

Curriculum Vitae

December 16, 2022

Eric C. Bruning

Associate Professor of Atmospheric Science
Department of Geosciences, Texas Tech University, Lubbock, TX
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Professional Positions

- September 2016 – present: Associate Professor, Texas Tech University, Dept. of Geosciences, Atmospheric Science Group
- June 2010 – August 2016: Assistant Professor, Texas Tech University, Dept. of Geosciences, Atmospheric Science Group
- June 2008 – May 2010: Research Associate, University of Maryland (Earth System Science Interdisciplinary Center and NOAA Cooperative Institute for Climate & Satellites), Postdoc sponsor: Steven J. Goodman
- May 2003 – May 2008: Graduate Research Assistant, W. David Rust, National Severe Storms Laboratory (NSSL)
- November 1999 – May 2003: Undergraduate Research Assistant, W. David Rust, NSSL

Education

- Ph.D. in Meteorology, *University of Oklahoma, May 2008*, “Charging Regions, Regions of Charge, and Storm Structure in a Partially Inverted Polarity Supercell Thunderstorm”, Advisors: Michael I. Biggerstaff and W. David Rust
- M.S. in Meteorology, *University of Oklahoma, December 2005*, “Electrical and Polarimetric Radar Observations of a Multicell Storm in TELEX”, Advisor: W. David Rust
- B.S. in Meteorology, *Summa Cum Laude*, Minor in Mathematics, *U. Oklahoma, May 2003*

Professional Awards

- 2018 American Geophysical Union Atmospheric and Space Electricity Section Early Career Award
- 2017 NASA Agency Honor Award, Group Achievement Award, GOES-R Team Member, “For excellence resulting in the successful GOES-R satellite launch, providing the nation’s foundation for the world’s highest quality weather monitoring and forecasting.”

Summary of Research Interests

The relationship of lightning and thunderstorm electricity to meteorological processes in thunderstorms, as characterized through remote sensing (radio and optical) and in-situ (balloon-borne electric field) observations. Primary topics include the multi-scale charge structure of thunderstorms, its organization by turbulence in thunderstorms, and electrification mechanisms. Related interests in cloud and precipitation microphysics, weather radar, thunderstorm fluid dynamics and severe storm meteorology. Supporting work with high resolution electrified numerical simulations of thunderstorms. Developer of and contributor to open-source community scientific software.

Discovered that electrical energy in thunderstorms (its spatial frequency domain spectrum) is distributed like turbulence kinetic energy, including a Kolmogorov-like inertial range. Established key conceptual links between the mapped extent of lightning channels and the underlying kinematic and precipitation texture of thunderclouds. Developed methods for display and interpretation of lightning mapping data; these were adopted by operational weather agencies in the US and Europe. Highly collaborative in supporting advancement of lightning science at the meteorological interface.

Research Direction

Texas Tech University

Postdoctoral Scholars Supervised

- Dr. Kelcy Brunner (2021 - present).

Doctoral Students Supervised

- Jessica Dos Santos Souza, *TBD, cloud ice microphysics, thunderstorm electrification, and models of thunderstorm convection*, Geosciences, Atmospheric Science Group. (Jan 2021 - present).
- Vicente Salinas, *Examining Thunderstorm Kinematic Structures in which Lightning Initiates and How the Causal Electrostatics Are Generated*, Geosciences, Atmospheric Science Group. (May 2016 - Dec 2020).
- Vanna C. Chmielewski, *Understanding the surprising variation in storm charge structures on 4 June 2012 over West Texas*, Geosciences, Atmospheric Science Group. (May 2013 - August 2017).

Masters Students Supervised

- David Singewald, *TBD* (May 2022 - present)
- David PeQueen, *GLM Flash Data Trends during Tropical Cyclone Intensification Changes* (August 2019 - December 2021)
- Jessica Dos Santos Souza, *Assessing turbulence in different spots of lightning flash propagation* (January 2019 - Dec 2021)
- David Newbern, *Dynamical Processes Associated with Winter Lightning Events in Iowa* (August 2018 - December 2020)
- Cameron Nixon, *The GOES-16 Geostationary Lightning Mapper: Lightning Trends Within Tornadic Quasi-Linear Convective Systems* (August 2017 - December 2019)
- Kelley Murphy, *Assessing Lightning Risk In Vulnerable Outdoor Environments* (August 2016 - December 2018)
- Candace Wood, Atmospheric Science, Atmospheric Science Group, *Horizontal Channel Lengths of Cloud to Ground Lightning Flashes*, (October 2010 – May 2018; inherited from Prof. Kyle Wiens, my predecessor).
- Matthew Brothers, *Investigating the Relative Contribution of Charge Deposition in Organizing Charge within a Thunderstorm*, (June 2015 - August 2017).
- Samantha Berkseth, *Quantitative Analysis of the Turbulent Structure of Convection*, (August 2014 - Oct 2016).
- Vicente Salinas, *Quantification and geometrical evaluation of the electrostatics of lightning flashes*, (August 2014 - May 2016).
- Jennifer Daniel, *A Study of Inferred Charge Advection in Mesoscale Convective Systems on the South Plains Utilizing the West Texas Lightning Mapping Array*, (August 2010 - August 2016).
- Phillip J. Ware, Atmospheric Science, Atmospheric Science Group, *Thunderstorm Electrification and Kinematics as Seen Through Ensemble Lightning Flash Properties*, (August 2013 – August 2015).
- Camaron Plourde, Atmospheric Science, Atmospheric Science Group, *An Investigation of Lightning Behavior during the Quasi-Linear Convective System in northwest Texas on March 19, 2012*, (August 2011 – August 2013).

- Vanna Sullivan, Atmospheric Science, Atmospheric Science Group, *Variations of the Vertical Electric Field and Wind Speed on Days with Airborne Dust in Lubbock, Texas*, (August 2011 – May 2013).
- Natalie Gusack, Atmospheric Science, Atmospheric Science Group, *Using EFM and Soundings to Examine Variations in Thunderstorm Thermodynamics*, (August 2010 - August 2012).

Member of Doctoral Committees

- Isaac Arsenau, TBD, NWP predictability and observation targeting. Geosciences, Texas Tech University, Atmospheric Science Group (July 2022 - present).
- Alex Schueth, TBD, Tornado dynamics. Geosciences, Texas Tech University, Atmospheric Science Group (June 2020 - present).
- Austin Coleman, TBD, Numerical weather prediction and ensemble sensitivity analysis. Geosciences, Texas Tech University, Atmospheric Science Group (June 2020 - present).
- Robert Gautreaux, TBD, Philosophy and effectiveness of communications in weather broadcast. Media and Communications, Texas Tech University (April 2020 - present).
- Milind Sharma, “The relationship between cloud microphysics and electrification in Southeast U.S. storms investigated using polarimetric, cold pool, and lightning characteristics”. Department of Earth, Atmospheric, and Planetary Sciences, Purdue University (Feb 2018 – July 2022).
- Jannick Fischer, “Insights into Tornadogenesis and Tornado Dynamics from Idealized Simulations”. Geosciences, Texas Tech University, Atmospheric Science Group (June 2020 - May 2022).
- Felix Erdmann, “Preparation for the use of MTG LI observations in short-term numerical weather prediction.” Ocean, Atmosphere, and Climate, University of Toulouse and Centre National de Recherches Météorologiques (July 2020 – December 2020).
- Aaron Hill, “Demonstration of Ensemble Sensitivity-based Targeted Observing for Convective-Scale Applications: Perfect-model Experiments,” Geosciences, Texas Tech University, Atmospheric Science Group (June 2015 – August 2019).
- Nicholas H. Smith, “A sensitivity study on wind ramp events in the Columbia River Basin”, Geosciences, Texas Tech University, Atmospheric Science Group (May 2015 – December 2018)
- Anthony Reinhart, “Verification of Numerically Simulated Supercell Cold Pools using Data Assimilation,” Geosciences, Texas Tech University, Atmospheric Science Group (January 2011 - August 2016).
- William Scott Gunter, “High-resolution Full-scale Observations of Thunderstorm Outflow Winds,” Geosciences, Texas Tech University, Atmospheric Science Group (January 2012 – May 2015).

Professional Society Memberships

- American Meteorological Society
- American Geophysical Union

Professional Service

Current

- University Corporation for Atmospheric Research, Unidata Strategic Advisory Committee, Member, October 2021 - present.

- EUMETSAT Meteosat Third Generation Lightning Imager Mission Advisory Group, Member, November 2018 - present.
- NOAA VORTEX-SE Scientific Steering Committee, Member, January 2018 - present.
- GOES-R Geostationary Lightning Mapper - Science Team (2008–present)

Previous

- University Corporation for Atmospheric Research, Unidata Users Committee, Member, August 2018 - October 2021.
- Member, World Meteorological Organization (WMO) Commission for Climatology (CCI) ad-hoc Weather and Climate Extremes evaluation committee for lightning extremes, June 2019 - August 2020.
- American Meteorological Society, Chair, Scientific and Technological Activities Commission, Atmospheric Electricity Committee, January 2016 - January 2018.
- NASA Global Hydrology Resource Center, User Working Group steering committee, September 2014 - September 2017.
- American Meteorological Society, Member, Scientific and Technological Activities Commission, Atmospheric Electricity Committee, January 2012 - December 2015.
- Instructor, AMS Short Course: *Climate Data Access, Use, And Tools*, 2010 Annual Mtg.
- EUMETSAT Lightning Imager Science Team (2009-2010) and Science Review Panel (2011, 2013)
- Reviewer, Journal of Geophysical Research, Geophysical Research Letters (American Geophysical Union); Bulletin of the American Meteorological Society, Journal of Atmospheric Science, Journal of Atmospheric and Oceanic Technology, Weather and Forecasting (American Meteorological Society) journals; Atmospheric Research (Elsevier); Boundary Layer Meteorology (Springer). Grant reviewer for NSF, NOAA, German Research Foundation, Israeli Science Foundation, Swiss Science Foundation.

Exhibitions

- *Marcando el Relámpago (Marking the Lightning)*, Museum of Texas Tech University, Lubbock, TX. September 30, 2017 – January 28, 2018, artist Tina Fuentes; catalogue. Funded by NSF CAREER award. <https://www.depts.ttu.edu/museumttu/exhibitions/2017/Marcando.php>
- *Marcando el Relámpago (Marking the Lightning)*, South Texas College, McAllen, TX. August 27, 2018 – October 17, 2018, artist Tina Fuentes. <https://library.southtexascollege.edu/marcando-el-relampago/>

Formal Publications

- Boggs, L., D. Mach, E. Bruning, N. Liu, O. A. van der Velde, J. Montanyà, S. A. Cummer, K. Palivec, V. Chmielewski, D. MacGorman, and M. Peterson, 2022: Novel radio and optical measurements reveal the electrical structure of gigantic jets. *Science Advances*, **8** (31), doi: 10.1126/sciadv.abl8731
- May, R. M., K. H. Goebbert, J. E. Thielen, J. R. Leeman, M. D. Camron, Z. Bruick, E. C. Bruning, R. P. Manser, S. C. Arms, and P. T. Marsh, 2022: MetPy: A meteorological python library for data analysis and visualization. *Bulletin of the American Meteorological Society*, doi: 10.1175/bams-d-21-0125.1
- Ardon-Dryer, K., V. Chmielewski, E. C. Bruning, and X. Xueting, 2021: Changes of electric field, aerosol, and wind covariance in different blowing dust days in West Texas. *Aeolian Res.*, **54** (100762), doi: 10.1016/j.aeolia.2021.100762

- Brune, W. H., P. J. McFarland, E. Bruning, S. Waugh, D. MacGorman, D. O. Miller, J. M. Jenkins, X. Ren, J. Mao, and J. Peischl, 2021: Extreme oxidant amounts produced by lightning in storm clouds. *Science*, **372** (6543), 711–715, doi: 10.1126/science.abg0492
- Duran, P., C. J. Schultz, E. Bruning, S. N. Stevenson, D. PeQueen, N. Johnson, R. Allen, M. Smith, and F. LaFontaine, 2021b: Changes in inner-core lightning characteristics as Hurricane Dorian (2019) reached peak intensity. *Geophys. Res. Lett.*, **48** (8), e2020GL092067, doi: 10.1029/2020GL092067
- Lyu, F., S. A. Cummer, P. R. Krehbiel, W. Rison, E. Bruning, and S. A. Rutledge, 2021: A distinct class of high peak current lightning pulses over mountainous terrain in thunderstorms. *Geophys. Res. Lett.*, **48** (14), e2021GL094153, doi: 10.1029/2021GL094153
- Murphy, K., E. C. Bruning, J. Vanos, K. Ardon-Dryer, and C. J. Schultz, 2021b: Assessing lightning risk in outdoor vulnerable environments. *Weather, Climate, and Society*, **13** (3), 571–589, doi: 10.1175/WCAS-D-20-0021.1
- Salinas, V., E. C. Bruning, and E. R. Mansell, 2022: Examining the kinematic structures within which lightning flashes are initiated using a cloud-resolving model. *J. Atmos. Sci.*, **79** (2), 513–530, doi: 10.1175/JAS-D-21-0132.1
- Salinas, V., E. C. Bruning, E. R. Mansell, and M. D. Brothers, 2021: Modeling the electrical energy discharged by lightning flashes using capacitors for application with lightning datasets. *J. Atmos. Sci.*, **78** (12), 3909–3924, doi: 10.1175/JAS-D-21-0073.1
- Souza, J. C. S., and E. C. Bruning, 2021b: Assessment of turbulence intensity in different spots of lightning flash propagation. *Geophys. Res. Lett.*, **48** (21), e2021GL095923, doi: 10.1029/2021GL095923
- Sharma, M., R. Tanamachi, E. Bruning, and K. Calhoun, 2021a: Polarimetric and electrical structure of the 19 May 2013 Edmond-Carney, Oklahoma tornadic supercell. *Mon. Wea. Rev.*, **149** (7), 2049–2078, doi: 10.1175/MWR-D-20-0280.1
- Lavigne, T., C. Liu, J. Hill, and E. Bruning, 2021: Observations from the One Year Electric Field Study-North Slope of Alaska (OYES-NSA) field campaign, and their implications for observing the distribution of global electrified cloud activity. *Journal of Atmospheric and Solar-Terrestrial Physics*, **214**, 105–128, doi: 10.1016/j.jastp.2020.105528
- Peterson, M. J., T. J. Lang, E. C. Bruning, R. Albrecht, R. J. Blakeslee, W. A. Lyons, S. Pedebay, W. Rison, Y. Zhang, M. Brunet, and R. S. Cerveny, 2020: New WMO megaflash lightning extremes for flash distance (709 km) and duration (16.73 seconds) recorded from space. *Geophys. Res. Lett.*, **47** (16), e2020GL088888, doi: 10.1029/2020GL088888
- Bruning, E. C., C. E. Tillier, S. F. Edgington, S. D. Rudlosky, J. K. Zajic, C. M. Gravelle, M. Foster, K. M. Calhoun, P. A. Campbell, G. T. Stano, C. J. Schultz, and T. C. Meyer, 2019d: Meteorological imagery for the Geostationary Lightning Mapper. *J. Geophys. Res.*, **124** (24), 14 285–14 309, doi: 10.1029/2019JD030874
- Lyons, W. A., E. C. Bruning, T. A. Warner, D. R. MacGorman, S. Edgington, C. Tillier, and J. Mlynarczyk, 2020: Megaflashes: Just how long can a lightning discharge get? *Bulletin of the American Meteorological Society*, **101** (1), E73–E86, doi: 10.1175/BAMS-D-19-0033.1
- Rudlosky, S. D., S. J. Goodman, K. S. Virts, and E. C. Bruning, 2019b: Initial Geostationary Lightning Mapper observations. *Geophys. Res. Lett.*, **46** (2), 1097–1104, doi: 10.1029/2018GL081052
- Brothers, M. D., E. C. Bruning, and E. R. Mansell, 2018: Investigating the relative contributions of charge deposition and turbulence in organizing charge within a thunderstorm. *J. Atmos. Sci.*, **75** (9), 3265–3284, doi: 10.1175/JAS-D-18-0007.1
- Chmielewski, V. C., E. C. Bruning, and B. C. Ancell, 2018b: Variations of thunderstorm charge structures in West Texas on 4 June 2012. *J. Geophys. Res.*, **123** (17), 9502–9523, doi: 10.1029/2018jd029006
- Weiss, S. A., D. R. MacGorman, E. C. Bruning, and V. C. Chmielewski, 2018b: Two methods for correcting range-dependent bias of Lightning Mapping Arrays. *J. Atmos. Oceanic Tech.*, **35**, 1273–1282, doi: 10.1175/JTECH-D-17-0213.1
- Schultz, C. J., T. J. Lang, E. C. Bruning, K. M. Calhoun, S. Harkema, and N. Curtis, 2018: Characteristics of lightning within electrified snowfall events using Lightning Mapping Arrays. *J. Geophys. Res.*, **123**, 2347–2367, doi: 10.1002/2017JD027821
- Gunter, W. S., J. L. Schroeder, C. C. Weiss, and E. C. Bruning, 2017: Surface measurements of the 5 June 2013 damaging thunderstorm wind event near Pep, Texas. *Wind and Structures*, **24** (2), 185–204

- Chmielewski, V. C., and E. C. Bruning, 2016: Lightning mapping array flash detection performance with variable receiver thresholds. *J. Geophys. Res. Atmos.*, **121** (14), 8600–8614, doi: 10.1002/2016jd025159
- Fuchs, B. R., E. C. Bruning, S. A. Rutledge, L. D. Carey, P. R. Krehbiel, and W. Rison, 2016a: Climatological analyses of LMA data with an open-source lightning flash-clustering algorithm. *J. Geophys. Res. Atmos.*, **121** (14), 8625–8648, doi: 10.1002/2015JD024663
- Lyu, F., S. A. Cummer, M. Briggs, M. Marisaldi, R. J. Blakeslee, E. Bruning, J. G. Wilson, W. Rison, P. Krehbiel, G. Lu, and et al., 2016a: Ground detection of terrestrial gamma ray flashes from distant radio signals. *Geophysical Research Letters*, **43** (16), 8728–8734, doi: 10.1002/2016gl070154, URL <http://dx.doi.org/10.1002/2016GL070154>
- Pollack, I. B., C. R. Homeyer, T. B. Ryerson, K. C. Aikin, J. Peischl, E. C. Apel, T. Campos, F. Flocke, R. S. Hornbrook, D. J. Knapp, D. D. Montzka, A. J. Weinheimer, D. Riemer, G. Diskin, G. Sachse, T. Mikoviny, A. Wisthaler, E. Bruning, D. R. MacGorman, K. A. Cummings, K. E. Pickering, H. Huntrieser, M. Lichtenstern, H. Schlager, and M. C. Barth, 2016: Airborne quantification of upper tropospheric NO_x production from lightning in deep convective storms over the United States Great Plains. *J. Geophys. Res. Atmos.*, **121** (4), 2002–2028, doi: 10.1002/2015JD023941
- Bruning, E. C., and R. J. Thomas, 2015: Lightning channel length and flash energy determined from moments of the flash area distribution. *J. Geophys. Res.*, **120** (17), 8925–8940, doi: 10.1002/2015JD023766
- Barth, M., C. A. Cantrell, W. H. Brune, S. A. Rutledge, J. H. Crawford, H. Huntrieser, L. D. Carey, D. MacGorman, M. Weisman, K. E. Pickering, E. Bruning, B. E. Anderson, E. Apel, M. Biggerstaff, T. Campos, P. Campuzano-Jost, R. C. Cohen, J. Crouse, D. A. Day, G. S. Diskin, F. Flocke, A. Fried, C. Garland, B. Heikes, S. Honomichl, R. Hornbrook, L. G. Huey, J. Jimenez, T. Lang, M. Lichtenstern, T. Mikoviny, B. A. Nault, D. O'Sullivan, L. Pan, J. Peischl, I. Pollack, D. Richter, T. Ryerson, H. Schlager, J. S. Clair, J. Walega, P. Weibring, A. Weinheimer, P. Wennberg, A. Wisthaler, P. Wooldridge, and C. Ziegler, 2015: The Deep Convective Clouds and Chemistry (DC3) field campaign. *Bulletin of the American Meteorological Society*, **96**, 1281–1309, doi: 10.1175/BAMS-D-13-00290.1
- Behnke, S. A., and E. C. Bruning, 2015: Changes to the turbulent kinematics of a volcanic plume inferred from lightning data. *Geophys. Res. Lett.*, **42** (10), 4232–4239, doi: 10.1002/2015GL064199
- Fuchs, B. R., S. A. Rutledge, E. C. Bruning, J. Pierce, T. J. Lang, D. R. MacGorman, P. R. Krehbiel, and W. Rison, 2015a: Environmental controls on storm intensity and charge structure in various regions of the United States. *J. Geophys. Res.*, **120** (13), 6575–6596, doi: 10.1002/2015JD023271
- Bruning, E. C., S. A. Weiss, and K. M. Calhoun, 2014: Continuous variability in thunderstorm primary electrification and an evaluation of inverted-polarity terminology. *Atmos. Res.*, **135–136**, 274–284, doi: 10.1016/j.atmosres.2012.10.009
- Bruning, E. C., and D. R. MacGorman, 2013: Theory and observations of controls on lightning flash size spectra. *J. Atmos. Sci.*, **70** (12), 4012–4029, doi: 10.1175/JAS-D-12-0289.1
- Lu, G., S. A. Cummer, J. Li, L. Zigoneanu, W. A. Lyons, M. A. Stanley, W. Rison, P. R. Krehbiel, R. J. Thomas, S. A. Weiss, W. H. Beasley, R. J. Blakeslee, E. C. Bruning, D. R. MacGorman, K. Palivec, T. Ashcraft, and T. Samaras, 2013: Coordinated observations of sprites and in-cloud lightning flash structure. *J. Geophys. Res.*, **118** (12), 6607–6632, doi: 10.1002/jgrd.50459
- Emersic, C., P. L. Heinselman, D. R. MacGorman, and E. C. Bruning, 2011: Lightning activity in a hail-producing storm observed with phased-array radar. *Mon. Wea. Rev.*, **139** (6), 1809–1825, doi: 10.1175/2010MWR3574.1
- Bruning, E. C., W. D. Rust, D. R. MacGorman, M. I. Biggerstaff, and T. J. Schuur, 2010: Formation of charge structures in a supercell. *Mon. Wea. Rev.*, **138** (10), 3740–3761, doi: 10.1175/2010MWR3160.1
- Mansell, E. R., C. L. Ziegler, and E. C. Bruning, 2010: Simulated electrification of a small thunderstorm with two-moment bulk microphysics. *J. Atmos. Sci.*, **67** (1), 171–194, doi: 10.1175/2009JAS2965.1
- MacGorman, D. R., W. D. Rust, T. J. Schuur, M. I. Biggerstaff, J. M. Straka, C. L. Ziegler, E. R. Mansell, E. C. Bruning, K. M. Kuhlman, N. R. Lund, N. S. Biermann, C. Payne, L. D. Carey, P. R. Krehbiel, W. Rison, K. B. Eack, and W. H. Beasley, 2008: TELEX: The Thunderstorm Electrification and Lightning Experiment. *Bull. Amer. Met. Soc.*, **89** (7), 997–1013
- Weiss, S. A., W. D. Rust, D. R. MacGorman, E. C. Bruning, and P. R. Krehbiel, 2008: Evolving complex electrical structure of the STEPS 25 June 2000 multicell storm. *Mon. Wea. Rev.*, **136** (2), 741–756

- Stolzenburg, M., T. C. Marshall, W. D. Rust, E. C. Bruning, D. R. MacGorman, and T. Hamlin, 2007: Electric field values observed near lightning flash initiations. *Geophys. Res. Lett.*, **34**, doi: 10.1029/2006GL028777
- Bruning, E. C., W. D. Rust, T. J. Schuur, D. R. MacGorman, P. R. Krehbiel, and W. Rison, 2007: Electrical and polarimetric radar observations of a multicell storm in TELEX. *Mon. Wea. Rev.*, **135** (7), 2525–2544, doi: 10.1175/MWR3421.1
- Rust, W. D., D. R. MacGorman, E. C. Bruning, S. A. Weiss, P. R. Krehbiel, R. J. Thomas, W. Rison, T. Hamlin, and J. Harlin, 2005: Inverted-polarity electrical structures in thunderstorms in the Severe Thunderstorm Electrification and Precipitation Study. *Atmos. Res.*, **76**, 247–271
- MacGorman, D. R., W. D. Rust, P. R. Krehbiel, W. Rison, E. C. Bruning, and K. Wiens, 2005: The electrical structure of two supercell storms during STEPS. *Month. Wea. Rev.*, **133**, 2583–2607

Technical Reports

- Jensen, M., E. Bruning, D. Collins, A. Fridlind, P. Kollias, C. Kuang, D. Rosenfeld, A. Ryzhkov, A. Varble, S. Brooks, S. Collis, E. Defer, J. Fan, J. Flynn, S. Giangrande, R. Griffin, J. Hu, R. Jackson, M. Kumjian, T. Logan, T. Matsui, G. McFarquhar, C. Nowotarski, J. Quaas, M. Oue, R. Sheesley, J. Snyder, P. Stier, S. Usenko, S. van den Heever, M. van Lier Walqui, Y. Wang, Y. Xu, and G. Zhang, 2019: Tracking Aerosol Convection Interactions Experiment (TRACER) Science Plan. Tech. Rep. DOE/SC-ARM-19-017, U.S. Department of Energy Office of Science

Publications in peer review

- Iguchi, T., T. Matsui, M. van Lier-Walqui, E. C. Bruning, A. M. Fridlind, E. R. Mansell, K. Brunner, and T. Logan, 2022b: NU-WRF EPIC daily forecasting for TRACER IOP over Houston: designs of the model simulations and results of pre-IOP case simulations. *Weather and Forecasting*, submitted

Recent Talks and Conference Presentations

- Brunner, K., E. C. Bruning, C. C. Weiss, V. C. Chmielewski, and V. Salinas, 2023: Thunderstorm electrification and microphysical signals during the Perils field campaign. *Preprints, 11th Conf. on the Meteorological Applications of Lightning Data*, Paper 1.3
- Freeman, S. W., G. A. Sokolowsky, J. Kukulies, W. K. Jones, P. J. Marinescu, F. Senf, M. Heikenfeld, K. N. Brunner, E. C. Bruning, S. M. Collis, M. Grover, R. C. Jackson, G. R. Leung, N. Pfeifer, B. Raut, S. M. Saleeby, P. Stier, and S. C. van den Heever, 2023: tobac: Rapid tracking of cloud systems within large 2D and 3D datasets. *Preprints, 13th Symposium on Advances in Modeling and Analysis Using Python*, Paper 3.2
- Matsui, T., T. Iguchi, E. Mansell, M. van Lier-Walqui, E. C. Bruning, K. N. Brunner, and A. Fridlind, 2023: Aerosol impact on simulated life cycles of isolated deep convection during the TRACER field campaign: Initial sensitivity experiments. *Preprints, 15th Symposium on Aerosol-Cloud-Climate Interactions*, Paper 8A.4
- Salinas, V., V. C. Chmielewski, J. Ringhausen, K. M. Calhoun, K. Brunner, E. C. Bruning, A. E. Reinhart, and C. C. Weiss, 2023: Using lightning data as a proxy for quasi-linear storm evolution, intensification, cold-pool development, and tornadic potential during the Propagation, Evolution, and Rotation in Linear Storms field project. *Preprints, 11th Conf. on the Meteorological Applications of Lightning Data*, Paper 1.2
- Singewald, D., E. C. Bruning, K. Brunner, S. A. Weiss, V. C. Chmielewski, and D. Zhang, 2023: A multi-sensor analysis of satellite and ground based lightning measurements of photographed lightning. *Preprints, 11th Conf. on the Meteorological Applications of Lightning Data*, Paper 3.5
- Steiger, S. M., E. C. Bruning, V. C. Chmielewski, G. T. Stano, J. M. Trostel, L. Boggs, J. L. Losego, Y. Wang, K. M. Calhoun, D. Kennedy, T. J. Lang, C. J. Schultz, S. Waugh, K. A. Kosiba, and J. Wurman, 2023: Overview of and initial results from the 2022-23 Lake-Effect Electrification (LEE) study in the Lake Ontario region. *Preprints, 11th Conf. on the Meteorological Applications of Lightning Data*, Paper 5.6

- Bruning, E. C., K. Brunner, J. Souza, M. van Lier-Walqui, and T. Logan, 2022a: Observations of mixed-phase microphysics and lightning for the 2022 TRACER/ESCAPE field campaigns. *Proc. Fifth Texas Weather Conference*
- Bruning, E. C., K. M. Calhoun, J. R. Leeman, V. C. Chmielewski, D. Kennedy, Z. Barney, K. Brunner, and S. A. Weiss, 2022c: An updated balloon-borne vector electric field meter with full inertial reference measurement. *Proc. 17th. Intl. Conf. Atmos. Elec., Tel Aviv, Israel*, Paper P2.3
- Bruning, E. C., K. Brunner, M. van Lier-Walqui, T. Logan, M. Miller, J. C. S. Souza, D. Singewald, and S. Weiss, 2022b: Radar polarimetry and flash rate variability in varying thermodynamic and aerosol environments in Houston, TX. *Eos Trans. AGU, Fall Meet. Suppl.*, AE13A-04
- Brunner, K., E. C. Bruning, and C. C. Weiss, 2022: An analysis of microphysical and kinematic controls of lightning activity in VORTEX-SE case storms. *Proc. Fifth Texas Weather Conference*
- Chmielewski, V., K. Calhoun, D. Kennedy, V. Salinas, J. Ringhausen, E. Bruning, and K. Brunner, 2022a: Preliminary mobile lightning mapping array observations during the PERiLS field campaign. *Proc. 17th. Intl. Conf. Atmos. Elec., Tel Aviv, Israel*, Paper O4.2
- Chmielewski, V., J. Ringhausen, V. Salinas, K. Calhoun, D. Kennedy, Z. Barney, E. Bruning, and K. Brunner, 2022b: Preliminary PERiLS analyses from a new mobile Lightning Mapping Array. *Eos Trans. AGU, Fall Meet. Suppl.*, AE13A-02
- Freeman, S. W., G. A. Sokolowsky, S. C. van den Heever, P. J. Marinescu, W. K. Jones, M. Heikenfeld, P. Stier, D. Watson-Parris, F. Senf, J. Kukulies, S. M. Collis, R. C. Jackson, B. Raut, X. Zhang, E. C. Bruning, and K. Brunner, 2022: tobac: Rapid tracking of cloud systems within 2d and 3d data. *Proc. 25th Conference on Satellite Meteorology, Oceanography, and Climatology / Joint 2022 NOAA Satellite Conference and 16th Conference on Atmospheric Radiation*, Amer. Meteor. Soc., 158
- Larsen, M. L., C. K. Blouin, C. A. Barber, A. R. Jameson, B. Hirth, and E. C. Bruning, 2022: Variability of raindrop size distributions in the lower boundary layer as measured by a Micro Rain Radar. *Proc. 16th Conference on Cloud Physics/16th Conference on Atmospheric Radiation*, Amer. Meteor. Soc., P93
- Kollias, P., G. McFarquhar, M. Wolde, P. Lawson, D. Bodine, R. Brientjes, E. Bruning, V. Chandrasekar, P. DeMott, A. Dzambo, M. Jensen, M. Kumjian, K. Lamer, Z. Lebo, T. Logan, K. Lombardo, E. Luke, M. Oue, G. Roberts, R. Shaw, J. Snyder, S. van den Heever, N. Allwayin, B. Ascher, J. Barr, N. Bala, K. Bliankinshtein, A. Brown, K. Brunner, Z. Mages, C. McCluskey, K. McKeown, E. Leghart, L. Nichman, M. Litzmann, C. Nguyen, R. Patnaude, S. Patil, R. Perkins, P. Tsai, K. Ranjbar, E. Rosky, B. Treserras, K. Tuftedal, and C. Wolff, 2022: Experiment of Sea Breeze Convection, Aerosols, Precipitation and Environment (ESCAPE). *Eos Trans. AGU, Fall Meet. Suppl.*, A45M-2022
- van Lier-Walqui, M., K. Brunner, E. Bruning, T. Matsui, T. Iguchi, D. Hernandez-Deckers, and A. M. Fridlind, 2022: Tracking isolated thunderstorms in Houston TX with polarimetric radar and the lightning mapping array. *Proc. 11th European Conference on Radar in Meteorology and Hydrology*, MIC2.P15
- Iguchi, T., T. Matsui, M. van Lier-Walqui, E. C. Bruning, and A. M. Fridlind, 2022a: Semi-operational NASA-Unified WRF forecasting simulations for TRACER IOP over Houston in 2022 summer. *Proc. 16th Conference on Cloud Physics*, Amer. Meteor. Soc., V42
- Schwartzman, D., E. Bruning, T.-Y. Yu, V. Chmielewski, D. Bodine, and H. B. Bluestein, 2022a: Analysis of polarimetric spectral densities in severe thunderstorms for the identification of lightning-induced signatures. *Proc. 11th European Conference on Radar in Meteorology and Hydrology*
- Schwartzman, D., E. Bruning, T.-Y. Yu, V. C. Chmielewski, D. Bodine, and H. B. Bluestein, 2022b: Analysis of polarimetric spectral densities in severe thunderstorms for the identification of lightning-induced signatures. *Proc. 11th European Conference on Radar in Meteorology and Hydrology*, POL.P9
- Souza, J., and E. C. Bruning, 2022b: Geometric effects on hydrometeors electrification in the noninductive relative growth rate charging mechanism. *Proc. 17th. Intl. Conf. Atmos. Elec., Tel Aviv, Israel*, Paper O1.4
- Souza, J., and E. Bruning, 2022a: Temperature distribution on ice particle surfaces and the microphysical implications on charge transfer. *Eos Trans. AGU, Fall Meet. Suppl.*, A35N-1661
- Weiss, S., and E. Bruning, 2022: Using modeled charge distributions and calculations of the resulting electric field to improve understanding of thunderstorm charge structures inferred from electric field profiles measured by balloon-borne electric field meters. *Eos Trans. AGU, Fall Meet. Suppl.*, AE25A-1863
- Barber, C. A., M. L. Larsen, E. Bruning, and B. Hirth, 2021: Preliminary analysis of bulk rain variables acquired from laser precipitation monitors mounted at different heights on a vertical tower. *21st Symposium on Meteorological Observation and Instrumentation*, 10-15 January 2021

- Back, A., S. Weygandt, C. Alexander, S. Benjamin, M. Hu, G. Ge, E. James, A. Kliever, J. Mecikalski, D. Dowell, E. Bruning, K. Hilburn, and A. Sebok, 2021: Convection-indicating GOES-R products assimilated in the experimental UFS Rapid Refresh System. *Eos Trans. AGU, Fall Meet. Suppl.*
- Boggs, L., T. Neubert, A. Nag, and E. Bruning, 2021a: Optical and radio emissions of a possible blue starter observed by ASIM and the West Texas LMA. *Abstracts, EGU General Assembly*, EGU21-13649
- Boggs, L., D. Mach, E. Bruning, N. Liu, O. van der Velde, J. Montanya, S. Cummer, V. Chmielewski, D. MacGorman, and M. Peterson, 2021b: Novel radio, optical, and meteorological observations of a gigantic jet with extraordinary charge transfer. *Eos Trans. AGU, Fall Meet. Suppl.*, AE22A-01
- Bruning, E. C., D. PeQueen, S. A. Weiss, and J. Jordan, 2021c: Multi-sensor comparison of lightning datasets in West Texas. *Preprints, 10th Conf. on the Meteorological Applications of Lightning Data*, 10-15 January 2021
- Bruning, E., 2021: Illuminated flash fraction imagery derived from GOES Geostationary Lightning Mapper data. *Eos Trans. AGU, Fall Meet. Suppl.*, AE35A-1904
- Brunner, K., E. C. Bruning, and C. Weiss, 2021: An analysis of lightning activity in response to microphysical processes in Southeast U.S. storms. *Eos Trans. AGU, Fall Meet. Suppl.*, AE15B-1896
- Duran, P., C. J. Schultz, E. Bruning, S. N. Stevenson, R. Allen, N. Johnson, and D. PeQueen, 2021a: Changes in inner-core lightning characteristics as Hurricane Dorian (2019) reached peak intensity. *Fourth Special Symposium on Tropical Meteorology and Tropical Cyclones*, 10-15 January 2021
- Lybrand, S., C. J. Schultz, P. Meyer, R. Allen, K. M. Calhoun, and E. C. Bruning, 2021: A case study validation of the geostationary lightning mapper infrared rgb product. *Preprints, 10th Conf. on the Meteorological Applications of Lightning Data*, 10-15 January 2021
- Murphy, K., E. C. Bruning, and C. J. Schultz, 2021a: A spatiotemporal lightning risk assessment using lightning mapping data. *Preprints, 10th Conf. on the Meteorological Applications of Lightning Data*, 10-15 January 2021
- PeQueen, D., E. C. Bruning, and S. N. Stevenson, 2021: Glm flash data trends in tropical cyclone intensification changes. *Preprints, 10th Conf. on the Meteorological Applications of Lightning Data*, 10-15 January 2021
- PeQueen, D., and E. C. Bruning, 2021: GLM flash data trends during tropical cyclone intensification changes. *Eos Trans. AGU, Fall Meet. Suppl.*, A13J-03
- Salinas, V., and E. C. Bruning, 2021: Identifying the representative kinematics in which lightning flash initiations occur and their influence on the associated microphysics and electrostatics. *Preprints, 10th Conf. on the Meteorological Applications of Lightning Data*, 10-15 January 2021
- Sharma, M., R. Tanamachi, D. T. Dawson II, Y. Jung, E. R. Mansell, E. C. Bruning, and K. Thomas, 2021d: Investigating the coupling of supercell dynamics and microphysics through lightning and cold pools. *Preprints, 10th Conf. on the Meteorological Applications of Lightning Data*, 10-15 January 2021
- Sharma, M., R. Tanamachi, E. C. Bruning, and K. M. Calhoun, 2021c: Polarimetric and electrical structure of the 19 May 2013 Edmond-Carney, Oklahoma, tornadic supercell. *Preprints, 10th Conf. on the Meteorological Applications of Lightning Data*, 10-15 January 2021
- Sharma, M., R. Tanamachi, E. Bruning, and S. De Iaco, 2021b: Spatiotemporal analysis of cold pool and lightning observations for a tornadic supercell from VORTEX-SE 2016 field campaign. *Eos Trans. AGU, Fall Meet. Suppl.*, AE21A-06
- Souza, J., and E. Bruning, 2021a: Analysis of lightning flash properties relative to turbulence in thunderstorms. *Preprints, 10th Conf. on the Meteorological Applications of Lightning Data*, 10-15 January 2021
- Welty, T., E. C. Bruning, C. C. Weiss, and J. McDonald, 2021: Using lightning's microphysical link to better understand storm conditions and processes. *Preprints, 10th Conf. on the Meteorological Applications of Lightning Data*, 10-15 January 2021
- Bruning, E. C., 2020: What would it take to predict lightning? *Proc. Fourth Texas Weather Conference*, 24-25 September 2020, URL <https://youtu.be/TC0IwzWxw8I>
- Bruning, E. C., D. PeQueen, S. A. Weiss, and J. Jordan, 2020: Multi-sensor comparison of lightning datasets in West Texas. *Eos Trans. AGU, Fall Meet. Suppl.*, AE007-05
- Calhoun, K. M., E. C. Bruning, C. J. Schultz, and T. C. Meyer, 2020: GLM use, feedback, and development in the Hazardous Weather Testbed. *Preprints, 16th Annual Symposium on New Generation Operational Environmental Satellite Systems*, Paper 6.1, AMS Annual Meeting, Boston, MA, USA

- Duran, P., C. J. Schultz, R. Allen, E. Bruning, S. N. Stevenson, and D. PeQueen, 2020: Using GLM flash density, flash area, and flash energy to diagnose tropical cyclone structure and intensification. *Proc. JPSS/GOES-R Proving Ground / Risk Reduction Summit*, College Park, MD; United States, URL <https://ntrs.nasa.gov/search.jsp?R=20200001351>
- Jensen, M., E. C. Bruning, D. R. Collins, A. M. Fridlind, P. Kollias, C. Kuang, A. V. Ryzhkov, D. Rosenfeld, A. C. Varble, N. Bharadwaj, S. Collis, J. H. Flynn, S. E. Giangrade, J. C. Hardin, H. Powers, J. Quaas, R. Sheesley, S. Springston, P. Stier, and S. C. van den Heever, 2020a: Tracking Aerosol Convection interactions Experiment (TRACER): An upcoming field campaign. *Preprints, 12th Symposium on Aerosol - Cloud - Climate Interactions*, Paper 10.5, AMS Annual Meeting, Boston, MA, USA
- Jensen, M., E. C. Bruning, D. R. Collins, A. M. Fridlind, P. Kollias, C. Kuang, A. V. Ryzhkov, D. Rosenfeld, A. C. Varble, and H. H. Powers, 2020b: Tracking Aerosol Convection interactions Experiment (TRACER): An upcoming field campaign. *Eos Trans. AGU, Fall Meet. Suppl.*, A045-05
- PeQueen, D., and E. C. Bruning, 2020: Diagnosing intensification changes of tropical cyclones using glm flash data. *Proc. Fourth Texas Weather Conference*, 24–25 September 2020, URL <https://youtu.be/TC0IwzWxW8I>
- Salinas, V., and E. C. Bruning, 2020: Investigating the influence of thunderstorm kinematics on local increases in electric fields and charge preceding lightning flash initiations. *Proc. Fourth Texas Weather Conference*, 24–25 September 2020, URL <https://youtu.be/TC0IwzWxW8I>
- Souza, J. C. S., and E. C. Bruning, 2020: Flash propagation relative to radar-estimated turbulence during the KTaL experiment. *Proc. Fourth Texas Weather Conference*, 24–25 September 2020, URL <https://youtu.be/TC0IwzWxW8I>
- Welty, T., and E. C. Bruning, 2020: Using lightning's microphysical link to better understand storm conditions and processes. *Proc. Fourth Texas Weather Conference*, 24–25 September 2020, URL <https://youtu.be/TC0IwzWxW8I>
- Williams, J., E. C. Bruning, E. R. Mansell, and K. Ardon-Dryer, 2020: Effects of ice nuclei particle parameterization on cloud formation and electrification using the COMMAS model. *Preprints, 12th Symposium on Aerosol - Cloud - Climate Interactions*, Paper 1431, AMS Annual Meeting, Boston, MA, USA
- Bruning, E. C., V. Salinas, and L. Schielicke, 2019a: Concerning the coupling of fluid flows to thunderstorm electrostatics and lightning. *Preprints, 22nd Conference on Atmospheric and Oceanic Fluid Dynamics*, Poster 2, Portland, ME, USA
- Bruning, E. C., 2019c: When you wish upon a star: Early Career Scientist perspectives on the future of Beyond Earth sciences. *Eos Trans. AGU, Fall Meet. Suppl.*, U34A (invited panelist)
- Bruning, E. C., C. J. Schultz, and K. M. Calhoun, 2019b: Quantification of lightning flash characteristics using meteorological imagery from the Geostationary Lightning Mapper. *Eos Trans. AGU, Fall Meet. Suppl.*, AE24A-03
- Bruning, E. C., C. E. Tillier, S. F. Edgington, J. K. Zajic, S. D. Rudlosky, K. M. Calhoun, C. M. Gravelle, and M. Foster, 2019c: Design and implementation of GLM gridded imagery for operations and research. *Preprints, Ninth Conference on the Meteorological Application of Lightning Data*, Paper TJ21.1, Phoenix, AZ
- Calhoun, K. M., T. C. Meyer, E. C. Bruning, C. J. Schultz, G. T. Stano, P. A. Campbell, J. K. Zajic, and S. D. Rudlosky, 2019: Operational use, analysis, and applications of Geostationary Lightning Mapper data in the Hazardous Weather Testbed. *Preprints, 15th Annual Symposium on New Generation Operational Environmental Satellite Systems*, Paper TJ14.1, Phoenix, AZ
- Lyons, W. A., E. C. Bruning, S. F. Edgington, C. E. Tillier, D. R. MacGorman, T. A. Warner, T. E. Nelson, J. C. S. Souza, and K. M. Calhoun, 2019: Documenting a 400+ km long mesoscale lightning flash in an MCS trailing stratiform region using GLM, NLDN, and OKLMA data. *Preprints, Ninth Conference on the Meteorological Application of Lightning Data*, Paper TJ20.1, Phoenix, AZ
- Newbern, D., and E. C. Bruning, 2019: Winter lightning events in Iowa. *Eos Trans. AGU, Fall Meet. Suppl.*, AE11A-3196
- Nixon, C., and E. C. Bruning, 2019: The GOES-16 Geostationary Lightning Mapper: Using lightning trends operationally during tornadic storms in VORTEX-SE and other cases. *Preprints, Ninth Conf. on the Meteorological Applications of Lightning Data*, AMS Annual Meeting, Phoenix, AZ, Paper 7.1

- Rudlosky, S. D., E. Bruning, K. M. Calhoun, and C. J. Schultz, 2019a: Geostationary Lightning Mapper products. *Preprints, 2019 Joint Satellite Conference*, Paper 13A.1, Boston, MA, USA
- Salinas, V., E. C. Bruning, L. Schielicke, E. Mansell, and M. D. Brothers, 2019: Enhancement of electric fields and charge density by thunderstorm turbulence leading to flash initiation in simulated thunderstorms. *Eos Trans. AGU, Fall Meet. Suppl.*, AE24A–15
- Salinas, V., and E. C. Bruning, 2019: Observations of lightning flash characteristics in turbulent environments of thunderstorms. *Preprints, Ninth Conference on the Meteorological Application of Lightning Data*, Paper 2.2, Phoenix, AZ
- Schultz, C. J., L. D. Carey, N. Curtis, K. M. Calhoun, and E. C. Bruning, 2019: Characterization of optical energy output in thunderstorms to enhance severe thunderstorm identification. *Preprints, Ninth Conference on the Meteorological Application of Lightning Data*, Paper 7.4, Phoenix, AZ
- Sharma, M., R. Tanamachi, E. Bruning, K. M. Calhoun, H. B. Bluestein, J. B. Houser, J. C. Snyder, and Z. B. Wienhoff, 2019: Observational analysis of the electrical and kinematic structure of a tornadic supercell. *Preprints, Ninth Conference on the Meteorological Application of Lightning Data*, Paper 2.5, Phoenix, AZ
- Souza, J. C. S., and E. C. Bruning, 2019: Flash propagation relative to radar-estimated turbulence during the KTaL experiment. *Eos Trans. AGU, Fall Meet. Suppl.*, AE21B–3064
- Souza, J. C. S., E. C. Bruning, R. I. Albrecht, T. A. Warner, D. R. MacGorman, K. M. Kuhlman, and W. A. Lyons, 2019: Observations of upward lightning-producing storm in oklahoma. *Preprints, Ninth Conference on the Meteorological Application of Lightning Data*, Paper 2.1, Phoenix, AZ
- Stano, G., C. M. Gravelle, M. J. Foster, E. Bruning, S. D. Rudlosky, J. K. Zajic, L. A. Byerle, E. M. Guillot, K. M. Calhoun, B. Gockel, and K. J. Runk, 2019: Early assessment of the Geostationary Lightning Mapper. *Preprints, Ninth Conference on the Meteorological Application of Lightning Data*, Paper 6.4, Phoenix, AZ
- Thomas, R. J., P. R. Krehbiel, W. Rison, S. A. Weiss, M. A. Stanley, and E. C. Bruning, 2019b: Evaluation of the GOES 16 and 17 Geostationary Lightning Mappers (GLM) using ground based Lightning Mapping Array (LMA) observations. *Eos Trans. AGU, Fall Meet. Suppl.*, AE21A–05
- Thomas, R. J., P. R. Krehbiel, W. Rison, D. R. MacGorman, E. C. Bruning, and M. A. Stanley, 2019a: Evaluation of the GOES-R Geostationary Lightning Mapper (GLM) using ground-based Lightning Mapping Array (LMA) observations. *Preprints, Ninth Conference on the Meteorological Application of Lightning Data*, Paper TJ21.4, Phoenix, AZ
- Weiss, S. A., and E. C. Bruning, 2019b: Investigation of drop-offs in detection efficiency of GOES-16 Geostationary Lightning Mapper data as compared to Lightning Mapping Array data. *Eos Trans. AGU, Fall Meet. Suppl.*, AE11A–3185
- Weiss, S. A., and E. C. Bruning, 2019a: Comparison of GOES-16 Geostationary Lightning Mapper data to Lightning Mapping Array data. *Preprints, 15th Annual Symposium on New Generation Operational Environmental Satellite Systems*, Paper 1017, Phoenix, AZ
- Bruning, E. C., J. Chastang, and T. Yoksas, 2018a: Taking Geostationary Lightning Mapper data to the community with Python. *Eos Trans. AGU, Fall Meet. Suppl.*, paper NS53A-0544
- Bruning, E. C., 2018a: Meteorological imagery from the GOES-16 Geostationary Lightning Mapper. *Proc. Third Annual Texas Weather Conference*, 21–22 September 2018, invited keynote
- Bruning, E. C., T. Fuentes, S. Berkseth, and V. Salinas, 2018b: Visualizing lightning and turbulence through a combined art-science exhibit. *16th Intl. Conf. Atmos. Elec., Nara, Japan*, Paper P-03-07
- Bruning, E. C., V. Salinas, C. Nixon, S. Berkseth, M. D. Brothers, E. R. Mansell, and V. C. Chmielewski, 2018c: The coupling of thunderstorm kinetic and electrical energetics. *16th Intl. Conf. Atmos. Elec., Nara, Japan*, Paper O-05-03
- Bruning, E. C., 2018b: Processing and quality-controlled visualization of GOES-16 GLM data. *Eighth Symposium on Advances in Modeling and Analysis Using Python*, Austin, TX, USA, American Meteorological Society. P. 7.4
- Calhoun, K. M., D. M. Kingfield, A. O. Fierro, P. A. Campbell, A. Reinhart, M. Mahalik, A. Schumacher, and E. Bruning, 2018b: Lightning frequency and 2017 atlantic hurricane intensity and landfall. *16th Intl. Conf. Atmos. Elec., Nara, Japan*, Paper O-09-01
- Calhoun, K. M., E. C. Bruning, and C. J. Schultz, 2018a: Principles and operational applications of Geostationary Lightning Mapper data for severe local storms. *Preprints, 29th Conference on Severe Local Storms*, Paper 2.3

- Chmielewski, V. C., E. C. Bruning, and B. C. Ancell, 2018a: The effect of dry-air entrainment on charge structure in cellular thunderstorms. *16th Intl. Conf. Atmos. Elec., Nara, Japan*, Paper O-04-04
- Dahl, J., C. C. Weiss, E. C. Bruning, D. Dowell, and C. R. Alexander, 2018: Impact of orography on updraft rotation in simulated supercells. *Preprints, 29th Conference on Severe Local Storms*, Paper 109
- Salinas, V., E. C. Bruning, and S. Berksth, 2018: Observations of thunderstorm kinematics: Characteristics of lightning in turbulent environments. *16th Intl. Conf. Atmos. Elec., Nara, Japan*, Paper P-05-14
- MacGorman, D. R., S. A. Weiss, E. Bruning, and V. C. Chmielewski, 2018: A climatology of total lightning flashes mapped by the Oklahoma Lightning Mapping Array 2003-2012. *16th Intl. Conf. Atmos. Elec., Nara, Japan*, Paper P-09-13
- Murphy, K., E. C. Bruning, and J. Vanos, 2018: Assessing lightning risk in vulnerable outdoor environments. *13th Symposium on Societal Applications: Policy, Research and Practice*, Austin, TX, USA, American Meteorological Society. P. 11.2
- Sharma, M., R. Tanamachi, E. C. Bruning, K. M. Calhoun, H. B. Bluestein, J. B. Houser, J. C. Snyder, and Z. B. Wienhoff, 2018: A case study of kinematical, microphysical, and lightning characteristics of a tornadic supercell. *Preprints, 29th Conference on Severe Local Storms*, Paper 172, Stowe, VT
- Skinner, P. S., W. S. Gunter, E. C. Bruning, C. C. Weiss, J. L. Schroeder, and S. M. Berkseth, 2018: Turbulence characteristics of severe straight-line winds in a rear-flank downdraft and bow echo observed by the Texas Tech Univ. Ka-band mobile Doppler radars. *Preprints, 29th Conference on Severe Local Storms*, Paper 30, Stowe, VT
- Weiss, C. C., D. C. Dowell, A. J. Hill, J. McDonald, E. C. Bruning, and J. Dahl, 2018a: An update on VORTEX-SE activities at Texas Tech Univ. *Preprints, 29th Conference on Severe Local Storms*, Paper 3B.1, Stowe, VT
- Bruning, E. C., S. A. Cummer, K. Palivec, W. A. Lyons, V. C. Chmielewski, and D. R. MacGorman, 2017a: Video, LMA and ULF observations of a negative gigantic jet in North Texas. *Eos Trans. AGU, Fall Meet. Suppl.*, paper AE21A-03
- Bruning, E. C., 2017c: Quantifying the energetics of lightning flashes from LMA and GLM observations. *Texas A&M Symposium in Honor of Richard Orville*, College Station, TX (invited)
- Bruning, E. C., 2017b: No longer a dot product: Evidence of thunderstorm fluid dynamics in modern lightning measurements. *National Center for Atmospheric Research MMM Seminar Series*, Boulder, CO
- Bruning, E. C., 2017a: From the field to geostationary orbit: Mapping lightning with Python. *Conference on Scientific Computing with Python (SciPy)*, URL <https://github.com/deeplycloudy/scipy2017/tree/master>
- Berkseth, S. M., and E. C. Bruning, 2017: Quantitative analysis of the turbulent structure of convection and its relation to thunderstorm electrical properties. *Preprints, Eighth Conf. on the Meteorological Applications of Lightning Data*, AMS Annual Meeting, Seattle, WA
- Brothers, M. D., E. C. Bruning, and E. R. Mansell, 2017: Investigating the relative contribution of charge deposition in organizing charge within a thunderstorm. *Preprints, Eighth Conf. on the Meteorological Applications of Lightning Data*, AMS Annual Meeting, Seattle, WA
- Bruning, E. C., V. Salinas, S. M. Berkseth, M. D. Brothers, and V. C. Chmielewski, 2017b: Lightning flash sizes relative to storm structure and turbulence during the Kinematic Texture and Lightning Experiment. *Preprints, Eighth Conf. on the Meteorological Applications of Lightning Data*, AMS Annual Meeting, Seattle, WA
- Chmielewski, V. C., and E. Bruning, 2017: Simulated lma source and flash detection efficiency using a new interactive tool. *Preprints, Eighth Conf. on the Meteorological Applications of Lightning Data*, AMS Annual Meeting, Seattle, WA
- Chmielewski, V. C., E. C. Bruning, and B. C. Ancell, 2017: An analysis of small changes in environment which resulted in diverse charge structures on 4 June 2012 in west Texas. *Preprints, Eighth Conf. on the Meteorological Applications of Lightning Data*, AMS Annual Meeting, Seattle, WA
- Cummings, K. A., K. E. Pickering, M. C. Barth, M. M. Bela, Y. Li, D. Allen, E. Bruning, V. C. Chmielewski, D. R. MacGorman, S. A. Rutledge, B. Basarab, B. A. Fuchs, T. Davis, A. Weinheimer, I. Pollack, T. B. Ryerson, F. Flocke, T. Campos, G. Diskin, L. Carey, R. M. Mecikalski, C. L. Ziegler, E. R. Mansell, M. Biggerstaff, D. P. Betten, E. DiGangi, R. Doherty, and D. Finney, 2017: WRF-chem simulations of lightning-NO_x production and transport in Oklahoma and Colorado thunderstorms observed during DC3. *Preprints, 19th Conference on Atmospheric Chemistry*, AMS Annual Meeting, Seattle, WA

- Dahl, J., C. Weiss, E. Bruning, D. Dowell, and C. Alexander, 2017: Behavior of vertical-vorticity rivers in simulated supercells. *Proc. 9th European Conf. on Severe Storms, Pula, Croatia*, ECSS2017-167-1
- Harr, P., M. C. Barth, M. Bell, E. Bruning, and P. Markowski, 2017: Storm-penetrating aircraft: Scientific opportunities provided by the availability of an A-10 aircraft. *NSF-organized Side Panel Discussion*, AMS Annual Meeting, Seattle, WA (invited)
- Salinas, V., E. C. Bruning, M. D. Brothers, and E. R. Mansell, 2017: Evaluating a flash size and energy dissipation relationship through various modeling techniques. *Eos Trans. AGU, Fall Meet. Suppl.*, paper AE13A-2234
- Weiss, C. C., E. C. Bruning, J. Dahl, D. Dowell, C. R. Alexander, A. J. Hill, and V. C. Chmielewski, 2017b: An overview of Texas Tech operations during vortex-se 2016. *Preprints, Special Symposium on Severe Local Storms: Observation Needs to Advance Research, Prediction, and Communication*, AMS Annual Meeting, Seattle, WA
- Weiss, C., E. Bruning, J. Dahl, D. Dowell, C. Alexander, A. Hill, and V. Chmielewski, 2017a: Preliminary results from the 2016 and 2017 VORTEX-SE project. *Proc. 9th European Conf. on Severe Storms, Pula, Croatia*, ECSS2017-155
- Bruning, E. C., V. C. Chmielewski, C. C. Weiss, J. Dahl, A. J. Hill, C. J. Schultz, and J. Bailey, 2016a: Flash size distributions characterized by mobile LMA deployments during VORTEX-SE. *Preprints, 28th Conference on Severe Local Storms*, Portland, OR, paper 9.4
- Bruning, E. C., V. Salinas, S. M. Berkseth, V. C. Chmielewski, and M. D. Brothers, 2016b: Lightning flash sizes relative to storm structure and turbulence during the Kinematic Texture and Lightning Experiment. *Eos Trans. AGU, Fall Meet. Suppl.*, paper AE23A-0417
- Chmielewski, V. C., and E. C. Bruning, 2016: Lightning mapping array flash detection performance with variable receiver thresholds. *J. Geophys. Res. Atmos.*, **121** (14), 8600–8614, doi: 10.1002/2016jd025159
- Chmielewski, V., E. C. Bruning, and B. C. Ancell, 2016: An analysis of small changes in environment which resulted in diverse charge structures on 4 June 2012 in West Texas. *Eos Trans. AGU, Fall Meet. Suppl.*, paper AE21A-02
- Cummings, K. A., K. E. Pickering, M. C. Barth, M. M. Bela, Y. Li, D. Allen, E. Bruning, D. R. MacGorman, S. A. Rutledge, B. Basarab, B. A. Fuchs, A. Weinheimer, I. Pollack, T. B. Ryerson, F. Flocke, T. Campos, G. Diskin, and L. Carey, 2016: WRF-chem simulations of lightning-NO_x production and transport in Oklahoma and Colorado thunderstorms observed during DC3. *Preprints, 18th Conference on Atmospheric Chemistry*, paper 3.3
- Fuchs, B. R., S. A. Rutledge, E. C. Bruning, and T. Davis, 2016b: Three dimensional lightning channel distributions in thunderstorms. *Eos Trans. AGU, Fall Meet. Suppl.*, paper AE23A-0403
- Lyu, F., S. A. Cummer, M. S. Briggs, M. Marisaldi, R. J. Blakeslee, E. C. Bruning, J. G. Wilson, W. Rison, P. R. Krehbiel, G. Lu, E. Cramer, G. Fitzpatrick, B. Maliyan, S. McBreen, O. Roberts, M. Stanbro, and D. M. Smith, 2016b: Ground detection of terrestrial gamma-ray flashes from distant radio signals. *Eos Trans. AGU, Fall Meet. Suppl.*, paper AE21A-02
- Salinas, V., and E. C. Bruning, 2016: Electrical and turbulent kinetic energy spectra during the Kinematic Texture and Lightning Experiment. *Eos Trans. AGU, Fall Meet. Suppl.*, paper AE21A-03
- Weiss, C. C., E. C. Bruning, J. Dahl, D. Dowell, C. R. Alexander, A. J. Hill, and V. C. Chmielewski, 2016: An overview of Texas Tech operations during VORTEX-SE 2016. *Preprints, 28th Conference on Severe Local Storms*, Portland, OR, paper 3.5
- Bruning, E. C., S. M. Berkseth, V. Salinas, V. Chmielewski, and P. J. Ware, 2015a: Observations of the spatial and temporal distribution of lightning flash sizes. *Eos Trans. AGU, Fall Meet. Suppl.*, AE21A-02 (invited)
- Chmielewski, V., and E. C. Bruning, 2015: Simulated source and flash detection efficiency during the Deep Convective Clouds and Chemistry field campaign using a new interactive tool. *Eos Trans. AGU, Fall Meet. Suppl.*, AE31C-0448
- Salinas, V., and E. C. Bruning, 2015: Geometrical dependence of electrical energy dissipated for intra-cloud flashes using LMA data. *Eos Trans. AGU Fall Meet. Suppl.*, AE31C-0447
- Schultz, C. J., E. C. Bruning, T. J. Lang, and K. M. Kuhlman, 2015: Characteristics of lightning within electrified snowfall events using total lightning measurements. *Eos Trans. AGU, Fall Meet. Suppl.*, AE31C-0452

- Lang, T. J., N. Guy, E. C. Bruning, and S. M. Berkseth, 2015: Investigating the relationship between turbulence and lightning. *Eos Trans. AGU, Fall Meet. Suppl.*, AE31C-0451
- Berkseth, S. M., and E. C. Bruning, 2015: Quantitative analysis of the turbulent structure of convection and its relation to thunderstorm electrical properties. *Preprints, 37th Conference on Radar Meteorology, Norman, OK, American Meteorological Society*
- Bruning, E. C., V. C. Sullivan, V. Salinas, S. M. Berkseth, P. J. Ware, and S. A. Weiss, 2015b: Initial observations from the Kinematic Texture and Lightning (KTaL) experiment. *Proc. 8th European Conf. on Severe Storms, Wiener Neustadt, Austria, European Severe Storms Laboratory*
- Bruning, E. C., V. C. Sullivan, V. Salinas, S. M. Berkseth, P. J. Ware, and S. A. Weiss, 2015c: Initial observations from the Kinematic Texture and Lightning (KTaL) experiment. *Preprints, 37th Conference on Radar Meteorology, Norman, OK, American Meteorological Society*
- Bruning, E. C., 2015c: Thunderstorm electrification and lightning flash sizes in meteorological context (Core Science Lecture). *Seventh Conference on the Meteorological Applications of Lightning Data*, Paper 3.1, AMS Annual Meeting, Phoenix, AZ, USA, invited
- Bruning, E. C., 2015b: Meteorology and lightning flash rate, size, and energy. *National Space Science and Technology Center Seminar Series, Univ. of Alabama - Huntsville (invited)*
- Cummings, K., K. E. Pickering, M. C. Barth, M. M. Bela, Y. Li, D. J. Allen, E. C. Bruning, D. R. MacGorman, S. A. Rutledge, B. A. Fuchs, A. J. Weinheimer, I. B. Pollack, T. B. Ryerson, H. Huntrieser, and M. I. Biggerstaff, 2015: A WRF-Chem analysis of flash rates, lightning-NO_x production and subsequent trace gas chemistry of the 29-30 May 2012 convective event in Oklahoma during DC3. *Seventh Conference on the Meteorological Applications of Lightning Data*, Paper 9.4, AMS Annual Meeting, Phoenix, AZ, USA
- DiGangi, E., D. R. MacGorman, C. L. Ziegler, M. I. Biggerstaff, D. P. Betten, and E. C. Bruning, 2015: Flash size and rates relative to the evolving kinematics and microphysics of the 29 May Kingfisher supercell observed during DC3. *Seventh Conference on the Meteorological Applications of Lightning Data*, Paper 9.3, AMS Annual Meeting, Phoenix, AZ, USA
- Fuchs, B. R., S. A. Rutledge, P. Kennedy, E. C. Bruning, and V. N. Bringi, 2015b: Anomalously electrified storms in Colorado: A search for physical mechanisms. *Seventh Conference on the Meteorological Applications of Lightning Data*, Paper 9.5, AMS Annual Meeting, Phoenix, AZ, USA
- Jordan, J., S. Cobb, and E. C. Bruning, 2015: Use of the West Texas Lightning Mapping Array in operations at WFO Lubbock. *Seventh Conference on the Meteorological Applications of Lightning Data*, Paper 5.2, AMS Annual Meeting, Phoenix, AZ, USA
- Sullivan, V. C., E. Bruning, B. Ancell, and A. Reinhart, 2015: Surprising sensitivity of lightning and related storm processes to environment on 4 June 2012 in West Texas. *Proc. 8th European Conf. on Severe Storms, Wiener Neustadt, Austria, European Severe Storms Laboratory*

Scientific Software and Data Products

- Bruning, E. C., V. C. Chmielewski, V. Salinas, J. C. S. Souza, and S. Berkseth, 2021b: West Texas Lightning Mapping Array - KTaL 2015-2016. Zenodo, doi: 10.5281/zenodo.4509546
- Bruning, E. C., S. Berkseth, J. C. S. Souza, V. C. Chmielewski, and V. Salinas, 2021a: TTU-Ka mobile Doppler radar - KTaL 2015-2016. Zenodo, doi: 10.5281/zenodo.4515064
- Bruning, E. C., 2019b: glmttools. URL <https://github.com/deeplycloudy/glmttools/>, Software package, doi: 10.5281/zenodo.2648658
- Bruning, E., 2019a: GOES-R PLT West Texas Lightning Mapping Array (LMA). Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A., doi: 10.5067/GOESRPLT/LMA/DATA701
- Bruning, E. C., 2015a: lmatools: lmatools-v0.5z-stable. URL <http://dx.doi.org/10.5281/zenodo.32510>, Software package, doi: 10.5281/zenodo.32510
- May, R. M., S. C. Arms, P. Marsh, E. Bruning, J. R. Leeman, K. Goebbert, J. E. Thielen, and Z. S. Bruick, 2008 – 2020: Metpy: A Python package for meteorological data. Boulder, Colorado, URL <https://github.com/Unidata/MetPy>, doi: 10.5065/D6WW7G29

Pending Support

- None.

Current Support

- Collaborative Research: EAGER: Initial Evaluation of Polarimetric Phased Array Radar for the Study of Storm Electrification and Lightning. PI: Eric Bruning, Funding Agency: NSF, \$77,584, 0.0/0.5 months per year, 1 Apr 2023 - 30 Sep 2024 (1.5 yr). Program Manager: NSF AGS/PDM, Nicholas Anderson, (703) 292-4715, nanderso@nsf.gov. (recommended for funding, 100% of TTU effort, \$77,584,000). Indirect cost portion: \$24,288.70.
- TTU support to GOES-R GLM cal/val and products. PI: Eric Bruning, Funding Agency: NOAA task via U. Oklahoma / Cooperative Institute for Severe and High Impact Weather Research and Operations). \$89,933, 0.6 months, 1 Sep 2022-31 Aug 2023. Program Manager: Daniel T. Lindsey, NOAA GOES-R Program, (970) 491-8773, dan.lindsey@noaa.gov. (current, 100% of TTU effort, \$89,933). Indirect cost portion: \$29,381.
- Synergetic Surface-based and Satellite-borne Measurements of Arid-region Aerosol and Precipitation (S3-MAAP); TTU PI Sandip Pal, Funding Agency: NASA. \$590,000. 0.5/0.0/0.0/0.0/0.5 mo/yr. 1 October 2022 – 30 September 2027. Program Manager: Barry Lefer, NASA HQ, (202) 358-3857, barry.lefer@nasa.gov. (current, 15% of TTU effort, \$88,500). Indirect cost portion: \$28,450.
- Continuation Supplement to “Polarimetric radar & lightning analysis and high resolution simulations to support TRACER science goals”; TTU PI Eric Bruning, Funding Agency: DOE via subaward from Columbia Univ. (Columbia PI Marcus van Lier-Walqui). \$99,669, 1.0 month , 15 September 2023 – 14 September 2024. Program Manager: Shaima Nasiri, DOE CESD/ASR, (301) 903-0207, Shaima.Nasiri@science.doe.gov. (current, 100% of TTU effort, \$99,669). Indirect cost portion: \$34,526.
- Collaborative Research: Project LEE: Lake-Effect Electrification and the impacts of wind turbines on electrification east of Lake Ontario. PI: Eric Bruning, Funding Agency: NSF, \$315,967, 1.0/1.0/1.0 months per year, 1 August 2022 - 31 July 2025. Program Manager: NSF AGS/PDM, Yu Gu, (703) 292-8796, ygu@nsf.gov. (current, 100% of TTU effort, \$315,967). Indirect cost portion: \$99,074.
- VORTEX-USA: Spatiotemporal analysis of lightning and the mesoscale environment to identify significantly severe and potentially tornadic storms. PI: Eric Bruning, Funding Agency: NOAA/OAR/WPO, \$455,070, 0.5/0.5/0.5 months per year, 1 August 2022 - 31 July 2025. Program Manager: Jordan Dale, 301-734-1243, jordan.dale@noaa.gov. (current, 100% of TTU effort, \$455,070). Indirect cost portion: \$157,638.
- Environmental and Storm-generated Controls in Modulating Quasi-linear Convective System Vertical Vorticity: Dynamics and Detection; TTU PI Christopher Weiss. Funding Agency: NOAA. \$1,589,283, 1.0/1.0/1.0 months per year, 1 September 2021 - 31 August 2024. Three subaward institutions. Program Manager: Bruce Gibbs, NOAA OAR, bruce.t.gibbs@noaa.gov, (301) 734-1134. (current, 50% of TTU effort, \$369,080). Indirect cost portion: \$261,160.
- Polarimetric radar & lightning analysis and high resolution simulations to support TRACER science goals; TTU PI Eric Bruning, Funding Agency: DOE via subaward from Columbia Univ. (Columbia PI Marcus van Lier-Walqui). \$269,569, 1.0/1.0/1.0 months per year, 1 August 2020-31 July 2023. Program Manager: Shaima Nasiri, DOE CESD/ASR, (301) 903-0207, Shaima.Nasiri@science.doe.gov. (current, 100% of TTU effort, \$269,569). Indirect cost portion: \$84,085.
- Collaborative Research: Experiment of Sea Breeze Convection, Aerosols, Precipitation and Environment (ESCAPE). PI: Eric Bruning, Funding Agency: NSF, \$157,644, 0.5/1.5/1.0 months per year, 1 January 2021 - 31 December 2023. Program Manager: NSF AGS/PDM, Nicholas Anderson, (703) 292-4715, nanderso@nsf.gov. (current, 100% of TTU effort, \$157,644). Indirect cost portion: \$50,780.

- TTU support for drop size distribution and rainfall profiles at the 200m tower. Subaward of “Collaborative Research to Explore the Spatial/Temporal Statistical-Physical Structures of Rain in the Vertical Plane,” AGS-2001490. TTU PI: Eric Bruning, Funding Agency: College of Charleston (original source: NSF), \$ 35,131 1 April 2020 – 31 March 2023, 0 months per year (current, 50% of TTU effort, \$ 17,566).
- Texas Tech University Support to GOES-R GLM Validation. PI: Eric Bruning, Funding Agency: NOAA/NASA-MSFC, \$463,947, 1.5/1.0/1.5 months per year, 1 September 2019 – 31 August 2023. Program Manager: Richard Blakeslee, NASA MSFC, (256) 961-7962, rich.blakeslee@nasa.gov. (current, 100% of TTU effort, \$463,947, in one-year no-cost extension, faculty support expended). Indirect cost portion: \$127,905.

Previous awards

- VORTEX-SE: Characterization of microphysical processes in potentially tornadic Southeast U.S. storms via polarimetric radar - disdrometer - lightning synthesis. PI: Eric Bruning, Funding Agency: NOAA, \$147,273, 1 September 2019 – 31 August 2022, 0/1 months per year. Program Manager: NOAA OAR/OWAQ, Kandis Boyd, (301) 734-1026, kandis.boyd@noaa.gov. (current, 50% of TTU effort, \$73,636). Indirect cost portion: \$44,617.
- Optimizing Geostationary Lightning Mapper Use in AWIPS. PI: Eric Bruning, Funding Agency: NOAA via U. Maryland CISES subcontract, \$211,742, 1 August 2019 – 30 June 2022, 0.5 / 0.5 months per year. Program Manager: Fernando Miralles-Wilhelm, U. Maryland CISES, (301) 405-0788, fwilhelm@umd.edu. (100% of TTU effort, \$136,587) Indirect cost portion: \$41,780.
- VORTEX-SE: Establishing the Interdependence of Thermodynamic State, Lightning, and Low-Level Vorticity as a Foundation for Improved Forecaster Awareness of Southeast U.S. Storms. PI: Christopher Weiss, Funding Agency: NOAA, \$299,040, 1 September 2018 – 31 August 2021, 1/1 months per year. Program Manager: NOAA OAR/OWAQ, Kandis Boyd, (301) 734-1026, kandis.boyd@noaa.gov. (50% of TTU effort, \$149,520) Indirect cost portion: \$89,350.
- CAREER: Thunderstorm electrical energy structure, dissipation, and visualization. PI: Eric Bruning, Funding Agency: NSF, \$738,576, 0.25/1/1/1/1 months per year, 1 May 2014 – 30 April 2021. Program Manager: Nicholas Anderson, NSF AGS/PDM, (703) 292-4715, nanderso@nsf.gov. (100% of TTU effort, \$738,576). Indirect cost portion: \$214,246.
- Meteosat Third Generation Lightning Imager / Geostationary Lightning Mapper Intercomparison Study; TTU PI Eric Bruning, Funding Agency: National Meteorological Administration of Romania (original source: EUMETSAT). \$37,430.00, 1 semester teaching buyout, 15 December 2020 - 15 April 2021. Contact: Andrei Diamandi, NMA Romania and EUMETSAT NWC SAF Local Manager, diamandi@meteoromania.ro. (100% of TTU effort, \$37,430.00). Indirect cost portion: \$12,641.92.
- VORTEX-SE: Insights into the Structure and Predictability of Southeastern U.S. Tornadic Storms Afforded by Intensive Observation and High-Resolution Numerical Modeling. PI: Christopher C. Weiss, Funding Agency: NOAA, \$149,754, 1 September 2017 – 31 August 2020, 0/0 months per year. Program Manager: NOAA OAR/OWAQ, Kandis Boyd, (301) 734-1026, kandis.boyd@noaa.gov. (33% of TTU effort, \$49,418). Indirect cost portion: \$45,758.
- Precipitation Drop Size Measurement on the TTU 200 m Tower. PI: Eric Bruning, Funding Agency: College of Charleston (original source: NSF), \$ 10,609 1 March 2019 – 31 March 2020, 0 months per year (current, 50% of TTU effort, \$ 5,304).
- Optimizing Geostationary Lightning Mapper Use in AWIPS. PI: Eric Bruning, Funding Agency: NOAA via U. Maryland CICS subcontract, \$61,895, 1 September 2018 – 30 June 2020, 1 month total (current, 100% of TTU effort, \$61,895).
- Cloud-ready Processing and Dissemination of GOES-16 Geostationary Lightning Mapper Gridded Imagery. PI: Eric Bruning, Funding Agency: Univ. Corp. Atmos. Res. / Unidata Equipment Award program, \$14,207, 1 May 2018 – 30 September 2019, 0 months per year (100% of TTU effort, \$14,207)
- VORTEX-SE: The Role and Predictability of Baroclinic and Terrain Influences in Southeastern U.S. Tornado Environments. PI: Christopher C. Weiss, Funding Agency: NOAA, \$249,835, 1 October 2016 – 30 September 2018, 0/1 months per year (33% of TTU effort, \$82,445)
- Texas Tech University Support to GOES-R GLM Validation. PI: Eric Bruning, Funding Agency: NOAA/NASA-MSFC, \$224,763, 1/1/1 months per year, 6 January 2016 – 1 September 2019 (100% of TTU effort, \$224,763)

- VORTEX-SE: Improving Understanding and Predictability of Tornadic Storms in the Southeastern U.S. Using Intensive Observations and High-Resolution Modeling. PI: Christopher C. Weiss, Funding Agency: NOAA, \$249,942, 1 September 2015 – 31 August 2017, 1/1 month per year (33% of TTU effort, \$82,481)
- Collaborative Research: Thunderstorm Influences on Lightning and Atmospheric Chemistry in Oklahoma and North Texas during the Deep Convective Clouds and Chemistry (DC3) Project. PI: Eric Bruning, Funding Agency: NSF, \$271,732, 1/1/1/0/0 months per year, January 1 2012 – 31 December 2016 (100% of TTU effort, \$271,732)
- Texas Tech University Support to GOES-R GLM Validation. PI: Eric Bruning, Funding Agency: NOAA/NASA-MSFC, \$224,998, 2/2/1.75 months per year, 22 December 2011 – 22 December 2015 (100% of TTU effort, \$224,998)
- Establishment of a Joint Atmospheric Sciences- National Wind Institute Research Electronics Lab at Texas Tech University PI: Eric C. Bruning, Co-I: Jennifer K. Vanos, Funding Agency: Texas Tech University National Wind Institute Discovery Program, 2 weeks support, \$39,714.00, 1 May 2015 – 31 August 2015 (60% of TTU effort, \$23,828)
- Operational Trials of Total Lightning Data and Training at the NWS Lubbock Forecast Office. PI: Eric Bruning, Funding Agency: COMET/UCAR, \$14,934, 0 months per year, 1 May 2011 – 31 Aug 2013 (100% of TTU effort, \$14,934)
- *Risk Reduction Research for the GOES-R Geostationary Lightning Mapper*, PI: Phil Arkin, Funding Agency: NOAA, \$135,000, 1 month per year, 1 October 2010 – 30 September 2011 (100% of TTU effort, \$51,538)

Declined grant activity

- Collaborative Research: Phased Array Polarimetry for Electrification and Lightning (PAPEL). PI: Eric Bruning, Funding Agency: NSF, \$364,351, 1.0/1.0/1.0 months per year, 1 Jan 2023 - 31 Dec 2025. Program Manager: NSF AGS/PDM, Nicholas Anderson, (703) 292-4715, nanderso@nsf.gov. (declined, 100% of TTU effort, \$364,351). Indirect cost portion: \$115,522.
- Collaborative Research: Elements: Extending Zarr Support in NetCDF. TTU PI: Eric Bruning, Funding Agency: NSF, \$91,801, 0.0/0.0/0.0 months per year, 1 June 2022 - 31 May 2025. Program Manager: NSF, Seung-Jong Park, (703) 292-4383, spark@nsf.gov. (declined, 20% of TTU effort, \$18,360). Indirect cost portion: \$31,714.
- Generalist Electromechanics for Applied Researchers (GEARS) Workshop - Summer 2022. PI: Eric Bruning, Funding Agency: NSF, \$99,999, 0.0/0.0/0.0 months per year, 1 May 2022 - 30 April 2023. Program Manager: NSF EAR/IF, Luciana Astiz, (703) 292-4705, lastiz@nsf.gov. (declined, 100% of TTU effort, \$99,994). Subaward to Leeman Geophysical, LLC. Indirect cost portion: \$13,250.
- Collaborative Research: Microphysical Illumination of Large Lightning Study; TTU PI Eric Bruning. Funding Agency: NSF. \$691,594, 0.5/1.0/1.0 months per year, 1 September 2021 - 31 August 2024. Program Manager: Nicholas Anderson, NSF AGS/PDM, (703) 292-4715, nanderso@nsf.gov. (declined, 100% of TTU effort, \$691,594). Indirect cost portion: \$208,753.
- Consortium Proposal to Implement the WeST-M3 Infrastructure to Enable Convergent Research at the Weather-Social- Technology Interface; TTU PI John Schroeder; TTU Co-PIs Eric Bruning and Jennifer Henderson. Other institutions: Northwestern University, 2i2c and UC Berkeley, University of Houston, Arizona State University. Funding Agency: National Science Foundation, Mid-Scale Research Infrastructure program. \$19,999,000.00, 1 October 2021 – 30 September 2026. Preliminary proposal declined. (20% of TTU effort).

- Impact of boundary layer kinematics and aerosol physicochemical properties on convection initiation downwind of an urban hotspot (Houston) within the TRACER project; TTU PI Sandip Pal, Funding Agency: DOE. \$835,242 1.0/0.0/0.0 months per year, 1 August 2020-31 July 2023. Program Manager: Shaima Nasiri, DOE CESD/ASR, (301) 903-0207, Shaima.Nasiri@science.doe.gov. (declined, 10% of TTU effort, \$83,524). Indirect cost portion: \$263,805.
- Developing merged GLM products and applications from GOES 16 and 17: blending ground truth with storm characteristics to evaluate abilities and additional capabilities; TTU PI Eric Bruning, Funding Agency: NASA via subaward from U. Oklahoma (Oklahoma PI Vanna Chmielewski). \$297,057, 0.5/1.0/1.5 months per year, 1 Sep 2020-31 Aug 2023. Program Managers: Tsengdar Lee, NASA SMD/ESD, (202) 358-0860, tsengdar.lee@nasa.gov; Daniel T. Lindsey, NOAA GOES-R Program, (970) 491-8773, dan.lindsey@noaa.gov. (declined, 100% of TTU effort, \$297,057). Indirect cost portion: \$92,420.
- Using GLM Flash Density, Flash Area, and Flash Energy to Diagnose Tropical Cyclone Structure and Intensification; TTU PI Eric Bruning, Funding Agency: NASA, TTU subaward on proposal led by Patrick Duran (NASA-MSFC), \$98,722, 0.5/1.0/1.5 months per year, 1 Sep 2020-31 Aug 2023. Program Managers: Tsengdar Lee, NASA SMD/ESD, (202) 358-0860, tsengdar.lee@nasa.gov; Daniel T. Lindsey, NOAA GOES-R Program, (970) 491-8773, dan.lindsey@noaa.gov. (declined, 100% of TTU effort, \$98,722). Indirect cost portion: \$34,047.
- Mid-scale RI-1 (M1:IP):SAGE: A Software-Defined Sensor Network. TTU PI Eric Bruning, Funding Agency: NSF, TTU subaward on proposal led by Northwestern University. \$159,853.00, 0.5/1.0/0.5/0.5 months per year, 1 October 2019 – 30 September 2023. Program Manager: Deepankar (Deep) Medhi, NSF CISE, (703) 292-8950, dmedhi@nsf.gov. (declined, 100% of TTU effort, \$159,853.00). Indirect cost portion: \$50,234.
- Collaborative Research: Study of Negative Lightning Leader Stepping. PI: Eric Bruning, Funding Agency: NSF, \$103,454 , 1 May 2018 – 30 April 2021, 0/1/1 months per year (declined, 100% of TTU effort, \$103,454)
- Augmentation of vertical and horizontal ozone profiles with miniature NOx and CO sensors in Houston, TX. PI: Jennifer Vanos. Agency: Texas Air Quality Research Program, \$172,679, 0 months per year, 1 July 2016 – 31 August 2017 (declined)
- CC*DNI DIBBs: Enhance Unidata Data Facility with a Scalable Lightning Data Infrastructure and Geospatial Capabilities. PI: Guofeng Cao, Co-Is: Ryan May, Yong Chen, Eric Bruning. Funding Agency: NSF, \$1,380,219, \$662,749 is non-TTU. 1/1/1 months per year. Oct 1 2015 - Sep 30 2018. (declined)
- ROSES: Linking cloud-top evidence of updraft processes to near-ground rotation PI: Eric C. Bruning, Co-Is: Johannes M. L. Dahl and Christopher C. Weiss (TTU) Christopher J. Schultz (NASA-MSFC), Edward R. Mansell (NOAA/OAR/NSSL) Funding Agency: NASA, \$451,380, 1/1/1 months per year, 1 July 2015 - 30 June 2018 (declined)
- ThUnderstorms, Precipitation and Aerosol interactions (TUPA). PI:Emmanouil Anagnostou (UCONN), Funding Agency: DOE/NASA-MSFC, \$95,658, 1 month per year, 1 January 2014 – 31 December 2016 (declined)
- Hazards SEES Type 2: An Integrated Framework for Enhancing Community Resiliency to Severe Thunderstorms. PI: Daan Liang (Texas Tech U.), Funding Agency: NSF, \$2,999,763, 1 month per year, 1 January 2014 – 31 December 2017 (declined)