CSTAR* at UAlbany: How Gene Auciello and Daniel Keyser Conspired to Create the Collaborative UAlbany-NWS Research Program Now Overseen by Professor Kristen Corbosiero

Lance F. Bosart

Department of Atmospheric and Environmental Sciences

University at Albany/SUNY

Wednesday 13 November 2024

*Collaborative Science Technology and Applied Research

National Weather Service Collaborations (Before CSTAR)

- **50-years of collaborations. Interacted with forecasters at WFOs and NOAA centers (SPC, WPC, and NHC). Informed my research and benefitted student education.**

- **Interactions benefitted undergraduate and graduate student education (broadly defined)**

- **Example: Collaborative tornado research: Great Barrington, MA, F4 tornado of 29 May 1995 and the Mechanicville, NY, F3 tornado of 31 May 1998**

- **(Alicia) Wasula et al. (2002): The Influence of Terrain on the Severe Weather Distribution across Interior Eastern New York and Western New England (https://doi.org/10.1175/1520-0434(2002)017<1277:TIOTOT>2.0.CO;2)**

- **LaPenta et al. (2005): A Multiscale Examination of the 31 May 1998 Mechanicville, New York, Tornado (https://doi.org/10.1175/WAF875.1)**

- **Bosart et al. (2006): Supercell Tornadogenesis over Complex Terrain: The Great Barrington, Massachusetts, Tornado on 29 May 1995 (https://doi.org/10.1175/WAF957.1)**

- **Anton Seimon was a key player In our severe weather-related research efforts**

NWS-CSTAR (Collaborative Science Technology and Applied Research)

- "The CSTAR Program represents a NOAA/NWS effort to create a cost-effective transition from basic and applied research to operations and services through collaborative research between operational forecasters and academic institutions" (https://vlab.noaa.gov/web/nws-osti/cstar)

- A synopsis of UAlbany CSTAR-funded M.S. theses: https://vlab.noaa.gov/web/albany-cstar/m.s.-theses

Gene Auciello: Prelude to CSTAR (I)

- Graduated from UAlbany in 1972

- Promoted to General Forecaster, NWS-Boston in 1980

- Met/Worked with Prof. Fred Sanders, a frequent NWS visitor

- Developed/published a checklist for "bomb cyclones" with Fred Sanders

- Worked on operational research with Fred Sanders in his "attic hideaway" in Marblehead

- Went to DC to work with OM Director Dr. Ron Lavoie to collocate universities and NWS offices

Gene Auciello: Prelude to CSTAR (II)

- **Dr. Louis Uccellini assumed the directorship of the Office of Meteorology from Dr. Ron Lavoie**

- **Auciello:**

1) worked with Uccellini to bring NWS collaborative research plans to reality

2) Went to NOAA Congressional Affairs to assist in the Congressional approval of NWS Doppler radars

3) Convinced NWS higher-ups to send him to WFO-Albany to help launch CSTAR

4) Worked with Dan Keyser and Land Bosart on a CSTAR research plan

- **Bottom line: Dan Keyser's tireless efforts ensured the success of the UAlbany-NWS CSTAR research plan before and after we had secured NOAA approval to proceed with CSTAR**

Forecast Philosophy

There is always the risk that when you go against the guidance you will be wrong. I can live with that. At issue is whether you win more than you lose and whether you have "quality wins" (forecasts for significant weather events). If the answer is yes, then a reasonable argument can be made that you are adding value* to the forecast.

* How do we know we are adding value? Enter CSTAR stage right

From Sam Contorno (NWS/OM/CSTAR) Dated 2 June 2000

Drs. Bosart and Keyser,

The UA-SUNY CSTAR proposal scored very well during the recent panel review and will be forwarded to the NOAA Grants Management Division (GMD) for funding within the next several months.

The NWS has an opportunity to tap into a supplemental source of NOAA funding that would allow us to submit the UA-SUNY proposal to GMD immediately. **The NWS will use these funds for the proposal if you are willing to:**

1) Incorporate the January 2000 "surprise" East Coast snowstorm as a case study in one of the cool season experiments within the overall CSTAR proposal.

2) Collaborate with NCEP/HPC and EMC while investigating the January 2000 case study.

3) Utilize NCEP models and products whenever possible during the investigation of the January event.

Overarching UAlbany-NWS CSTAR Division of Effort Philosophy

- UAlbany faculty and students focus on research and education

- NWS staff focus on technology transfer to operations

- Both groups work together to ensure a seamless research transition to operations

- Interactive Forecast Preparation System (IFPS) will assist with this goal

- identify existing/potential research findings to be incorporated into IFPS Smart Tools

UAlbany–NWS Albany CSTAR Program

~ Started by *Lance Bosart*, *Dan Keyser*, and *Gene Auciello* in the late 1990s

~ *Added new faculty* as DAES grew in the 2010s
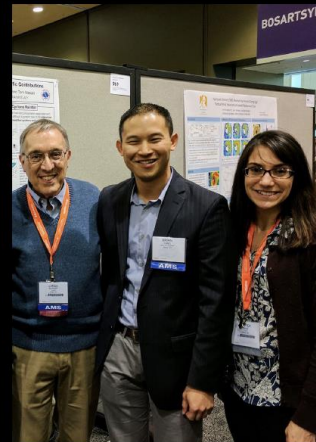
Source: NWSAlbany_CSTAR_R20_February2022.pdf

UAlbany–NWS Albany CSTAR Program
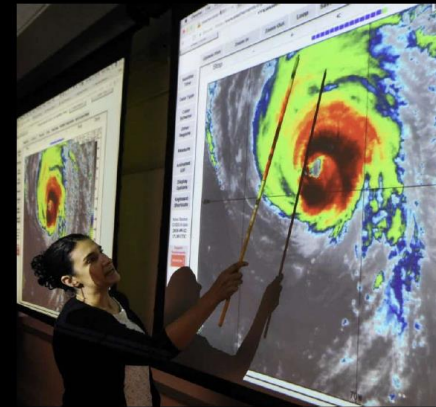
1) **Winter weather**
   - *Mesoscale snowbands*
   - *Uncertain precipitation type*

2) **Severe weather**
   - *Prediction* of *severe thunderstorms*
   - Forecasting *tornadoes*

3) **Tropical cyclone precipitation**
   - *Predecessor rain events*
   - *Rainfall* in *complex terrain*

UAlbany CSTAR Linchpins: Tom Wasula, Kristen Corbosiero, and Mike Evans

CSTAR: NWS Participants

- **WFO Albany**: Gene Auciello, Joe Cebulko, Mike Cempa, Carl Cerniglia, Steve DiRenzo,
- Mike Evans, Brian Frugis, Hugh Johnson, Bob Kilpatrick, Vasil Koleci, Ian Lee, Kevin Lipton,
- George Maglaras, Brian Montgomery, Lee Picard, John Quinlin, Warren Snyder, Christina
- Speciale, Neil Stuart, Joe Villani, and Tom Wasula
- **WFO Binghamton**: Jeff Waldstreicher, Michael Evans, Mike Jurewicz, and David Nicosia
- **WFO Buffalo**: John Hitchcock, Edward Mahoney, Shawn Smith, and David Zaff
- **WFO Burlington**: Paul Sisson
- **WFO Gray**: Justin Arnott, Frank Nocera, Joseph Ronco, and Dan St. Jean
- **WFO Pittsburgh**: Matthew Kramar
- **WFO State College**: Richard Grumm, Mike Jurewicz
- **WFO/RFC Boston/Taunton**: Joe Dellicarpini, Frankl Nocera, and David Vallee
- **WFO Philadelphia**: Alan Cope
- **NCEP/HPC**: Wes Junker

CSTAR Graduate Students: I

- **Heather Archambault: Cool season regime transitions**
- **Jonas Asuma: Cool season high wind events in the Northeast**
- **Michael Augustyniak: Mohawk-Hudson Valley flow convergence**
- **Massey Bartolini: Lake-effect snow predictability**
- **Tomer Burg: Northeast major winter snowstorm track and intensity variability**
- **Chris Castellano: Freezing rain weather regimes**
- **Matt Cote: Predecessor rain events**
- **Dave DeLuca: Landfalling tropical cyclone rainfall**
- **Pamela Eck: Low-skill severe convection**
- **Rachael Eldridge: Severe weather across complex terrain**
- **Brian Filipiak: Probabilistic precipitation forecasts using a random forest**
- **William Flamholz: Mesoscale convection over complex terrain**
- **Tony Fracasso: Upper-level cutoff cyclones**
- **Dave Groenert: Northeast cool season precipitation**
- **Matthew Greenstein: Mesoscale rainfall structure in Northeast winter storms**
- **James Kenyon: Mesoscale snowbands**
- **Jared Klein: Mesoscale precipitation structure in landfalling TCs**
- **Keith Meier: Thundersnow dynamics and thermodynamics**

CSTAR Graduate Students: II

- **Adrian Mitchell: Northeast cool season upper-level cyclones**
- **Benjamin Moore: Dynamics of predecessor rain events**
- **Jessica Najuch: Warm season cutoff cyclone rainfall**
- **David Novak: Cold season banded precipitation**
- **Matthew Novak: Warm season cutoff cyclones**
- **Melissa Payer: Precipitation with cool season cutoff cyclones**
- **Matt Potter: Tropical cyclones**
- **Matt Scalora: Warm season cutoff cyclone precipitation**
- **Megan Schiede: Near freezing winter precipitation type**
- **Matt Seymour: Predictability issues associated with new-freezing precipitation**
- **Brandon Smith: Cutoff cyclones**
- **Molly Smith: Heavy rain predictability**
- **Rebecca Steeves: Transition season Northeast snowstorms**
- **Brendan Stutsrim: Upscale growth of deep convection over complex terrain**
- **Dan Thompson: Appalachian lee troughs and severe convection**
- **Matthew Vaughan: Low-predictability severe weather**
- **Keith Wagner: Northeast cool season precipitation events**
- **Patrick Wilson: Warm season lake/sea breeze never weather**

David Novak: The First UAlbany CSTAR Student

- **Email from David to Lance/Dan from 20 September 2000:**

- **"I talked to Gene Auciello last week, and we discussed the C-STAR proposal. I was again impressed with his willingness to work with university students, both graduate and undergraduate, and his excitement about the project. Anyways, I certainly am interested in the project, specifically the mesoscale features of mid-latitude cyclones section. It relates directly to your lecture in Hydro, and I see a great potential impact on forecasts from its results. I don't know how the thesis selection process works, and I know it's early in the academic year, but I would certainly commit to the project given the opportunity. Let me know how the steps in the process work."**

First Group of UAlbany CSTAR Graduate Students: Where are they Today?

- **David Groenert (NWS-Boise)**

- **David Novak (Director, Weather Prediction Center)**

- **Brandon Smith (National Aviation Meteorologist)**

Initial Organization of the CSTAR Project: 27 Nov 2000

Task #1: Investigate Precipitation Distribution in Northeast Cutoff Cyclones

Determine how heavy precipitation events associated with slow-moving cutoff cyclones over the northeastern US are controlled by large-scale circulation anomalies.

Task #2: Investigate Northeast U.S. Cool Season Weather Regimes

Identify precursor signals of abrupt regime changes and link large-scale circulation indices to planetary-scale flow signatures

Task #3: Investigate mesoscale substructures within NE extratropical cyclones

Determine the extent to which frontogenetical forcing in the lower and middle troposphere drives mesoscale circulations that contribute to banded precipitation structures.

CSTAR Research Examples

- **Predecessor rain events (PREs): Matt Cote and Benjamin Moore**

- **Large-scale weather regimes: Heather Archambault and Alicia Bentley**

- **Winter weather: Tomer Burg, Chris Castellano, Brian Filipiak, William Massey, and Rebecca Steeves**

- **Mesoscale snowbands: Jaymes Kenyon and David Novak**

- **Cutoff cyclones: Tony Fracasso, Jessica Najuch, Matt Novak, Melissa Payer, and Brandon Smith**

- **Tropical cyclones: David DeLuca, Jared Klein, Matthew Potter and Molly Smith**

- **Severe weather: Pamela Eck, Dan Thompson, Matt Vaughan, and Patrick Wilson**

- **Predictability: Matthew Seymour**
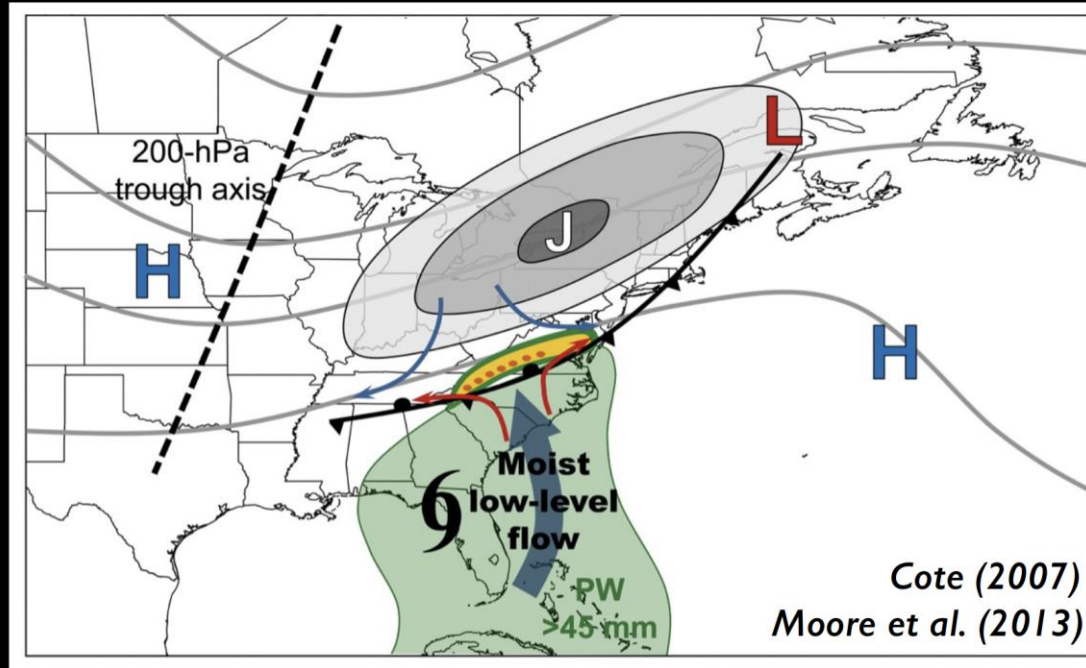
Source: NWSAlbany_CSTAR_R20_February2022.pdf

Bosart and Carr (1982): A Case Study of Excessive Rainfall Centered Around Wellsville, New York, 20-21 June 1972: https://doi.org/10.1175/1520-0493(1978)106<0348:ACSOER>2.0.CO;2

Cote, M. R., 2007: Predecessor Rain Events Ahead of Tropical Cyclones, M.S. thesis, University at Albany/SUNY, 200 pages

Novak et al. (2014): An Observational Study of Cold Season–Banded Precipitation in Northeast U.S. Cyclones
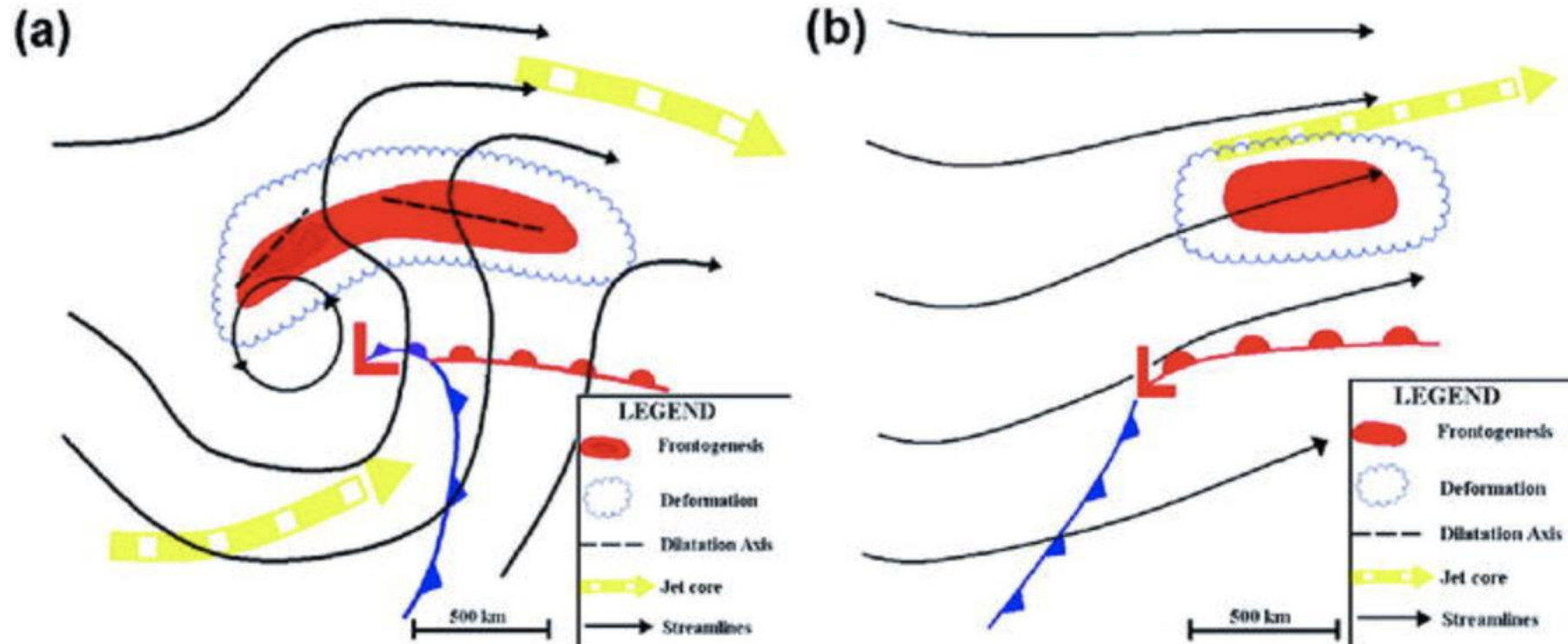
Conceptual model of the synoptic and mesoscale flow environment associated with (a) a single-banded event and (b) a nonbanded case highlighting the key features. Features shown include midlevel frontogenesis (red shading), midlevel deformation zone (encompassed by scalloped blue line) and associated primary dilatation axes [dashed lines in (a)], midlevel streamlines (black lines), and upper-level jet cores (wide dashed arrows)

Kenyon et al. (2020): The Motion of Mesoscale Snowbands in Northeast U.S. Winter Storms
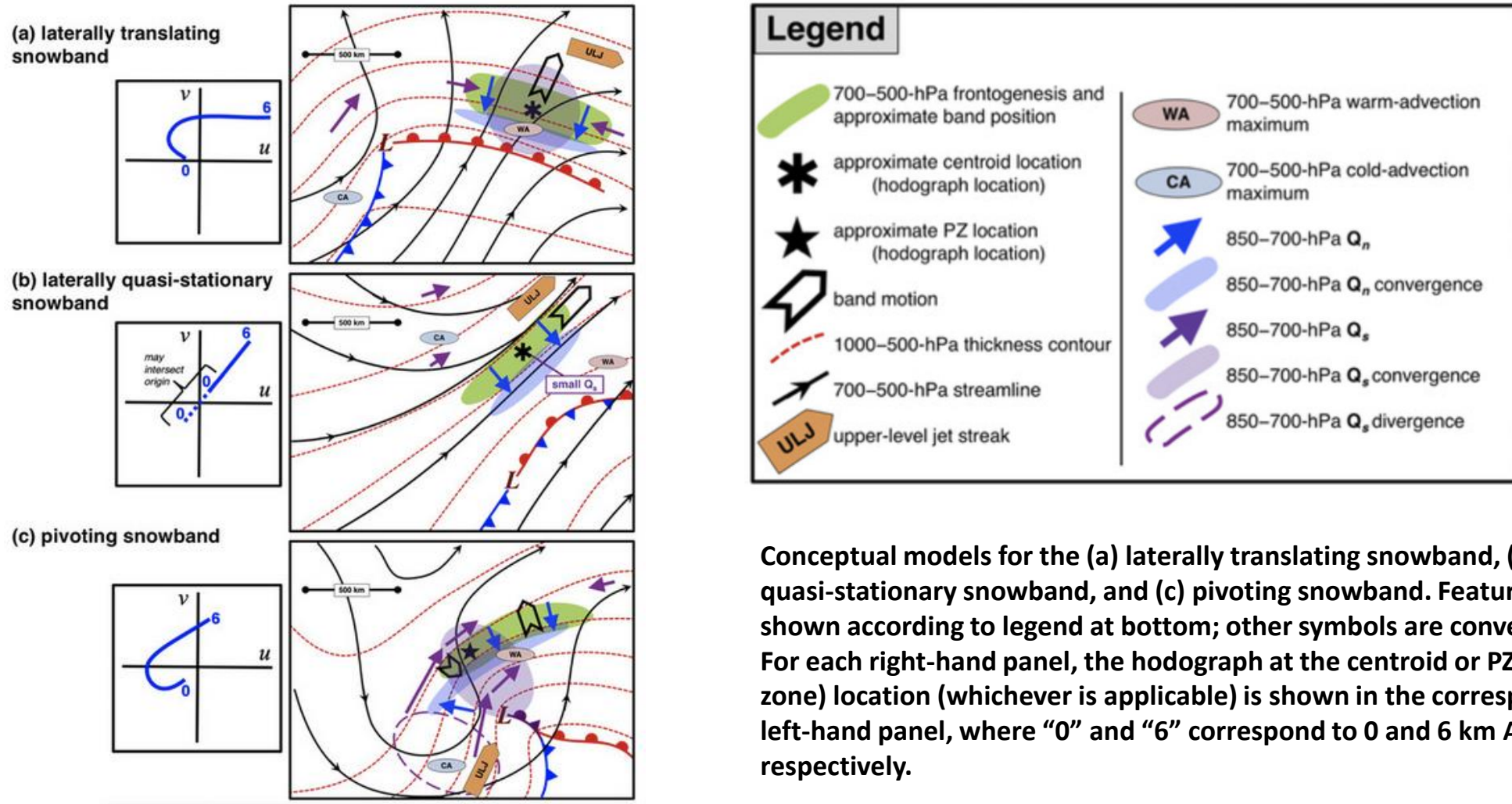

Conceptual models for the (a) laterally translating snowband, (b) laterally quasi-stationary snowband, and (c) pivoting snowband. Features are shown according to legend at bottom; other symbols are conventional. For each right-hand panel, the hodograph at the centroid or PZ (pivot zone) location (whichever is applicable) is shown in the corresponding left-hand panel, where "0" and "6" correspond to 0 and 6 km AGL, respectively.
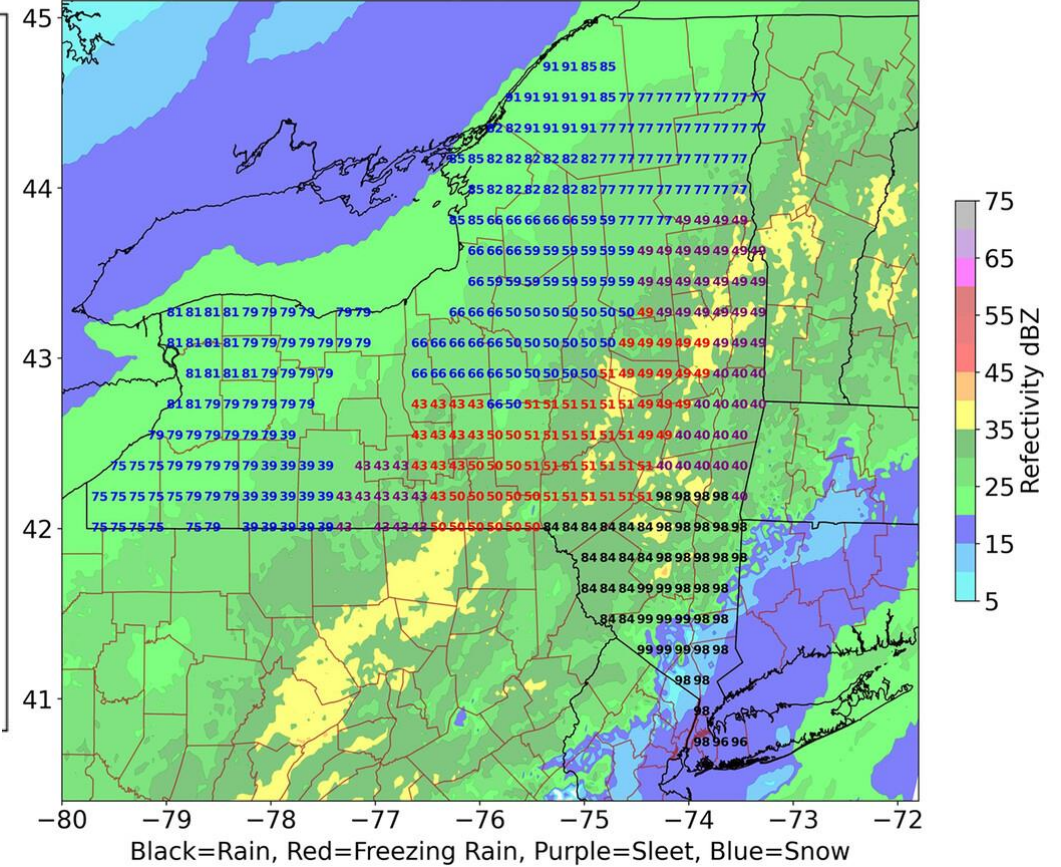
Filipiak et al. (2023): Probabilistic Forecasting Methods of Winter Mixed-Precipitation Events in New York State Utilizing a Random Forest (RF)
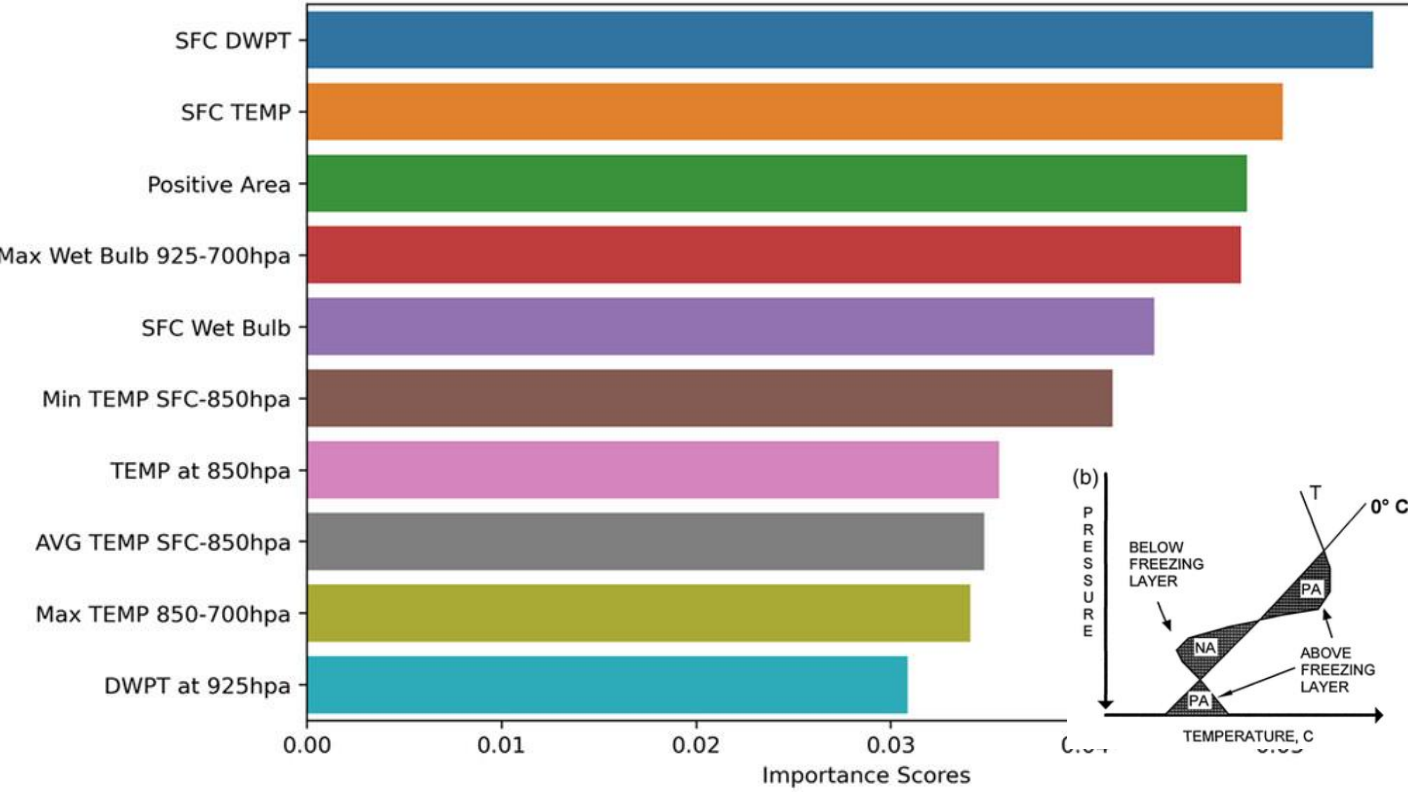
The top 10 most important features from RF runs of the new NAM_RCN dataset. The values of importance have been averaged over 50 runs. The higher the value is, the more important are the features. The full names of the features in order of importance are as follows: surface dewpoint, surface temperature, positive area, maximum wet-bulb temperature from 925 to 700 hPa, surface wet-bulb temperature, minimum temperature from the surface to 850 hPa, temperature at 850 hPa, average temperature from the surface to 850 hPa, maximum temperature from 850_700 hPa, and dewpoint at 925 hPa.

Forecast probabilities of the dominant precipitation type at each location (colored text; the color key is underneath the plot) from the 0000 UTC NAMNEST model run at forecast hour 4 on 4 Feb 2022 with NAMNEST composite reflectivity (dBZ; shaded).

Value of CSTAR from a UAlbany Senior Undergraduate Student Perspective

- "Through vigorous research with his coworkers and the University at Albany, this gentleman (Kenneth LaPenta) has become an icon of productivity whose career I would like to mimic."

CSTAR Program Today
Deceased (2024): R.I.P.
Can CSTAR be Reincarnated?