHORT TERM...Thompson

Tuesday 13 November 2018

CSTAR research on the inland extent of lake effect snowbands was cited in the near-term section of the NWS ALY AFD.

FXUS61 KALY 132114
AFDALY

Area Forecast Discussion
National Weather Service Albany NY
414 PM EST Tue Nov 13 2018

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

Meanwhile, the cold air aloft passing over the warm water of Lake Ontario (GLERL lake surface temps are around 49 F) will allow bands of lake-effect snow to develop. With a northwest flow in place, the best accumulation with this setup is generally across central New York. However, (as shown in CAM guidance), some pieces towards the end of the lake-bands look to reach into the Mohawk and Schoharie Valleys, Helderbergs and northeastern Catskills tonight, especially for after midnight. **Based on CSTAR inland extent research, this setup would be favorable for pieces of the bands to reach as far as 170 miles from the lakeshore, so the Capital Region, mid Hudson Valley and Taconics could all see a brief snow shower or two overnight.** CAMs suggests to occur by late tonight, so will include at least slight to CHC POPs across these areas, with a light dusting possible. Areas further northwest across the western Mohawk Valley could see a few inches of snow, depending on quickly the bands move.

NEAR TERM...Frugis

Wednesday 14 November 2018

CSTAR research on the inland extent of lake effect snowbands was cited in the near-term section of the NWS ALY AFD.

FXUS61 KALY 140557
AFDALY

Area Forecast Discussion
National Weather Service Albany NY
1257 AM EST Wed Nov 14 2018

.NEAR TERM /THROUGH TODAY/...

As of 1245 am, lake effect activity is becoming more organized into the Mohawk and Schoharie Valleys per KENX/KTYX 88D and upstream webcams. SPS was issued highlighting locally slippery conditions possible. Low-level winds are still expected to oscillate enough for the band to move around and not result in advisory-level accumulations in any one area, but locally a couple of inches are possible especially over the western Mohawk Valley. **A couple of snow showers may make it all the way to the Capital District/Berkshires per CAMs and CSTAR research/local inland extent program.** CAMs suggest this band may become oriented more south of our area as we head toward 12Z, but it some activity may increase again 15-18Z before quickly ending by 21Z as upper level height rises occur and high pressure builds in. Outside of the lake effect, partly to mostly sunny skies are expected today, but it will be frigid with high temperatures not far off from average lows for this time of year. 850 mb temps will be a very frigid -12 to -16C, or 3 SD below normal per the NAEFS. It will be blustery as well as 925 mb winds of 25-30 kt should be in the middle of the mixing layer and represent frequent gusts. This will produce wind chills as low as the single digits for the southern Adirondacks/Greens and teens and low 20s elsewhere.

NEAR TERM...Thompson

Wednesday 14 November 2018

CSTAR research on mesoscale snow bands was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 142258
AFDALY

Area Forecast Discussion
National Weather Service Albany NY
558 PM EST Wed Nov 14 2018

.SHORT TERM /THURSDAY NIGHT THROUGH FRIDAY/...

By Thursday afternoon, the parent shortwave starts to weaken/open up allowing the coastal \ low to become more organized and the dominant feature as it reaches the mid- Atlantic. Very strong isentropic lift on the front end of the approaching coastal storm along with an impressive 50 knot mid-level jet means the approaching precipitation shield should have no issues quickly overspreading the region from north to south. Temperatures profiles support all snow at the onset with surface temperatures likely dropping a few degrees to sub- freezing readings as snow arrives due to wet bulb processes. **Model guidance continues to show this band being a transient type band as discussed in previous CSTAR projects.** With the strong 700-500mb FGEN, this band could produce moderate to even heavy snow including potential 1 inch + per hour rates as it quickly travels from the mid- Hudson Valley up into the Capital District and areas northward Thursday afternoon into the evening. This means potential impacts for the evening commute, mainly for the mid- Hudson Valley and possibly for parts of the Capital District, depending on the exact speed of this initial band.

SHORT TERM...Speciale

Thursday 15 November 2018

CSTAR research on mesoscale snow bands was cited in the near-term section of the NWS ALY AFD.

FXUS61 KALY 150953
AFDALY

Area Forecast Discussion
National Weather Service Albany NY
453 AM EST Thu Nov 15 2018

.NEAR TERM /THROUGH FRIDAY/...

Mid and high clouds will continue to thicken today as the upper low moves eastward up the Ohio Valley. With the Arctic surface high overhead today and the increasing cloud fraction another very chilly day is expected. The upper low will accelerate and become an open wave as it reaches near NYC by 12Z Friday. At the surface, a coastal low will become dominant and deepen around 12

mb in 12 hours from 00-12Z Friday as it moves from the Delmarva to near Long Island. Isentropic lift will increase rather quickly ahead of this system, especially 00-06Z, as SE winds on the 295K surface increase to near 60-70 kt. This will allow saturation to occur rather quickly despite the dry airmass. Trend in the guidance has been for a slower precip onset compared with yesterday at this time, such that the evening commute will be spared from the Mohawk Valley/Capital District/northern Berkshires and points north. **South of there, snow should spread in and possibly impact the commute as it becomes moderate to briefly heavy. The onset of the system is reminiscent to the laterally translating band composite in CSTAR research, meaning that heavy bands will be transient for a particular area during this onset period, but could still approach an inch per hour at times 00-06Z.** Lift will be enhanced by a coupled jet structure.

From 03-09Z, most models suggest that a combination of a warm nose and dry slot aloft will allow precip to transition to sleet, freezing rain, and perhaps freezing drizzle from south to north. There is still uncertainty with how far north the mixture gets, with the ECMWF and some of its ensembles being on the colder/snowier side of the guidance compared with the GFS/NAM/HREF mean. Current forecast thinking is that a mixture could be seen as far north as the central Mohawk Valley to Glens Falls area (basically areas outside of the Winter Storm Warning). **In the warning area, this is where we see the best 850 to 700 mb frontogenesis, as the pattern becomes more reminiscent of the CSTAR pivoting band composite, although not totally as the wave opens up so the heavier bands may be more progressive.** Still, snowfall rates of one to two inches per hour are possible in the warning area just to the north and west of the dry slot. Snowfall accumulations here were adjusted upward accordingly. Further south, the eastern Catskills, Mid Hudson Valley, and Litchfield Hills and southern Berkshires could see around a tenth of an inch of ice, with locally higher amounts possible in the higher terrain. Combined with gusty winds, this could result in some isolated power outages.

NEAR TERM...Thompson

Thursday 15 November 2018

CSTAR research on mesoscale snow bands was cited in the near-term section of the NWS ALY AFD.

FXUS61 KALY 152207
AFDALY

Area Forecast Discussion
National Weather Service Albany NY
507 PM EST Thu Nov 15 2018

.NEAR TERM /THROUGH FRIDAY/...

Our winter storm is on track to bring the first widespread snowfall to all of eastern New York and western New England starting this evening and continuing into Friday morning. The coastal low as of 4PM EST is near Cape Hatteras, NC with a MSLP of around 1005mb based on the latest RAP analysis. Latest GOES16 water vapor channels show the parent potent cut off shortwave still holding strong over the TN Valley providing very strong upper level divergence which will enable our coastal low to intensify further over the coming hours. **We also can see a pronounced baroclinic leaf on water vapor channels over spreading into the Northeast associated with the approaching laterally transient snow band as has been researched in previous CSTAR projects.**

NEAR TERM...Speciale

Friday 16 November 2018

CSTAR research on mesoscale snow bands was cited in the near-term section of the NWS ALY AFD.

FXUS61 KALY 160624
AFDALY

Area Forecast Discussion
National Weather Service Albany NY
124 AM EST Fri Nov 16 2018

.NEAR TERM /UNTIL 1 PM THIS AFTERNOON/...

As of 100 am, well-defined midlevel dry slot punching northward into the area. **Cooling cloud tops are noted along the northward edge of the dry slot, which is where we expect a heavy band of frontogenetically-forced snow to set up for the remainder of the night across the western Mohawk Valley and southern Adirondacks per CSTAR research and model guidance output.** Snowfall rates of one to two inches per hour are likely in this band. A somewhat tight snowfall gradient can be expected depending on the exact positioning of this band, but latest guidance suggests the heaviest snow will remain north/west of the Glens Falls/Saratoga Springs corridor. It will be close though.

NEAR TERM...Thompson

Wednesday 16 January 2019

CSTAR research on mesoscale snow bands was cited in the long-term section of the NWS ALY AFD.

FXUS61 KALY 162217
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
517 PM EST Wed Jan 16 2019

.LONG TERM /SATURDAY THROUGH WEDNESDAY/...

The second half of Saturday night looks to experience the strongest warm air advection as our 850hPa jet intensifies to 50-60kts which would warm the column and increase the fetch of Gulf/Atlantic moisture reaching the Northeast. This would then shrink our dendritic snow growth zone and even shift the "sweet spot" experiencing the best lift through the -12C to -18C zone to the Upper Hudson Valley and Adirondacks. While this would decrease snow ratios for areas from the Greater Capital District south and eastward, there is strong agreement amongst the global guidance that a copious amount of moisture advects into our area with potentially 0.50 - 0.75 inches of liquid from 06z - 12z Sunday. **In fact, the snowfall band overnight Saturday resembles that of a quasi- stationary snowfall band as described in previous CSTAR research. Thus, even lower snowfall ratio closer to climatology (10 to 12:1) would not limit significant snowfall accumulations and high snowfall rates.** Thus, our confidence for areas reaching warning criteria snowfall continues to increase from the Capital District north and west. For areas in the mid-Hudson Valley, NW CT, the Catskills and perhaps the Berkshires, the warm nose could inch close enough the mid levels warm close enough to or even higher than 0C that these areas mix with sleet and even freezing rain. This could lead to ice accumulations as the sfc-925 layer remains cold. Exact icing potential is still uncertain but should be ironed out this event draws closer. The ECMWF is the coldest solution limiting the wintry mix to the far southern mid-Hudson Valley and NW CT with the CMC-NH a bit farther north with the mixing potential while the GFS is the warm outlier. For this update, again went with a ECMWF and CMC-NH blend for precipitation type.

LONG TERM...Speciale

Friday 18 January 2019

CSTAR research on mesoscale snow bands was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 180959
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
459 AM EST Fri Jan 18 2019

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

Saturday night into Sunday...A strong southeasterly low-level jet of 35-50 kts will advect into the region Gulf and Atlantic moisture Sat night. The low-level jet has a strong -u wind component /easterlies/ anomaly of 2-4 STD DEVS above normal with the latest 00Z GEFS, and a +v anomaly of +1 to +2 STD DEVS above normal from 00Z/SUN to 12Z/SUN with PWATS increasing 1 to 2 STD DEVS above normal south and east of the Capital Region. The strong QG lift generate by the strong differential thickness advection may allow for snow rates to increase to 1 to 2 inches and hour. **Based on the past CSTAR research some Laterally Translating bands are possible ahead of the warm front, and near the right entrance region of a 150-160 kt 250 hPa jet streak over NY and northern New England.** The H850-700 FGEM increases in and near the forecast area.

SHORT TERM...Wasula

Friday 18 January 2019

CSTAR research on mesoscale snow bands was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 182118
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
418 PM EST Fri Jan 18 2019

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

12z NAM suggest some impressive frontogenesis will be taking place across our area. **CSTAR research suggest this type of set up would lead to the formation of laterally translating bands of heavy snow within the isentropic lift on Saturday night, and snowfall rates of 1 to 3 inches per hour are likely within this band as it moves from south to north across the area.**

SHORT TERM...Frugis

Saturday 19 January 2019

CSTAR research on mesoscale snow bands was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 191010
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
510 AM EST Sat Jan 19 2019

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

Tonight...the low-level baroclinic zone is very impressive over the forecast area with strong isentropic lift on the 280-285k surfaces quickly increases from the south/southwest ahead of the warm front to low pressure that will move from the TN Valley towards the OH Valley, and then redevelops east of the central Appalachians over central and eastern VA between 06Z-12Z. Strong mid and upper level dynamics will be in place, as the right entrance region of a H250 150-160 kt jet streak will be near eastern NY and western New England with strong upper level divergence. A low-level southeasterly jet of 40-60 kts will advect in Gulf and Atlantic Moisture. PWATS increase to 1-2+ STD DEVS above normal based on the 00Z GEFS with an H850 low-level +v-anomaly /southerlies/ of 1-2+ STD DEVS above normal, and the -u-component/ easterlies/ anomaly is -2 to -4 STD DEVS above normal. There will likely be orographic enhancement off the eastern Catskills and the eastern Adirondacks with this strong anomaly. The low to mid level FGEN is very impressive with the strong QG lift generated by the differential thickness advection. We expect the snow to increase min intensity between 9 pm and midnight south of the Capital Region, and then quickly expanding northward with snow rates of 1 to 3 inches an hour. **CSTAR work indicates that some lateral translating bands ahead of the warm front are possible. A heavy snowfall is possible across the entire forecast with 4-8 inches possible over the Mid-Hudson Valley, and NW CT before some mixing occurs.** Further north, locations could get 8-12+" of snow overnight. We do think the Capital Region will get into the heavy snow bands.

SHORT TERM...Wasula

Saturday 19 January 2019

CSTAR research on mesoscale snow bands was cited in the near-term section of the NWS ALY

AFD.

FXUS61 KALY 192134
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
434 PM EST Sat Jan 19 2019

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

The boundary layer warming being drawn north may be more of a function of stronger boundary layer frontogenesis drawing warm air northward but stronger anchoring of the cold airmass to the north as well. There is a very impressive surface temperature gradient across NY and New England right now seen in the NY Mesonet and other data sources with below zero to the north and solidly in the 30s in the south. **Based on CSTAR research, strong frontogenesis should set up from the western/central Mohawk Valley through southern Adirondacks, Lake George Saratoga Region to parts of southern VT supporting a lateral quasi stationary mesoscale band with enhanced snowfall rates of greater than 2 inches per hour.** That is where yardsticks will likely be needed to measure the storm total snows. Mixed precipitation will reduce snow amounts in the Capital Region and points east and south but still enough snow will fall for a significant impact across the region.

NEAR TERM...NAS

Sunday 20 January 2019

CSTAR research on mesoscale snow bands was cited in the near-term section of the NWS ALY AFD.

FXUS61 KALY 200534
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
1234 AM EST Sun Jan 20 2019

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

As of 1234 AM EST...Latest KENX radar and ground truth indicate moderate to heavy snow is occurring across a large portion of the Albany forecast area, as the strong baroclinic zone ahead of the warm front is impacting the region. **Some embedded laterally transitioning mesoscale bands**

may be setting up documented in the CSTAR research. We have an SPS out for some 1 2"/hr rates. KALB has had 1"/hr hour snow increase group the past few hours. Interesting, that the 00Z GFS has trended colder with perhaps the ptype holding as mostly snow from KALB north and west. The 00Z NAM trended colder too, but still indicates a mixed pcpn potential up to the Capital Region/Berkshires/northern Taconics and possibly the southeast reaches of VT. The 00Z HREFs indicate this mixed potential too. It must be stressed that the northerly shallow cold air is going to be difficult to dislodge in the lower elevations down the Hudson River Valley. It is 4F at KGFL, 8F at KALB, 11F at Red Hook in the NYS Mesonet, 16F at Beacon in the NYS Mesonet, and it has dropped to 20F now at KPOU. It is still possible that KPOU turns to sleet/freezing rain between 08Z-12Z with ice accumulations close to a quarter inch, and possibly a third of an inch in Litchfield Co. Snow totals will continue rack up north and west of KALB with 12-20" possible. See our PNS with the latest snow reports.

NEAR TERM...MSE/NAS/Wasula

Sunday 20 January 2019

CSTAR research on mesoscale snow bands was cited in the near-term section of the NWS ALY AFD.

FXUS61 KALY 201004
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
504 AM EST Sun Jan 20 2019

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

The strong baroclinic zone to the system has focused moderate to heavy snowfall with some lateral transitioning bands (documented in the CSTAR research) that formed with snow rates of 1-3"/hr. The main issue that lowered some snow amounts across the region was the movement of the sfc low later today towards the NYC/Long Island corridor (more inland) and then shifting east towards Cape Cod. Warmer air aloft with a warm nose of +3 to +5c at H850 lowering a bit will allow for more freezing rain and sleet for locations from the Capital Region, northern and central Taconics, and the Berkshires south and east. The 00Z GFS profiles are colder than the NAM, as we have additional snowfall amounts of 6-10" expected from the Capital Region north and west. The snow accums are lower to the south and east due to more mixed pcpn. The sleet and freezing is cutting down on the totals The shallow cold air drainage down the Hudson River Valley was impressive yesterday into this morning. Temps are in the single digits and teens. Portions of the mid Hudson Valley, and NW CT could get ice accretions of one tenth to one third of an inch. Some localized amounts up to a half inch are possible. The latest 00Z HREFS indicated the mix

potential could reach the Capital Region, and southern VT. We placed some sleet, and a little freezing rain in during the late morning. Before this transition, we believe snow totals in the Capital Region may get into the 10-16" range, and portions of the Mohawk Valley in the southern Adirondacks, and the Lake George Region will get into the 15-20+ inch range.

NEAR TERM...Wasula

Thursday 24 January 2019

CSTAR research on the inland extent of lake effect snowbands was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 242116
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
416 PM EST Thu Jan 24 2019

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

Friday will feature much colder temperatures and blustery conditions. A short wave trough will move through from late morning into the afternoon. A surface boundary will push through northern NY, resulting in a well-aligned westerly wind developing over the western Adirondacks and upstream across Lake Ontario. Cold air aloft and relatively warm lake Ontario temps will result in borderline Moderate/Extreme lake-induced instability. Once the westerly flow aligns, lake effect snow will develop and move into far northern Herkimer/Hamilton counties Friday afternoon. NAMNest indicating a single band gradually moving southward through the Route 28 corridor by late afternoon/early evening. Due to potential for 1/2 inch to 1 inch per hour snowfall rates for at least a few hours, we have issued a Winter Weather Advisory for northern Herkimer/Hamilton counties. **Local application based on CSTAR research indicates potential for good inland extend through Hamilton county and even into parts of Warren county, especially near Gore Mountain.** Potential for 3-6" snow amounts expected to be limited to northern Herkimer/Hamilton counties where the advisory is in effect, although some 2-4" amounts could occur into NW Warren county. Despite limiting factor of higher-end instability, an upstream multi-lake connection is expected, along with good shear in the 0-1 km layer. Outside of lake effect, there will be isolated to scattered snow showers associated with the trough. NW winds will gust between 25-35 mph through much of Friday afternoon.

SHORT TERM...JPV

Friday 25 January 2019

CSTAR research on the inland extent of lake effect snowbands was cited in the near-term section of the NWS ALY AFD.

FXUS61 KALY 250918
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
418 AM EST Fri Jan 25 2019

.NEAR TERM /THROUGH TONIGHT/...

Elsewhere, lake effect snow showers will increase in magnitude downstream of Lake Ontario as moderate to extreme instability develops with surface to 850 mb delta Ts of 15 to 20C. Inversion heights will be rather good, around 2.5 km AGL, and there looks to be a multi-lake connection from Superior and Huron/Georgian Bay. **Local inland extent CSTAR research indicates potential for 150-180 miles of inland extent during the morning and early afternoon.** The problem is, flow trajectories will favor only far northern Herkimer County during this timeframe. The winds will veer somewhat in the midafternoon to the evening, allowing the strongest bands to shift south back toward the Route 28 corridor. During the evening and overnight, winds in the 0-3km layer weaken, so the band should retract. Outside of the lake effect band, other areas will see any lingering snow showers quickly diminish in the evening. With partly cloudy to mostly clear skies, low temperatures will be a bit chilly in the single digits and teens.

NEAR TERM...Thompson

Wednesday 31 January 2019

CSTAR research on the inland extent of lake effect snowbands was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 302122
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
422 PM EST Wed Jan 30 2019

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

Lake effect snow, heavy at times, will persist across northern Herkimer county (Warning in effect) and also extending east into western Hamilton county (Advisory in effect). **Local forecast tool from CSTAR research indicates the inland extent will increase slightly which will allow for some accumulating snow into parts of western Hamilton county.** Snow bands will also be prevalent along the Route 28 corridor in northern Herkimer near Old Forge with an expected 270 degree trajectory. Snow bands are then expected to slowly drift back to the north towards Thursday evening as the flow back slightly again. Outside of lake effect activity it will be dry with just a few flurries near the lake bands. Lake effect snow will continue from around Route 28 and points northward through Thursday evening, but should then finally start to weaken as inversion heights are forecast to lower considerably. Bands will likely contract to the near lake shore areas overnight.

SHORT TERM...JPV

Thursday 1 February 2019

CSTAR research on the inland extent of lake effect snowbands was cited in the near-term section of the NWS ALY AFD.

FXUS61 KALY 010239
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
939 PM EST Thu Jan 31 2019

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

As of 930 PM EST...Lake effect plume continues to impact the Tug Hill and into northern portions of Herkimer County. **CSTAR research of inland extent program is doing extremely well with inland penetration of 75 miles.** This program suggests the inland extent will shrink back below 60 miles after midnight then toward 50 miles by daybreak. This too is supported by the hires NAM3km/HRRR reflectivities as the short wave trough axis slides east and results with lowering inversion heights. Elsewhere, dry and clear as winds are not as high as this time yesterday. No changes to the current headlines as just a refresh to hourly grids per observations.

NEAR TERM...BGM/JPV

Wednesday 6 February 2019

CSTAR research on the inland extent of lake effect snowbands was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 062127
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
427 PM EST Wed Feb 6 2019

.SHORT TERM /6 AM THURSDAY MORNING THROUGH SATURDAY/...

The front Friday morning will drop H850 temps by around 15-20C in 12 hours. While temperatures may spike early in the morning immediately behind the front due to mixing, strong cold advection should drop temperatures in most areas by the afternoon. A strong postfrontal pressure gradient will set up with deep mixing encouraged by robust cold air advection. Forecast soundings suggest average wind speeds in the mixed layer are 30-40 kt, so we could be looking at wind advisory criteria. Most of the precipitation should have moved east by the time the colder air moves in. However, lake effect parameters will become increasingly impressive Friday afternoon into Friday evening, with surface to 850 mb delta-Ts increasing to 20C and inversion heights up to 2.5 km. Winds in the 0-3 km layer will be veering with time, so do not expect a band to remain stationary over a period of time, which should limit accumulations. **Late Friday night into Saturday morning, local inland extent program supported by CSTAR research is indicating values near 200 miles, so we could even see a band reach the Capital District to western New England briefly.** Wind chills Friday night likely will fall into the single digits above and below zero.

SHORT TERM...Thompson

Friday 8 February 2019

CSTAR research on the inland extent of lake effect snowbands was cited in the near-term section of the NWS ALY AFD.

FXUS61 KALY 081133
AFDALY

AREA FORECAST DISCUSSION

National Weather Service Albany NY
633 AM EST Fri Feb 8 2019

.NEAR TERM /THROUGH SATURDAY/...

Additionally, lake effect snow is possible starting this afternoon, mainly across the western Adirondacks, and continuing through Saturday morning. Winds in the 0-3 km layer will be veering with time, so do not expect a band to remain stationary over a period of time, which should limit accumulations. However, it still looks like 3 to 5 inches is possible across Herkimer county so have issued a winter weather advisory for lake effect snow through this period. **Late tonight into Saturday morning, local inland extent program supported by CSTAR research is indicating values near 120-150 miles, so we could even see a band reach the Capital District to western New England briefly.**

NEAR TERM...JLV

Saturday 9 February 2019

CSTAR research on mesoscale snow bands was cited in both the short- and long-term sections of the NWS ALY AFD.

FXUS61 KALY 092232
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
532 PM EST Sat Feb 9 2019

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

A large storm system originating from the Plains is forecast to move into the Great Lakes region Tuesday bringing widespread overrunning precipitation to the region. With the surface high centered to our northeast as the storm approaches cold air should be plenty deep for snow for most the day. There are indications by late in the day warmer air noses in aloft so have snow/sleet mixture across our three southern counties (Ulster, Dutchess and Litchfield). **Based on CSTAR research lateral translating snow bands are possible with this system during the day Tuesday.**

.LONG TERM /TUESDAY NIGHT THROUGH SATURDAY/...

Complex winter storm will be ongoing Tuesday night into Wednesday. **While we have increasing confidence that strong isentropic lift should lead to a laterally translating snow band (as shown in CSTAR research) at the start of this event and give us all snow, a secondary low looks to undergo cyclogenesis Tuesday night along the mid-Atlantic coast which makes for a**

challenging forecast. The main question is when and where this secondary low strengthens as that will determine the northern and western extent of the warmer air aloft and which areas, if any, turn to a wintry mix.

SHORT TERM...IAA
LONG TERM...Speciale

Sunday 10 February 2019

CSTAR research on mesoscale snow bands was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 102209
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
509 PM EST Sun Feb 10 2019

.SHORT TERM /6 AM MONDAY MORNING THROUGH WEDNESDAY/...

Ridging builds in aloft Monday and Monday night with the surface high centered to our north across eastern Canada also strengthening. A large storm system originating from the Plains is forecast to move across the Great Lakes region Tuesday into Tuesday night bringing widespread overrunning precipitation to the region. With the surface high centered to our northeast as the storm approaches cold air should be plenty deep for snow for most the day Tuesday. **Based on CSTAR research lateral translating snow bands are possible with this system during the afternoon hours with snowfall rates excess of an inch per hour possible especially north of I-90.** The evening commute will be impacted with difficult to dangerous travel conditions.

SHORT TERM...IAA

Monday 11 February 2019

CSTAR research on mesoscale snow bands was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 110938
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
438 AM EST Mon Feb 11 2019

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

Complex storm system will then affect the region for Tuesday through Wednesday. A strong surge of isentropic lift will allow for a band of moderate-heavy precipitation to spread northward across the region between late morning and mid/late afternoon. Initially, forecast thermal profiles suggest all snow as main P-type, and it could be heavy for a few hours. **Snowfall rates could easily reach or exceed 1-2 inches/hour as a translating snowband lifts north/northeast (per CSTAR research).** Then, as much warmer air advects northward within the H800-700 layer, P-type should transition to mainly sleet from south to north during the mid to late afternoon hours. Depending on how quickly this above-freezing elevated warm nose extends will ultimately determine front-ended snowfall amounts for areas along and especially south of I-90. Should it progress as quickly as the NAM and several SREF members suggest, snowfall totals could be drastically reduced in these areas. Due to this uncertainty, we have kept the Winter Storm Watch in tact for central portions of the forecast area. Farther north across the Mohawk Valley, southern Adirondacks, Lake George-Saratoga region and southern Vermont, a longer duration of moderate-heavy snowfall is expected to precede any changeover to sleet, in addition to the possibility of additional snowfall late Tuesday night as colder air aloft builds back eastward. So, since confidence is higher in this area regarding heavier snowfall, the previous Winter Storm Watch has been upgraded to a Winter Storm Warning.

SHORT TERM...KL

Tuesday 12 February 2019

CSTAR research on mesoscale snow bands was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 120930
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
430 AM EST Tue Feb 12 2019

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

CSTAR research suggests parameters favor a laterally translating snowband on the leading edge of strongest isentropic lift and mid level frontogenesis today. Snowfall rates should be increasing with northward translation of the band, with 1-2 inches/hour common, with some potential for 2-3+ inches/hour once the band reaches the Mohawk Valley region and points north and east. Can not even rule out a few rogue rumbles of thunder within this band.

NEAR TERM...KL

Tuesday 12 February 2019

CSTAR research on the inland extent of lake effect snowbands was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 120930
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
430 AM EST Tue Feb 12 2019

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

For Wednesday-Wednesday night, snow may linger through mid morning for areas mainly north of I-90 due to additional synoptic forcing ahead of an embedded shortwave. Behind this wave, strong subsidence may allow for a brief period of clearing in valley areas, before clouds redevelop in the afternoon. In addition, scattered to numerous snow showers should develop from NW to SE during the afternoon, with a few embedded heavier squalls possible. Rain may initially be mixed in for some valley areas. It will become windy by late in the day, with some gusts of 35-45+ mph possible. A new wind advisory may be required for portions of the region for Wednesday afternoon and night. **Also, a Lake Effect/Enhanced snowband may organize and extend into the southwest Adirondacks, with some extensions possible into the upper Hudson Valley and southern VT, per local CSTAR inland extent research.** A new Winter Weather Advisory may be needed for portions of Herkimer/Hamilton Counties for late Wednesday into Wednesday night, where several additional inches of snowfall is possible. Elsewhere, spotty accumulations of a coating to 2-3 inches will be possible. Wednesday high temps may spike into the lower 40s for valley areas late in the morning, before dropping back through the 30s in the afternoon. Higher terrain areas should reach the 30s, before falling into the 20s by late afternoon. Lows Wednesday night mainly in the teens and 20s.

SHORT TERM...KL

Wednesday 13 February 2019

CSTAR research on the inland extent of lake effect snowbands was cited in the near-term section of the NWS ALY AFD.

FXUS61 KALY 132135
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
435 PM EST Wed Feb 13 2019

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

A lake effect band is beginning to organize in the low-level southwest flow to the lee of Lake Ontario as surface to 850 mb delta-Ts become marginally favorable for lake-induced instability. Instability parameters are modest with surface to 850 mb delta-Ts increasing to 15 to 20 C and inversion heights around 2 km. **The wind field is somewhat favorable for moderate inland extent (per CSTAR research) with local application showing potential for 100-130 miles downwind of the lake, so some light accumulation could extend to the Glens Falls/Saratoga region to northern portions of the Capital District.** Some light accumulations are possible over the southern Greens as well. The 0-3 km winds will be veering with time, so expect the steadiest bands to shift from northern Herkimer to central/southern Herkimer around and after midnight. We have hoisted a Winter Weather Advisory for lake effect snow for the potential of a couple spots to pick up 4-5 inches of snow. The steadiest activity should remain north of the NYS Thruway, although 1-3 inches is possible across the Thruway corridor in Herkimer County. Lows tonight slightly warmer than normal in the mid-teens to mid-20s with partly to mostly cloudy skies expected for much of the region and westerly winds remaining elevated overnight.

NEAR TERM...Thompson

Monday 18 February 2019

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

FXUS61 KALY 181736
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY

1236 PM EST Mon Feb 18 2019

.NEAR TERM /THROUGH TONIGHT/...

As of 125 pm, light snowfall continues along an inverted trough axis across the advisory area. Snowfall has tapered off over Ulster, Dutchess, and Litchfield Counties, so the advisory was cancelled for those counties. Expect the light snowfall in the advisory area to continue to diminish from west to east as the surface trough axis/midlevel shortwave continues to work east of the area. CAMs are fairly consistent in showing light snow redeveloping across portions of the eastern Mohawk Valley, Capital District, and Helderbergs along the back side of the ongoing precipitation shield from around 20-00Z in a narrow band. **The wind field appears reminiscent of Hudson-Mohawk Convergence conceptual models (per CSTAR research) with northerly flow down the Hudson Valley converging with west- northwesterly flow down the Mohawk Valley.** This could allow for additional light accumulations perhaps around an inch in a fairly narrow band. PoPs were increased to likely in the aforementioned area this evening. Will consider if we need a temporal extension of the advisory with the next forecast update once we see how things are developing. Outside of the potential HMC, accumulations with the departing area of synoptically-driven snow should be less than an inch.

NEAR TERM...Thompson

Sunday 24 February 2019

CSTAR research on inland extent of lake effect snowbands was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 242202
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
502 PM EST Sun Feb 24 2019

.SHORT TERM /6 AM MONDAY MORNING THROUGH TUESDAY NIGHT/...

The other issue we are monitoring is possible lake effect snow. Some of the CAMs are showing the potential of a single lake effect snowband forming in the late morning downstream of lake Ontario, and extending through the Mohawk Valley and possibly into the Capital Region, northern Taconics, southern Greens and Berkshires. We were not confident enough to issue a warning (possibly a Blizzard warning) for portions of Herkimer county, as we increased snow tallies a bit to 4-8" over a 18-24 hour period. The BUFKIT profiles at KUCA/KRME indicate mainly conditional instability with inversion heights gradually lowering to 5 kft AGL by the late

afternoon/early evening. **The local CSTAR inland extent lake band tool supports a downstream extension of close to 200 miles.** We have extended the advisory into northern Fulton County for 3-6" of snow, and we do have 4-8" over an 18-hr or so period for southern/central Herkimer Counties. We may have to extend the advisory into the early evening or upgrade later in time. Blowing and drifting of the snow is possible with the powerful gusty winds. Highs Monday will be in the upper 20s to lower/mid 30s in the valley areas, and upper teens to mid 20s over the mountains. Light snow accums are possible in the Capital Region, northern Berkshires, northern Taconics, and the eastern Catskills with a coating to less than an inch.

SHORT TERM...Wasula

Wednesday 6 March 2019

CSTAR research on inland extent of lake effect snowbands was cited in the near-term section of the NWS ALY AFD.

FXUS61 KALY 060933
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
433 AM EST Wed Mar 6 2019

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

This morning, an upper level disturbance will slide across the region. With such limited moisture in place, there won't be any precip with this passing feature. However, it will allow winds behind it to become more northwesterly and mixing to deepen to nearly 700 hpa. **With the northwest flow, the lake band should have a multi-lake connection back from Lake Huron, and based on local CSTAR research, lake effect snow showers look to reach as far east as 150 miles from the lakeshore.** This matches up well with what is being shown in the latest 3km HRRR, as well as the NAMNest.

NEAR TERM...Frugis

Saturday 9 March 2019

CSTAR research on mesoscale snow bands was cited in the short-term section of the NWS ALY AFD.

FXUS61 KALY 092330
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
630 PM EST Sat Mar 9 2019

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

Sunday, a band (fitting the "laterally translating" paradigm per CSTAR research) of moderate to locally heavy precipitation should continue advancing quickly east/northeast between 6 and 8 AM EDT. Mainly snow is expected for the Mohawk Valley, southern Adirondacks, and southern VT as this initially moves through, with snowfall rates possibly as high as 1-1.5 inch/hour. However, sleet should mix in after 1-2 hours of snow. Thus, a quick 1-3 inches of snowfall is expected between roughly 6 and 8 AM EDT in these areas, with perhaps another 1-2 inches in portions of the SE Adirondacks and higher elevations of southern VT of snow/sleet after 8 AM EST. Elsewhere, mainly sleet and freezing rain is expected through mid morning Sunday before changing to plain rain from south to north. Ice accretion should range from a trace, to up to one tenth of an inch, with greatest amounts across higher terrain areas of the eastern Catskills, Helderbergs, and Litchfield Hills.

SHORT TERM...KL

Friday 22 March 2019

CSTAR research on mesoscale snow bands was cited in the near-term section of the NWS ALY AFD.

FXUS61 KALY 220608
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
208 AM EDT Fri Mar 22 2019

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

As of 1245 AM EDT...Main change for this update was to increase snowfall totals for the areas mentioned above where headlines were expanded/upgraded. We are concerned about a large band of heavy precip developing early this morning resulting in dynamic cooling due to precipitation intensity. This will allow rain to change to snow, even in valley locations from the Mohawk Valley and Capital District northward. 00Z guidance including the HRRR, NAMNest, and HREF all indicating increasing potential for a 2-4 hour period of moderate/heavy wet snow this morning. **Noting the 850-700mb F-Gen max is now forecast to be just south and east of the region, which would place a pivoting mesoscale band (based on CSTAR research) across southern VT through the Capital District, eastern Mohawk Valley and Helderbergs/Catskills.** Thus, the confidence for increasing snowfall totals and expansion/upgrade of winter headlines which includes this morning's commute.

NEAR TERM...SND/Frugis/JPV

Friday 22 March 2019

CSTAR research on mesoscale snow bands was cited in the near-term section of the NWS ALY AFD.

FXUS61 KALY 220810
AFDALY

AREA FORECAST DISCUSSION
National Weather Service Albany NY
410 AM EDT Fri Mar 22 2019

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

Latest guidance including the he-res HRRR, NAMNest and HREF continue to indicate moderate to heavy precipitation rates through much of the morning hours associated with a large pivoting mesoscale band, which fits the conceptual model from CSTAR research (closed 700 mb low and area of F-Gen to the NW of the low). The stronger rates will aid in dynamically cooling the column this morning, even in valley locations from around Albany northward. It will take at least a few more hours for the process to occur, but will likely result in a 3-5 hour window of moderate/heavy wet snow. Will monitor trends, but we are expecting around 1-2 inches for the valleys from Albany north, and several inches across the Adirondacks, Catskills, Helderbergs, southern Greens and northern Berkshires. This snow will likely impact the morning commute in these areas. Depending on how much cooling can occur, even areas south of Albany could see a rain/snow mix of brief period of wet snow.

NEAR TERM...JPV