

Curriculum Vitae

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Eric C. Bruning

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Professional Positions

- September 2023 – present: Professor, Texas Tech University, Dept. of Geosciences, Atmospheric Science Group
- September 2016 – August 2023: 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

- 2025 American Meteorological Society Atmospheric Electricity Scientific and Technological Activities Commission Technological Accomplishments Award, “For significant contributions to the development, applications, and deployment of lightning visualization techniques for the operational and research communities.”
- 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.”
- National Science Foundation Graduate Research Fellowship (2004–2007)
- American Meteorological Society Industry/Government Graduate Fellowship (2003–2004)

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 - 2023). Converted to staff research scientist at TTU.
- Dr. Bruno Medina (2023 - present).

Doctoral Students Supervised

- Jessica Dos Santos Souza, *Numerical simulations of the diffusional growth rate pattern on graupel and implications for graupel electrification*, Geosciences, Atmospheric Science Group. (Jan 2021 - May 2025).
- 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

- Samuel Gardner, *TBD*, meteorological, thermodynamic, and aerosol influences on lightning in deep convection (August 2023 - present)
- David Singewald, *TBD*, photographic, radio frequency, and optical analyses of lightning (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 Tornadoic 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

- Era Sharma, TBD, computational approaches to analyze hidden drivers of symbiosis. Biology, Texas Tech University (July 2023 - present).
- 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).
- Robert Gautreaux, TBD, Philosophy and effectiveness of communications in weather broadcast. Media and Communications, Texas Tech University (April 2020 - present).
- Austin Coleman, “Improving Predictability of Severe Weather and its Associated Hazards through Advanced Applications of Ensemble Sensitivity Analysis.” Geosciences, Texas Tech University, Atmospheric Science Group (June 2020 - April 2023).
- 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

- President-Elect, Atmospheric Electricity Section of the American Geophysical Union, Jan 2024 - Dec 2025.
- 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.
- GOES-R Geostationary Lightning Mapper - Science Team (2008–present)

Previous

- Secretary, Atmospheric Electricity Section of the American Geophysical Union, Jan 2023 - Dec 2024.
- NOAA VORTEX-SE Scientific Steering Committee, Member, January 2018 - October 2022.
- University Corporation for Atmospheric Research, Unidata Users Committee, Member, August 2018 - October 2021.
- Member, World Meteorological Organization (WMO) Commission for Climatology (CCL) 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

- Goede, V., D. Schwartzman, D. Bodine, V. C. Chmielewski, T. Yu, E. C. Bruning, M.-D. Tzeng, and M. Stock, 2025: Rapid sampling and polarimetric statistics of lightning with a phased array radar. *Geophys. Res. Lett.*, **52** (2), e2024GL112193, doi: 10.1029/2024GL112193
- Milani, Z., L. Nichman, E. Matida, L. Fleury, M. Wolde, E. Bruning, G. M. McFarquhar, and P. Kollias, 2025: In-flight measurements of lightning locations using an aircraft-mounted lightning mapper. *Aerospace Science and Technology*, 110038, doi: 10.1016/j.ast.2025.110038
- Bruning, E. C., K. N. Brunner, M. van Lier-Walqui, T. Logan, and T. Matsui, 2024b: Lightning and radar measures of mixed phase updraft variability in tracked storms during the TRACER field campaign in Houston, Texas. *Mon. Weather Rev.*, **152** (2), 2753–2769, doi: 10.1175/MWR-D-24-0060.1
- Cummings, K. A., and Coauthors, 2024: Evaluation of lightning flash rate parameterizations in a cloud-resolved WRF-Chem simulation of the 29–30 May 2012 Oklahoma severe supercell system observed during DC3. *J. Geophys. Res. Atmos.*, **129** (11), doi: 10.1029/2023JD039492
- Dzambo, A., and Coauthors, 2024: Forecasting for ESCAPE: A multi-institution hybrid forecasting and nowcasting operation for sea-breeze convection supporting a ground-based and airborne field campaign. *Bull. Amer. Meteor. Soc.*, in press, doi: 10.1175/BAMS-D-23-0015.1
- Kollias, P., and Coauthors, 2024: Experiment of Sea Breeze Convection, Aerosols, Precipitation and Environment (ESCAPE). *Bull. Amer. Meteor. Soc.*, in press, doi: 10.1175/BAMS-D-23-0014.1
- Kosiba, K. A., and Coauthors, 2024: The Propagation, Evolution, and Rotation in Linear Storms (PERiLS) project. *Bull. Amer. Meteor. Soc.*, **105** (10), E1768–E1799, doi: 10.1175/BAMS-D-22-0064.1
- Pickering, K. E., Y. Li, K. A. Cummings, M. C. Barth, D. J. Allen, and E. Bruning, 2024: Lightning NO_x in the may 29–30, 2012 Deep Convective Clouds and Chemistry (DC3) severe storm and its downwind chemical consequences. *J. Geophys. Res. Atmos.*, **129** (11), doi: 10.1029/2023JD039439
- Sharma, M., R. L. Tanamachi, and E. C. Bruning, 2024: Investigating temporal characteristics of polarimetric and electrical signatures in three severe storms: Insights from the VORTEX-Southeast field campaign. *Mon. Weather Rev.*, **152** (7), doi: 10.1175/MWR-D-23-0144.1
- Sokolowsky, G. A., and Coauthors, 2024: tobac v1.5: Introducing fast 3D tracking, splits and mergers, and other enhancements for identifying and analysing meteorological phenomena. *Geoscientific Model Development*, **17** (13), 5309–5330, doi: 10.5194/gmd-17-5309-2024
- Steiger, S., and Coauthors, 2024: Winter lightning to the Lee of Lake Ontario: The Lake-Effect Electrification (LEE) field campaign. *Bull. Amer. Meteor. Soc.*, **105** (11), E2026–E2046, doi: 10.1175/BAMS-D-23-0176.1
- Boggs, L., and Coauthors, 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., and Coauthors, 2022: MetPy: A meteorological python library for data analysis and visualization. *Bulletin of the American Meteorological Society*, **103** (10), doi: 10.1175/bams-d-21-0125.1
- 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
- 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., and Coauthors, 2021: Extreme oxidant amounts produced by lightning in storm clouds. *Science*, **372** (6543), 711–715, doi: 10.1126/science.abg0492
- Duran, P., and Coauthors, 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, 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**, 105 528, doi: 10.1016/j.jastp.2020.105528
- Peterson, M. J., and Coauthors, 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., and Coauthors, 2019: 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, 2019: 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, 2018: 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, 2018: 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, 2016: 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., and Coauthors, 2016: Ground detection of terrestrial gamma ray flashes from distant radio signals. *Geophysical Research Letters*, **43** (16), 8728–8734, doi: 10.1002/2016gl070154

- Pollack, I. B., and Coauthors, 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., and Coauthors, 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, 2015: 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., and Coauthors, 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., and Coauthors, 2008: TELEX: The Thunderstorm Electrification and Lightning Experiment. *Bull. Amer. Met. Soc.*, **89** (7), 997–1013, doi: 10.1175/2007BAMS2352.1
- 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., and Coauthors, 2005: Inverted-polarity electrical structures in thunderstorms in the Severe Thunderstorm Electrification and Precipitation Study. *Atmos. Res.*, **76**, 247–271, doi: 10.1016/j.atmosres.2004.11.029
- 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, doi: 10.1175/MWR2994.1

Technical Reports

- van Lier-Walqui, M., E. Bruning, K. Brunner, T. Matsui, and T. Iguchi, 2023a: TRACER Lightning Mapping Array field campaign report. Tech. Rep. DOE/SC-ARM-23-026, U.S. Department of Energy, Atmospheric Radiation Measurement user facility, Richland, Washington. URL <https://www.arm.gov/publications/programdocs/doe-sc-arm-23-026.pdf>
- Jensen, M., and Coauthors, 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

- Reger, R. S., J. Tilles, R. G. Sonnenfeld, E. C. Bruning, S. Goodman, C. Hogg, T. Edwards, and R. Longenbaugh, 2025: Flash development at sub-pixel resolution with the Geostationary Lightning Mapper. *J. Geophys. Res. Atmos.*, in major revisions
- Brunner, K., E. Bruning, V. Chmielewski, C. C. Weiss, and C. J. Schultz, 2024a: Polarimetric signals in southeastern thunderstorms: an objective tracking and polarimetric column analysis. *J. Atmos. Sci.*, (submitted)

Recent Talks and Conference Presentations

- Allen, B. J., and Coauthors, 2025: Assimilation of Geostationary Lightning Mapper observations into the NOAA GSL Rapid Refresh Forecast System. *Preprints, 12th Conference on the Meteorological Applications of Lightning Data, New Orleans, LA*, American Meteorological Society, Paper 7.4
- Bruning, E. C., A. Back, S. Behnke, S. Goodman, C. Hogg, T. J. Lang, and J. Tilles, 2025: Toward a physical model of lightning: A community grand challenge. *Preprints, Fourth Symposium on Community Modeling and Innovation*, American Meteorological Society, Paper 2.5
- DiGangi, E., and Coauthors, 2025: A roadmap for an integrated community physical model of lightning. *Preprints, 12th Conference on the Meteorological Applications of Lightning Data, New Orleans, LA*, Panel Discussion 8
- Brunner, K., and Coauthors, 2025: tobac: Xarray implementation and nontraditional uses for object-based analysis of clouds. *Preprints, 15th Symposium on Advances in Modeling and Analysis Using the Programming Languages of Open Science*, American Meteorological Society, Paper 812
- Burchfield, J. C., P. Gatlin, K. N. Brunner, Y. Wu, P. Bitzer, and E. C. Bruning, 2025: New 3D cloud optical scattering simulations to inform development of future satellite-based lightning mapping missions. *Preprints, 12th Conference on the Meteorological Applications of Lightning Data, New Orleans, LA*, American Meteorological Society, Paper 10.3
- Chmielewski, V. C., M. Stock, E. C. Bruning, S. A. Weiss, S. M. Steiger, J. M. Trostel, and J. L. Losego, 2025: Why did the Lightning Mapping Array miss flashes during the Lake Effect Electrification project? *Preprints, 12th Conference on the Meteorological Applications of Lightning Data, New Orleans, LA*, American Meteorological Society, Paper 2.2
- Das, D., S. Pal, E. C. Bruning, and B. Hirth, 2025: On the potential of GPM and JAXA precipitation retrievals in probing low, moderate and high precipitation regimes over semi-arid Southwest US. *Preprints, 25th Symposium on Meteorological Observation and Instrumentation*, American Meteorological Society, Paper 2.2
- Lamsma, B., S. Steiger, Y. Wang, E. C. Bruning, V. C. Chmielewski, and S. A. Weiss, 2025: The Lake-Effect Electrification (LEE) project: Differences in lightning flash characteristics during the 17-20 November 2022 event. *Preprints, 12th Conference on the Meteorological Applications of Lightning Data, New Orleans, LA*, American Meteorological Society, Paper 5.6
- Souza, J. C. S., E. C. Bruning, and B. Baker, 2025: Variability in the diffusional growth rate of a riming graupel surface and its implications for graupel electrification. *Preprints, 12th Conference on the Meteorological Applications of Lightning Data, New Orleans, LA*, American Meteorological Society, Paper 1.4
- Stock, M., K. M. Calhoun, E. C. Bruning, E. Mansell, and V. C. Chmielewski, 2025: Effects of tilt and demodulation on balloon born electric field measurements. *Preprints, 12th Conference on the Meteorological Applications of Lightning Data, New Orleans, LA*, American Meteorological Society, Paper 2.3
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Pending Support

- Revealing Lightning Initiation Through High-Speed Cloud-Top Imaging from Balloon Platforms (CloudLight). PI: Eric Bruning, Funding Agency: EU/ERC, \$4,503,258. 6.0/6.0/6.0/6.0/3.0/3.0 months, 1 January 2026 - 31 December 2031. Program Manager: TBD from European Research Council Synergy Program, if funded. (pending, 50% of TTU effort, \$2,265,129). Indirect cost portion: \$355,011.
- A Physics Approach to Lightning Attachment to Offshore Wind Turbines: Models and Experiments from Blade-Tip-Scale to Wind-Farm-Scale. PI: Eric Bruning, Funding Agency: DOE/EERE via MIT; MIT PI Prof. Carmen Guerra-Garcia. \$480,000. 0.5/0.5/0.5/0.5 months, 1 September 2025 - 31 August 2029. Program Manager: TBD, if funded. (pending, 100% of TTU effort, \$480,000). Indirect cost portion: \$355,011.
- Collaborative Research: AGS-FIRP Track 2: Phased Array Polarimetry for Electrification and Lightning (PAPEL). PI: Eric Bruning, Funding Agency: NSF, \$392,159. 1.0/0.5/0.5 month, 1 April 2025 - 31 March 2028. Program Manager: NSF AGS/PDM, Nicholas Anderson, (703) 292-4715, nanderso@nsf.gov. (pending, 100% of TTU effort, \$392,159). Indirect cost portion: \$140,552.
- 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. \$124,110, 0.2 months, 1 Oct 2024-30 Sep 2025. Program Manager: Daniel T. Lindsey, NOAA GOES-R Program, (970) 491-8773, dan.lindsey@noaa.gov. (pending, 50% of TTU effort, \$62,055). Indirect cost portion: \$48,551.

Current Support

- Conference: Lightning Modeling Grand Challenge Community Roadmap Workshop. PI: Eric Bruning, Funding Agency: NSF, \$49,736. 0.1 month, 1 January 2025 - 31 December 2025. Program Manager: NSF AGS/PDM, Chungu Lu, (703) 292-7110, CLU@nsf.gov. (current, 100% of TTU effort, \$49,736). Indirect cost portion: \$12,495.
- Three-dimensional Simulation of Lightning and Its Optical Emissions - Reachback. PI: Kelcy Brunner, Funding Agency: NASA-MSFC via USRA. \$47,847, 0.1 month, 1 Oct 2024 - 30 Sep 2025. Program manager: Patrick Gatlin, NASA MSFC, Earth Science Branch ST11, Huntsville, AL 35812, (256) 961-7910, patrick.gatlin@nasa.gov. (current, 50% of TTU effort, \$23,924). Indirect cost portion: \$18,849.
- Ground-based and Above Cloud Radiometry to Understand GLM/LMX Lightning Measurements. PI: Eric Bruning, Funding Agency: NOAA task via U. Oklahoma / Cooperative Institute for Severe and High Impact Weather Research and Operations. \$322,350, 0.1/0.2/0.2 months each year, 1 Oct 2024 - 30 Sep 2027. Program Manager: Andy Heidinger, NOAA GEO-XO Program, (608) 263-6750, andrew.heidinger@noaa.gov. (current, 50% of TTU effort, \$161,175). Indirect cost portion: \$49,566.
- Optical signals from lightning: modeling, observation, and statistics. PI: Kelcy Brunner, Funding Agency: Sandia National Laboratories. \$75,000, 0.25 months, 1 Jan 2024 - 30 Sep 2025. Program Manager: Randy Longenbaugh, Sandia National Laboratories, (505) 844-8493, rslonge@sandia.gov. (current, 50% of TTU effort, \$37,500). Indirect cost portion: \$29,545.
- 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. \$124,687, 0.5 months, 1 Sep 2023-31 Aug 2025. Program Manager: Daniel T. Lindsey, NOAA GOES-R Program, (970) 491-8773, dan.lindsey@noaa.gov. (current, 100% of TTU effort, \$124,687). Indirect cost portion: \$40,423.
- 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.

- 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 2025. 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.
- 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 2024. 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.

Previous awards

- 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.
- 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.
- 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 2024. 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.
- 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 2024. 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.
- 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.
- Regional lightning climatology with GOES GLM. PI: Eric Bruning, Funding Agency: Sandia National Laboratories. \$25,263, 0.5 months, 22 May 2023 - 31 Dec 2023. Program Manager: Randy Longenbaugh, Sandia National Laboratories, (505) 844-8493, rslonge@sandia.gov. (current, 100% of TTU effort, \$25,263). Indirect cost portion: \$7,939
- 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

- Enhancing the Open-Source Tracking and Object-Based Analysis of Clouds (tobac) Atmospheric Tracking Tool to Answer Diverse Scientific Questions. Institutional PI: Eric Bruning, Funding Agency: NASA via U. Alabama-Huntsville, lead PI Sean Freeman. \$235,637, 0.1/0.1/0.1 months each year, 1 Dec 2024 - 30 Nov 2027. Program Manager: Steven Crawford, NASA HQ SMD, (202) 358-1310, steven.m.crawford@nasa.gov. (pending, 50% of TTU effort, \$117,818). Indirect cost portion: \$89,736.
- Investigating Convective Clouds, Microphysics, Lightning and Precipitation Characteristics in the Southeast U.S. Using Integrated Observations and Earth System Modeling; TTU PI Eric Bruning. Funding Agency: DOE ASR. \$945,000, 0.5/0.5/0.5 months per year, 1 August 2024 - 31 July 2027. Three subaward institutions. Program Manager: Shaima Nasiri, DOE CESD/ASR, (301) 903-0207, Shaima.Nasiri@science.doe.gov. (pending, 50% of TTU effort, \$472,500). Indirect cost portion: \$157,000.
- 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 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)