Ting-Yu Cha

Ph.D. candidate in Atmospheric Science
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Research Interests

Tropical cyclones, heavy precipitation, mesoscale dynamics, radar meteorology, develop and improve radar software, numerical modeling, machine learning and statistical analysis.

Education

2018 - Expected Ph.D. in Atmospheric Science - Colorado State University

2022 summer Advisor - Michael M. Bell

2016 - 2018 M.S. in Atmospheric Science - Colorado State University

Advisor - Michael M. Bell

Thesis: *Eyewall Replacement Cycle of Hurricane Matthew (2016) Observed by Doppler Radars*

2012 - 2016 B.S. in Atmospheric Science - National Taiwan University

Advisors - Chun-Chieh Wu and Ben Jong-Dao Jou

Research Project: *Rainbands Characteristics and Polarimetric Analysis of Typhoon Soudelor (2015)*

Professional Experience

2018 - Present **Research Assistant** Colorado State University, Fort Collins, CO

- Analyzed hurricane's dynamics and rainfall impacts by applying spectral analysis and Fourier decomposition on the ground-based radar to present the first observational evidence of the evolving wind field of a rapidly intensifying hurricane with a polygonal eyewall.
- Evaluated large ensemble simulations using a bootstrap resampling approach to test the significance of physical parameters for influencing the accuracy of rainfall forecasts.
- Improved radar software using C++ to implement the boundary condition of terrain features for more accurate wind retrievals.

2016 - Present **LROSE Research Assistant** Colorado State University, Fort Collins, CO

- Maintained and developed open source radar software for the research community using C++ to monitor hurricane structure in real-time.
- Collaborated with the National Center for Atmospheric Research (NCAR) Computational and Information Systems Laboratory (CISL) to optimize the radar software performance by 5 times speedup.
- Brainstormed a prototype gateway to obtain radar data from AWS and implemented LROSE applications.

2018 **Teaching Assistant** Colorado State University, Fort Collins, CO

- Facilitated students' learning on a graduate-level course: Thermodynamics and Cloud dynamics.

2016 - 2018 **Research Assistant** Colorado State University, Fort Collins, CO

- Investigated how asymmetric dynamics impacting a sheared tropical cyclone undergoing an eyewall replacement cycle using the 35-hour ground-based and airborne radar observations.
- Compared the single Doppler and airborne dual-Doppler radar wind retrieval techniques and improved a radar wind retrieval algorithm.

2015 - 2016 **Research Assistant** National Taiwan University, Taipei

- Examined the polarimetric radar data during Typhoon Soudelor (2015) to understand the rainbands microphysics evolution.

Field Campaign Experience

2021 **Prediction of Rainfall Extremes Campaign In the Pacific (PRECIP), Colorado U.S.**

- Forecast weather and launched soundings in Colorado.
- Operated CHILL, CHIVO, and S-POL radars when interesting weather events occurred.
- Prepared materials for the PRECIP Educational Workshop.

2015 **Plains Elevated Convection at Night (PECAN), Central U.S.**

- Worked with the NCAR radiosonde team to launch balloon soundings in Kansas and Nebraska.
- Worked with University of Wyoming King Air to analyze flight-level data.
- Worked with the NCAR S-POL radar team to differentiate characteristics of hydrometeors from the S-POL radar data.

Publications

Peer Reviewed Journal Articles

1. Dennis, J. M., Baker, A. H., Dobbins, B., Bell, M. M., Sun, J., Kim, Y., and **Cha, T.-Y.** (2021). Enabling efficient execution of a variation assimilation application on CPU and GPU. *Submitted to International Journal of High Performance Computing Applications*
2. DesRosiers, A. J., Bell, M. M., and **Cha, T.-Y.** (2021). Vertical Development of the Vorticity Tower in Hurricane Michael (2018). *Accepted to Monthly Weather Review*
3. **Cha, T.-Y.**, Bell, M. M., and DesRosiers, A. J. (2021).Doppler Radar Analysis of the Eyewall Replacement Cycle of Hurricane Matthew (2016) in Vertical Wind Shear. *Monthly Weather Review*, 149(9), 2927-2943.
4. **Cha, T.-Y.** and Bell, M. M. (2021). Comparison of Single Doppler and Multiple Doppler Wind Retrievals in Hurricane Matthew (2016), *Atmospheric Measurement Techniques*, 14, 3523–3539.
5. **Cha, T.-Y.**, Bell, M. M., Lee, W.-C., and DesRosiers, A. J. (2020). Polygonal eyewall asymmetries during the rapid intensification of Hurricane Michael (2018). *Geophysical Research Letters*, 47, e2020GL087919.

Software tools

1. Bell, M. M., Dixon, M., Lee, W.-C., Javornik, B., DeHart, J. C., **Cha, T.-Y.** (2021). nsf-lrose/lrose-elle: lrose-elle stable final release 20210312 (lrose-elle-20210312). *Zenodo*, https://doi.org/10.5281/zenodo.5523312
2. Bell, M. M., Dixon, M., Lee, W.-C., Javornik, B., Melli, B., DeHart, J. C., **Cha, T.-Y.** (2020). nsf-lrose/lrose-cyclone: lrose-cyclone release 20200110 (lrose-cyclone-20200110). *Zenodo*, https://doi.org/10.5281/zenodo.3604387
3. Bell, M. M., Dixon, M., Lee, W.-C., Javornik, B., Melli, B., DeHart, J. C., **Cha, T.-Y.** (2019). nsf-lrose/lrose-blaze: lrose-blaze-20190105 (lrose-blaze-20190105). *Zenodo*, https://doi.org/10.5281/zenodo.2532758

Honors and Awards

2021 Received the Shrake-Culler Scholarship
The Shrake-Culler Scholarship is given annually to a senior Ph.D. student who demonstrates a strong work ethic and enthusiasm for higher education.

2021 Received third place in the Peter B. Wagner Memorial Award competition
The Peter B. Wagner Award is a competitive national honor that recognizes a woman pursuing a graduate education in the atmospheric sciences who has published an outstanding academic paper.

2020 First Ph.D. paper was chosen as AGU Editors' Highlight.
Fewer than 2 percent of journal articles are featured this way."Polygonal eyewall asymmetries during therapid intensification of Hurricane Michael (2018)"

2020 Awarded Taiwan Ministry of Education graduate fellowship
Proposed project: "Examination of Dynamic and Thermodynamic processes of Heavy Precipitation over Taiwan with the upcoming PRECIP field campaign observations."

2017 Student Poster Award at ICMCS-XII conference
Presentation "Eyewall Replacement Cycle of Hurricane Matthew Observed by Doppler Radar"

Leadership & Service

2019 - Present **Reviewer**
Monthly Weather Review, Weather and Forecasting, Atmospheric Research

2020 - 2021 **Graduate Representative**
CSU Department of Atmospheric Science

2014 - 2015 **Vice President**
NTU Department of Atmospheric Science Student Association

Technical Skills

- **Programming Languages** Julia, Python, Matlab, C++
- **Web Development** Jekyll, HTML, Mediawiki
- **Models** Weather Research and Forecast Model (WRF)
- **Operating Systems** Mac OS, Windows, Linux
- **Software Development** LIDAR RADAR Open Software Environment (LROSE)
- **Miscellaneous** git, LaTeX, Microsoft Office

Conference Presentations

Oral

1. **Cha, T.-Y.**, Bell, M. M., Lee, W.-C., and DesRosiers, A. J., 2019: Polygonal eyewall asymmetries during the rapid intensification of Hurricane Michael (2018), *39th AMS Radar Conference*, Nara, Japan
2. **Cha, T.-Y.** and Bell, M. M., 2018: Eyewall Replacement Cycle of Hurricane Matthew (2016) Observed by Doppler Radar, *33rd AMS Conference on Hurricanes and Tropical Meteorology*, Ponte Vedra, Florida
3. **Cha, T.-Y.** and Bell, M. M., 2017: Eyewall Replacement Cycle of Hurricane Matthew (2016) Observed by Doppler Radar, *38th AMS Conference on Radar Meteorology*, Chicago, Illinois
4. **Cha, T.-Y.** and Bell, M. M., 2017: Eyewall Replacement Cycle of Hurricane Matthew (2016) Observed by Doppler Radar, *17th AMS Conference on Mesoscale Processes*, San Diego, California

Poster

1. **Cha, T.-Y.** and Bell, M. M., 2018: Comparison of Single Doppler and Multiple Doppler Wind Retrievals in Hurricane Matthew (2016), *Colorado State University Graduate Student Showcase*, Fort Collins, Colorado
2. **Cha, T.-Y.** and Bell, M. M., 2017: Eyewall Replacement Cycle of Hurricane Matthew (2016) Observed by Doppler Radar, *Colorado State University Graduate Student Showcase*, Fort Collins, Colorado
3. **Cha, T.-Y.** and Bell, M. M., 2017: Eyewall Replacement Cycle of Hurricane Matthew (2016) Observed by Doppler Radar, *12th International Conference on Mesoscale Convective System and High Impact Weather (ICMCS-XII)*, Taipei, Taiwan
4. **Cha, T.-Y.**, Chu, S.-R. and Jou, J.-D., 2016: Rainbands Characteristics and Polarimetric Analysis of Typhoon Soudelor (2015), *11th International Conference on Mesoscale Convective System and High Impact Weather (ICMCS-XI)*, Busan, Korea

Co-authored conference abstract

1. DeHart, J. C., Javornik, B., **Cha, T.-Y.**, 2021: The LROSE Science Gateway: Accessible Lidar and Radar Processing in the Cloud, *Gateways 2021*, Virtual
2. Ellis, S. M., Lee, W.-C., Bryan, G., Manning, K., **Cha, T.-Y.**, Bell, M. M., Lussier, L., 2020: Development and Preliminary Results of the Airborne Phased Array Radar (APAR) Observation Simulator (AOS), *100th AMS Annual Meeting*, Boston, Massachusetts
3. Bell, M. M., Dixon, M., Lee, W.-C., **Cha, T.-Y.**, DeHart, J. C., Feng, Y.-C., Javornik, B., Melli, B., 2019: Current Status of the Lidar Radar Open Software Environment (LROSE), *39th AMS Radar Conference*, Nara, Japan
4. Bell, M. M., DeHart, J. C., **Cha, T.-Y.**, 2019: Coastal Radar Observations and Impacts of Hurricanes Florence and Michael (2018), *99th AMS Annual Meeting*, Phoenix, Arizona