

## Eric Gilleland

### curriculum vitae

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Research interests: forecast verification methodology, applied spatial and extreme value statistics.

### Personal Preparation

Ph.D., 2005, Statistics, Colorado State University, Fort Collins, Colorado

M.S., 1998, Statistics, Arizona State University, Tempe, Arizona

B.A., 1996, Mathematics, University of Colorado, Boulder, Colorado

### Appointments

12/03/2002 – Present: Research Applications Laboratory, National Center for Atmospheric Research: Project Scientist II (12/18/2013 – Present), Project Scientist I (10/30/2006 – 12/18/2013), Associate Scientist III (6/1/2006 – 10/30/2006), Associate Scientist II (12/03/2002 – 6/1/2006)

10/19/1998 – 12/03/2002: Geophysical Statistics Project/Atmospheric Technology Division, National Center for Atmospheric Research: Student Assistant III/Graduate Research Assistant

1998 – 1999: Lecturer, Department of Mathematics, Front Range Community College, Fort Collins, Colorado

1996 – 1998: Teaching Assistant, Department of Mathematics, Arizona State University, Tempe, Arizona

1993 – 1996: Math Tutor, Athletics Department, University of Colorado, Boulder

### Awards, Honors, Citations

- 2020 American Meteorological Society Editor's Award for *Monthly Weather Review*
- 2014 Editors' Citation for Excellence in Refereeing for *Journal of Geophysical Research – Atmospheres*
- 2010 UCAR Scientific and Technical Advancement Award

### Publications

#### Refereed

1. Casati, B., M. Dorninger, C. A. S. Coelho, E. E. Ebert, C. Marsigli, M. P. Mittermaier, and E Gilleland, 2022. The 2020 International Verification Methods Workshop Online: Major outcomes and way forward. *Bull. Amer. Meteorol. Soc.*, 103 (3), E899 - E910, doi: [10.1175/BAMS-D-21-0126.1](https://doi.org/10.1175/BAMS-D-21-0126.1).
2. Gilleland, E., F. Zwiers, D. Wilks, H. von Storch, B. G. Brown, B. Glahn, S. Mason, D. B. Stephenson, and J. Fieberg, 2021. Significant misinterpretations: What role should statistical hypothesis testing play in the atmospheric sciences? In Prep.
3. Gilleland, E., 2022. Comparing Spatial Fields with SpatialVx: Spatial Forecast Verification in R. Submitted to *Journal of Statistical Software*.
4. Brunner, M. I. and E. Gilleland, 2021. Complex high- and low-flow networks differ in their spatial correlation characteristics, drivers, and changes. *Water Resources Research*, **57** (9), e2021WR030049, doi: [10.1029/2021WR030049](https://doi.org/10.1029/2021WR030049).
5. Brunner, M. I., E. Gilleland, and A. W. Wood, 2021. Space-time dependence of compound hot-dry events in the United States: assessment using a multi-site multi-variable weather generator. *Earth System Dynamics*, **12** (2), 621 – 634, doi: [10.5194/esd-12-621-2021](https://doi.org/10.5194/esd-12-621-2021).

6. de Oliveira, M. M. F., J. L. F. de Oliveira, P. J. F., Fernandes, P. J. F., E. Gilleland, and N. F. F. Ebecken, 2021. Extreme climate characteristics near the coastline of the southeast region of Brazil in the last 40 years. Accepted to *Regional Environmental Change*, doi: [10.1007/s00704-021-03711-z](https://doi.org/10.1007/s00704-021-03711-z).
7. Brunner, M. I., D. L. Swain, R. R., Wood, F., Willkofer, J.M., Done, E. Gilleland, and R. Ludwig, 2021. An extremeness threshold determines the regional response of floods to changes in rainfall extremes. *Communications Earth & Environment*, 2 (173), doi: [10.1038/s43247-021-00248-x](https://doi.org/10.1038/s43247-021-00248-x).
8. Marsigli, C., E. Ebert, R. Ashrit, B. Casati, J. Chen, C. A. S. Coelho, M. Dorninger, E. Gilleland, T. Haiden, S. Landman, and M. Mittermaier, 2021. Observations for high-impact weather and their use in verification. *Natural Hazards and Earth System Sciences*, 21 (4), 1297 - 1312, doi: [10.5194/nhess-21-1297-2021](https://doi.org/10.5194/nhess-21-1297-2021).
9. Brunner, M. I., D. L. Swain, E. Gilleland, and A. W. Wood, 2021. Increasing importance of temperature as a driver of streamflow drought spatial extent. *Environmental Research Letters*, 16 (2), 024038, doi: [10.1088/1748-9326/abd2f0](https://doi.org/10.1088/1748-9326/abd2f0).
10. Brunner, M. I., S. M. Papalexiou, M. Clark, and E. Gilleland, 2020. How probable is widespread flooding in the United States? *Water Resources Research*, 56 (10), e2020WR028096, doi: [10.1029/2020WR028096](https://doi.org/10.1029/2020WR028096).
11. Griffin, S. M., J. A. Otkin, S. E. Nebuda, T. L. Jensen, P. S. Skinner, E. Gilleland, T. A. Supinie, and M. Xue, 2020. Evaluating the Impact of Planetary Boundary Layer, Land Surface Model, and Microphysics Parameterization Schemes on Upper-level Cloud Objects in Simulated GOES-16 Brightness Temperatures. *JGR-Atmospheres*, 126 (15), e2021JD034709, doi: [10.1029/2021JD034709](https://doi.org/10.1029/2021JD034709).
12. Brown, B. G., T. G. Jensen, J. Halley Gotway, R. Bullock, E. Gilleland, T. Fowler, K. Newman, D. Adriaansen, L. Blank, T. Burek, M. Harrold, T. Hertneky, C. Kalb, P. Kucera, L. Nance, and J. Wolff, 2020. The Model Evaluation Tools (MET): More than a decade of community-supported forecast verification. *Bull. Amer. Meteorol. Soc.*, 102 (4), E782 – E807, doi: [10.1175/BAMS-D-19-0093.1](https://doi.org/10.1175/BAMS-D-19-0093.1).
13. Jha, S., M. Goyal, B. B. Gupta, C.-H. Hsu, E. Gilleland, and J. Das, 2021. A methodological framework for extreme climate risk assessment integrating satellite and location based datasets in Intelligent Systems. *International Journal of Intelligent Systems*, (in press), doi: [10.1002/int.22475](https://doi.org/10.1002/int.22475).
14. Gilleland, E., 2021. Novel forecast performance metrics for high-resolution verification sets. *Advances in Statistical Climatology, Meteorology and Oceanography*, 7 (1), 13 – 34, doi: [10.5194/ascmo-7-13-2021](https://doi.org/10.5194/ascmo-7-13-2021).
15. North, J., Z. Stanley, W. Kleiber, W. Deierling, E. Gilleland and M. Steiner, 2020. A statistical approach to fast nowcasting of lightning potential fields. *Advances in Statistical Climatology, Meteorology and Oceanography*, 6, 79 – 90, doi: [10.5194/ascmo-6-79-2020](https://doi.org/10.5194/ascmo-6-79-2020).
16. Brunner, M. I., E. Gilleland, A. Wood, D. L. Swain, and M. Clark, 2020. Spatial dependence of floods shaped by spatiotemporally varying land surface processes. *Geophysical Research Letters*, 47 (13), e2020GL088000, doi: [10.1029/2020GL088000](https://doi.org/10.1029/2020GL088000).
17. Brunner, M. I. and E. Gilleland, 2020. Stochastic simulation of streamflow and spatial extremes: a continuous, wavelet-based approach. *Hydrology and Earth System Sciences*, 24, 3967 – 3982, doi: [10.5194/hess-2019-658](https://doi.org/10.5194/hess-2019-658).
18. Gilleland, E., 2020. Bootstrap methods for statistical inference. Part I: Comparative forecast verification for continuous variables. *Journal of Atmospheric and Oceanic Technology*, 37 (11), 2117 – 2134, doi: [10.1175/JTECH-D-20-0069.1](https://doi.org/10.1175/JTECH-D-20-0069.1).
19. Gilleland, E., 2020. Bootstrap methods for statistical inference. Part II: Extreme-value analysis. *Journal of Atmospheric and Oceanic Technology*, 37 (11), 2135 – 2144, doi: [10.1175/JTECH-D-20-0070.1](https://doi.org/10.1175/JTECH-D-20-0070.1).
20. Towler, E., D. Llewellyn, A. Prein, and E. Gilleland, 2020. Extreme-value analysis for the characterization of extremes in water resources: A generalized workflow and case study on New Mexico monsoon precipitation. *Weather and Climate Extremes*, 29, 100260, doi: [10.1016/j.wace.2020.100260](https://doi.org/10.1016/j.wace.2020.100260).
21. Gilleland, E., G. Skok, B. G. Brown, B. Casati, M. Dorninger, M. P. Mittermaier, N. Roberts, and L. J. Wilson, 2019. A novel set of verification test fields with application to distance measures. *Monthly Weather Review*, 148 (4), 1653 – 1673, doi: [10.1175/MWR-D-19-0256.1](https://doi.org/10.1175/MWR-D-19-0256.1).
22. Newman, A. J., M. P. Clark, R. J. Longman, E. Gilleland, T. W. Giambelluca, and J. R. Arnold, 2019. Use of daily station observations to produce high-resolution gridded probabilistic precipitation and temperature time series for the Hawaiian Islands. *J. Hydrometeorology*, 20 (3), 509 – 529, doi: [10.1175/JHM-D-18-0113.1](https://doi.org/10.1175/JHM-D-18-0113.1).

23. Abatan, A. A., W. J. Gutowski, Jr., C. M. Ammann, L. Kaatz, B. G. Brown, L. Buja, R. G. Bullock, T. L. Fowler, E. Gilleland and J. Halley Gotway, 2018. Statistics of multi-year droughts and pluvials from the Method for Object-Based Diagnostic Evaluation (MODE). *International Journal of Climatology*, **38** (8), 3405 – 3420, doi: [10.1002/joc.5512](https://doi.org/10.1002/joc.5512).
24. Fix, M., D. S. Cooley, A. Hodzic, E. Gilleland, B. T. Russell, W. C. Porter, and G. G. Pfister, 2018. Observed and predicted sensitivities of high and extreme surface ozone to meteorological drivers in the US (1996-2005). *Atmospheric Environment*, **176**, 292 – 300, doi: [10.1016/j.atmosenv.2017.12.036](https://doi.org/10.1016/j.atmosenv.2017.12.036).
25. Gilleland, E., A. S. Hering, T. L. Fowler, and B. G. Brown, 2018. Testing the tests: What are the impacts of incorrect assumptions when applying confidence intervals or hypothesis tests to compare competing forecasts? *Mon. Wea. Rev.*, **146** (6), 1685 – 1703, doi: [10.1175/MWRD-17-0295.1](https://doi.org/10.1175/MWRD-17-0295.1).
26. Dorninger, M., E. Gilleland, B. Casati, M. P. Mittermaier, E. E. Ebert, B. G. Brown, and L. J. Wilson, 2018. Mesoscale Verification Inter-Comparison over Complex Terrain. *Bull. Amer. Meteorol. Soc.*, **99** (9), 1887 – 1906, doi: [10.1175/BAMS-D-17-0164.1](https://doi.org/10.1175/BAMS-D-17-0164.1).
27. Gilleland, E., 2017. A new characterization in the spatial verification framework for false alarms, misses, and overall patterns. *Weather Forecast.*, **32** (1), 187{198, doi: [10.1175/WAF-D-16-0134.1](https://doi.org/10.1175/WAF-D-16-0134.1).
28. Gilleland, E., R. W. Katz, and P. Naveau, 2017. Quantifying the risk of extreme events under climate change. *Chance*, 30 (4), 30 - 36, doi: [10.1080/09332480.2017.1406757](https://doi.org/10.1080/09332480.2017.1406757). (invited paper).
29. Abatan, A. A., W. J. Gutowski, Jr., C. M. Ammann, B. G. Brown, L. Buja, R. G. Bullock, T. L. Fowler, E. Gilleland, J. Halley Gotway, and L. Kaatz, 2017. Multi-year droughts and pluvials over upper Colorado River basin and associated circulations. *J. Hydrometeorology*, **18**, 799 – 818, doi: [10.1175/JHM-D-16-0125.1](https://doi.org/10.1175/JHM-D-16-0125.1).
30. Ekström, M. and Gilleland, E., 2016. Assessing convection permitting resolutions of WRF for the purpose of water resource impact assessment and vulnerability work; a southeast Australian case study. *Water Resources Research*, **53** (1), 726 – 743, doi: [10.1002/2016WR019545](https://doi.org/10.1002/2016WR019545).
31. Gilleland, E., M. Bukovsky, C. L. Williams, S. McGinnis, C. M. Ammann, B. G. Brown, and L. O. Mearns, 2016. Evaluating NARCCAP model performance for frequencies of severe storm environments. *Advances in Statistical Climatology, Meteorology and Oceanography*, **2** (2), 137 – 153, doi: [10.5194/ascmo-2-137-2016](https://doi.org/10.5194/ascmo-2-137-2016).
32. Shen, L., L. J. Mickley, and E. Gilleland, 2016. Impact of increasing heatwaves on U.S. ozone episodes in the 2050s: Results from a multi-model analysis using extreme value theory. *Geophysical Research Letters*, **43** (8), 4017 – 4025, doi: [10.1002/2016GL068432](https://doi.org/10.1002/2016GL068432).
33. Bador, M., P. Naveau, E. Gilleland, M. Sanchez, and T. Arivelo, 2015. Spatial clustering of summer temperature maxima from the CNRM-CM5 climate model ensembles and E-OBS over Europe. *Weather and Climate Extremes*, **9**, 17 – 24, doi: [10.1016/j.wace.2015.05.003](https://doi.org/10.1016/j.wace.2015.05.003).
34. Gilleland, E. and R. W. Katz, 2016. extRemes 2.0: An Extreme Value Analysis Package in R. *Journal of Statistical Software*, **72** (8), 1 – 39, doi: [10.18637/jss.v072.i08](https://doi.org/10.18637/jss.v072.i08).
35. Gilleland, E. and G. Roux, 2015. A New Approach to Testing Forecast Predictive Accuracy. *Meteorol. Appl.*, **22** (3), 534 – 543, doi: [10.1002/met.1485](https://doi.org/10.1002/met.1485).
36. Cheng, L., A. AghaKouchak, E. Gilleland, and R. W. Katz, 2014a. Non-stationary extreme value analysis in a changing climate. *Climatic Change*, **127** (2), 353 – 369, doi: [10.1007/s10584-014-1254-5](https://doi.org/10.1007/s10584-014-1254-5).
37. Cheng, L., E. Gilleland, M. J. Heaton, and A. AghaKouchak, 2014b. Empirical Bayes estimation for the conditional extreme value model. *Stat*, 3 (1), 391 – 406, doi: [10.1002/sta4.71](https://doi.org/10.1002/sta4.71).
38. Gilleland, E., 2013. Testing competing precipitation forecasts accurately and efficiently: The spatial prediction comparison test. *Mon. Wea. Rev.*, **141** (1), 340 – 355, doi: [10.1175/MWR-D-12-00155.1](https://doi.org/10.1175/MWR-D-12-00155.1).
39. Gilleland, E., B. G. Brown, and C. M. Ammann, 2013. Spatial extreme value analysis to project extremes of large-scale indicators for severe weather. *Environmetrics*, **24** (6), 418 – 432, doi: [10.1002/env.2234](https://doi.org/10.1002/env.2234).
40. Gilleland, E., M. Ribatet, and A. G. Stephenson, 2013. A software review for extreme value analysis. *Extremes*, **16** (1), 103 – 119, doi: [10.1007/s10687-012-0155-0](https://doi.org/10.1007/s10687-012-0155-0).
41. Mannshardt, E. and E. Gilleland, 2013. Extremes of severe storm environments under a changing climate. *American Journal of Climate Change*, **2** (3A), 47 – 61, doi: [10.4236/ajcc.2013.23A005](https://doi.org/10.4236/ajcc.2013.23A005).
42. de Oliveira, M. M. F., N. F. F. Ebecken, J. L. F. de Oliveira and E. Gilleland, 2011. Generalized extreme wind speed distributions in South America over the Atlantic Ocean region. *Theor. Appl. Climatol.*, **104**, (3 – 4), 377 – 385, doi: [10.1007/s00704-010-0350-3](https://doi.org/10.1007/s00704-010-0350-3).

43. Gilleland, E., 2011. Spatial forecast verification: Baddeley's Delta metric applied to the ICP test cases. *Wea. Forecasting*, **26** (3), 409 – 415, doi: [10.1175/WAF-D-10-05061.1](https://doi.org/10.1175/WAF-D-10-05061.1).
44. Gilleland, E. and Katz, R. W., 2011. New software to analyze how extremes change over time. *Eos*, 11 January, **92** (2), 13 – 14, doi: [10.1029/2011EO020001](https://doi.org/10.1029/2011EO020001).
45. Gilleland, E., D.A. Ahijevych, B.G. Brown and E.E. Ebert, 2010. Verifying Forecasts Spatially. *Bull. Amer. Meteor. Soc.*, October, **91** (10), 1365 – 1373, doi: [10.1175/2010BAMS2819.1](https://doi.org/10.1175/2010BAMS2819.1).
46. Gilleland, E., J. Lindstrom, and F. Lindgren, 2010. Analyzing the image warp forecast verification method on precipitation fields from the ICP. *Wea. Forecasting*, **25** (4), 1249 – 1262, doi: [10.1175/2010WAF2222365.1](https://doi.org/10.1175/2010WAF2222365.1).
47. Heaton, M. J., M. Katzfuss, S. Ramachandar, K. Pedings, E. Gilleland, E. Mannshardt-Shamseldin, and R. L. Smith, 2010. Spatio-Temporal Models for Large-scale Indicators of Extreme Weather. *Environmetrics*, **22**, 294 – 303, doi: [10.1002/env.1050](https://doi.org/10.1002/env.1050).
48. Towler, E., B. Rajagopalan, E. Gilleland, R. S. Summers, D. Yates, and R. W. Katz, 2010. Modeling hydrologic and water quality extremes in a changing climate. *Water Resources Research*, **46**, W11504, doi: [10.1029/2009WR008876](https://doi.org/10.1029/2009WR008876).
49. Abeyirigunawardena, D. S., E. Gilleland, D. Bronaugh, 2009. Extreme wind regime responses to climate variability and change in the inner-south-coast of British Columbia Canada. *Atmosphere-Ocean*, **47**(1), 41 – 61, doi: [10.3137/AO1003.2009](https://doi.org/10.3137/AO1003.2009).
50. Ahijevych, D., E. Gilleland, B. G. Brown, and E. E. Ebert, 2009. Application of spatial verification methods to idealized and NWP gridded precipitation forecasts. *Wea. Forecasting*, **24** (6), 1485 – 1497, doi: [10.1175/2009WAF2222298.1](https://doi.org/10.1175/2009WAF2222298.1).
51. Gilleland, E., D. Ahijevych, B.G. Brown, B. Casati, and E.E. Ebert, 2009. Intercomparison of spatial forecast verification methods. *Wea. Forecasting*, **24**, 1416 – 1430, doi: [10.1175/2009WAF2222269.1](https://doi.org/10.1175/2009WAF2222269.1).
52. Gilleland, E., T. C. M. Lee, J. Halley Gotway, R. G. Bullock, and B. G. Brown, 2008. Computationally efficient spatial forecast verification using Baddeley's Delta image metric. *Mon. Wea. Rev.* **136** (5), 1747 – 1757, doi: [10.1175/2007MWR2274.1](https://doi.org/10.1175/2007MWR2274.1).
53. Gilleland, E. and T. L. Fowler, 2006. Network design for verification of ceiling and visibility forecasts. *Environmetrics*, **17** (6), 575 – 589, doi: [10.1002/env.765](https://doi.org/10.1002/env.765).
54. Gilleland, E. and D. Nychka, 2005. Statistical models for monitoring and regulating ground-level ozone. *Environmetrics*, **16**, 535 – 546, doi: [10.1002/env.720](https://doi.org/10.1002/env.720).
55. Stephenson, A. and E. Gilleland, 2005. Software for the Analysis of Extreme Events: The Current State and Future Directions. *Extremes*, **8**, 87 – 109, doi: [10.1007/s10687-006-7962-0](https://doi.org/10.1007/s10687-006-7962-0).

## Book Chapters

1. Gilleland, E., F. Pappenberger, B. G. Brown, E. E. Ebert, and D. Richardson, 2016. Verification of meteorological forecasts for hydrological applications. In *Handbook of Hydrometeorological Ensemble Forecasting*, Edts. Duan, Q., F. Pappenberger, J. Thielen, A. Wood, H. L. Cloke, and J. C. Schaake, Springer, Berlin, Heidelberg, doi: [10.1007/978-3-642-40457-3\\_4-1](https://doi.org/10.1007/978-3-642-40457-3_4-1).
2. Gilleland, E., 2016. Computing Software. Chapter 25 In *Extreme Value Modeling and Risk Analysis: Methods and Applications*. Edts. Dipak K. Dey and Jun Yan, CRC Press, Boca Raton, Florida, U.S.A., pp. 505 – 515.
3. Gilleland, E. and Ribatet, M., 2015. Reinsurance and extremal events. In: *Computational Actuarial Science with R*. Ed. A. Charpentier, Chapman & Hall/CRC the R series, Boca Raton, Florida, U.S.A., pp. 257 - 286.
4. Brown, B. G., E. Gilleland, and E. E. Ebert, 2012. Chapter 6: Forecasts of spatial fields. pp. 95 – 117, In *Forecast Verification: A Practitioner's Guide in Atmospheric Science*, 2<sup>nd</sup> Edition, Edts. I. T. Jolliffe and D. B. Stephenson, Wiley, Chichester, West Sussex, U.K., 274 pp.
5. Gilleland, E., D.W. Nychka, and U. Schneider, 2006. Spatial models for the distribution of extremes, Hierarchical modelling for the Environmental Sciences: statistical methods and applications, Edts. JS Clark and A Gelfand. Oxford University Press, New York pp. 170 – 183. ISBN 0-19-8569671.

## Edited Book

Machine Learning and Data Mining Approaches to Climate Science, 2015. Proceedings of the 4th International Workshop on Climate Informatics. Editors: Lakshmanan, V., Gilleland, E., McGovern, A., Tingley, M. (Eds.), Springer International Publishing, 252 pp., ISBN: 978-3-319-17220-0, doi: 10.1007/978-3-319-17220-0.

## Technical Notes

1. Gilleland, E. and Katz, R. W., 2016: in2extremes: Into the R Package extremes – Extreme Value Analysis for Weather and Climate Applications. NCAR Technical Note, NCAR/TN-523+STR, 102 pp., doi: [10.5065/D65T3HP2](https://doi.org/10.5065/D65T3HP2).
2. Dorninger, M., M. P. Mittermaier, E. Gilleland, E. E. Ebert, B. G. Brown, and L. J. Wilson, 2013: MesoVICT: Mesoscale Verification Inter-Comparison over Complex Terrain. NCAR Technical Note NCAR/TN-505+STR, 23 pp, doi: [10.5065/D6416V21](https://doi.org/10.5065/D6416V21).
3. Gilleland, E., 2013. Two-dimensional kernel smoothing: Using the R package smoothie. NCAR Technical Note, NCAR/TN-502+STR, 17pp, doi: [10.5065/D61834G2](https://doi.org/10.5065/D61834G2).
4. Gilleland, E., L. Chen, M. DePersio, G. Do, K. Eilertson, Y. Jin, E.L. Kang, F. Lindgren, J. Lindström, R.L. Smith, and C. Xia, 2010. Spatial Forecast Verification: Image Warping. NCAR Technical Note, TN-482+STR, 23pp, doi: [10.5065/D62805JJ](https://doi.org/10.5065/D62805JJ).
5. Gilleland, E., 2010. Confidence intervals for forecast verification. NCAR Technical Notes, NCAR/TN-479+STR, doi: [10.5065/D6WD3XJM](https://doi.org/10.5065/D6WD3XJM).

## Conference preprints

1. Ahijevych, D.A., E. Gilleland, B.G. Brown, E.E. Ebert, L. Holland, and C. Davis, 2008. Intercomparison of spatial verification methods. 88th Annual American Meteorological Society (AMS) meeting, New Orleans, Louisiana. 9.1 Probability/Statistics conference.
2. Gilleland, E., M. Pocerich, H.E. Brooks, B.G. Brown, and P. Marsh, 2008. Large-scale indicators for severe weather. Proceedings of the American Statistical Association (ASA) Joint Statistical Meetings (JSM), 3-7 August 2008, Denver, Colorado. Available at: <http://www.ral.ucar.edu/staff/ericg/GillelandEtAl2008.pdf>.
3. Gilleland, E. and R. W. Katz, 2006. Analyzing seasonal to interannual extreme weather and climate variability with the extremes toolkit (extRemes). 18th Conference on Climate Variability and Change, 86th American Meteorological Society (AMS) Annual Meeting, 29 January - 2 February, 2006, Atlanta, Georgia. P2.15. Available at: <http://www.isse.ucar.edu/extremevalues/Gilleland2006.pdf>.
4. Gilleland, E., 2004. Optimizing METAR Network Design for Verification of Cloud Ceiling Height and Visibility Forecasts, conference proceedings (preprint) for the 2004 joint meeting of The Fifteenth Annual Conference of The International Environmetrics Society and The Sixth International Symposium on Spatial Accuracy Assessment in Natural Resources and Environmental Sciences, 28 June - 1 July, 2004, Portland, ME.
5. Gilleland, E., 2004. 2.5 Improving forecast verification through network design, proceedings of the 17th Conference on Probability and Statistics in the Atmospheric Sciences, 84th Annual Meeting of the American Meteorological Society (AMS), 10 - 15 January, 2004, Seattle, WA.

## Grants and Contracts

1. Genex Systems LLC award, Investigating trends in extreme precipitation for highway bridge safety, 04/01/2016 – 06/30/2016, PI.
2. Risk Prediction Initiative (RPI), "Development of an Improved Database for Tropical Cyclone Size Parameters," 10/01/2013 – 1/1/2016, co-PI.
3. NSF Earth System Modeling (EaSM), "Advanced Climate and Regional Model Validation for Societal Applications", 2012 – 2016, co-I.
4. Environmental Protection Agency (EPA), "Using Advanced Statistical Techniques to Identify the Drivers and Occurrence of Historical and Future Extreme Air Quality Events in the United States from Observations and Models," 6/1/2012 – 5/31/2015, collaborator.



## Invited Talks

1. extRemes: An R package for statistical extreme-value analysis (EVA). NCAR Earth System Extremes Affinity Group meeting, 7 April 2022.
2. Geospatial Statistical Methods for Rare Meteorological Events. 3rd Triple-G Colloquium Series – 26 March 2021, Department of Geography, Environment, and Spatial Sciences, Michigan State University, East Lansing, Michigan, U.S.A.
3. Spatial extreme-value analysis. 29 July 2019. American Statistical Association Joint Statistical Meetings, 27 July – 1 August 2019, Denver, Colorado, U.S.A.
4. A spatial propinquity extreme-value model for assessing large-scale process extremes in future climates. STATMOS Workshop on Spatial and Spatio-temporal EVA and Oceanography 2019, National Science Foundation (NSF), San Diego, California, U.S.A. (OpenSky Citable URL: <http://n2t.net/ark:/85065/d7sb48sv>).
5. Forecast verification for solar power forecasts. 19 July 2018, The 28th Annual Conference of the International Environmetrics Society, 16 - 21 July 2018, Guanajuato, Mexico.
6. Verification within complexity: Comparing spatial fields. 25 April 2018. Institute for Mathematics and Applications (IMA) Forecasting from Complexity Workshop, 23 - 27 April 2018, Minneapolis, Minnesota, U.S.A. <https://www.ima.umn.edu/2017-2018.6/W4.23-27.18>.
7. Extreme value analysis with the R package extRemes. 28 August 2017, Environmental Risk Modeling and Extreme Events Workshop, 28{31 August 2017, Montréal, Québec, Canada Statistical Applications for Severe Storm Environments. 17 February 2017, Università degli Studi di Torino, Turin, Italy.
8. Towards finding trends in extreme values of precipitation: A preliminary Analysis. 24 October 2016, STATMOS Workshop on Climate Extremes, 23 – 25 October 2016, State College, Pennsylvania, U.S.A.
9. Evaluating Severe-Storm Environment Variables from the North American Climate Change Assessment Program Climate Models. 17 October 2016, Mathematical and Statistical Sciences Department, University of Colorado, Denver, Colorado, U.S.A.
10. The spatial prediction comparison test. 6 October 2016, Met Office, Exeter, United Kingdom.
11. Evaluation of weather and climate forecasts: A 2016 perspective. 96th Annual American Meteorological Society Meeting, 23rd Conference on Probability and Statistics in the Atmospheric Sciences, 14 January 2016, New Orleans, Louisiana, U.S.A. (presented for Barbara G. Brown).
12. Testing the tests: A look at size and power for hypothesis tests of competing forecasts. 96<sup>th</sup> Annual American Meteorological Society Meeting, 23rd Conference on Probability and Statistics in the Atmospheric Sciences, 13 January 2016, New Orleans, Louisiana, U.S.A.
13. Conditional Extreme Value Analysis for Severe Storm Environments. 20 November 2015, NCAR/IMAGE ToY seminar, Boulder, Colorado, U.S.A.
14. Which forecast is better? 10 November 2015, Big Data & Environment Workshop, 10 – 13 November 2015, Buenos Aires, Argentina (<http://www.cima.fcen.uba.ar/UMI/bde/index.php>).
15. Conditional extreme value analysis for severe storm environments. University of Colorado, Department of Applied Mathematics colloquium seminar, 23 January 2015, Boulder, Colorado, U.S.A.
16. Mesoscale Verification Intercomparison over Complex Terrain (MesoVICT) Project. University of Delaware SIAM Chapter seminar, 17 April 2014.
17. Testing competing models on spatial fields. GC14B-05, American Geophysical Union Fall Meeting 9 – 13 December 2013, San Francisco, California, U.S.A., 9 December 2013.
18. A conditional extreme value model for severe storm environments. International Short Conference on Advances in Extreme Value Analysis and Application to Natural Hazards, 18 – 20 September 2013, Siegen, Germany, 18 September 2013 (keynote presentation).
19. Extreme Value Analysis and Ventures into Space and Time. Next Generation Climate Data Products Workshop, 15 – 19 July 2013, Boulder, Colorado, U.S.A., 15 July 2013.
20. The Spatial Prediction Comparison Test. 14th Annual WRF Users' Workshop, Boulder, Colorado, U.S.A., 28 June 2013.
21. A conditional distribution for severe storm environments. Colorado School of Mines, Applied Mathematics and Statistics Colloquium seminar presentation, 22 February 2013, Golden, Colorado, U.S.A.

22. Spatial Forecast Verification methods overview. 5 February 2013, 2013 WRF Winter Tutorial and MET Tutorial, 4 – 5 February 2013.
23. Predicting and evaluating extreme weather events, 12th Experimental Chaos and Complexity Conference, Ann Arbor, Michigan, 18 May 2012.
24. Spatial Forecast Verification, WRF User Tutorial, 23 January - 3 February, 2012, Boulder, Colorado, 31 January, 2012.
25. Extreme Value Analysis. Guest lecture for the Systems Thinking class at Leeds Business School at the University of Colorado, Boulder, 8 March 2011.
26. Some extreme value problems in climatology. Extreme events in climate and weather an interdisciplinary workshop (10w5016), Banff Centre, Banff, Alberta, Canada, 22 – 27 August 2010.
27. Spatial Forecast Verification. NCAR Fleishman Building, Boulder, Colorado 14 June 2010, 2010 Advanced Study Program (ASP) Forecast Verification Colloquium.
28. Confidence Intervals: Giving meaning to your results. NCAR Damon Room, Boulder, Colorado, 9 June 2010, 2010 Advanced Study Program (ASP) Forecast Verification Colloquium.
29. Spatial Extremes in Atmospheric Problems, The 19th TIES Conference 8-13 June 2008 Kelowna, BC Canada.
30. The Image Warp for Gridded Forecast Verification, The 19th TIES Conference 8 – 13 June 2008 Kelowna, BC Canada.
31. Extremes and Atmospheric Data. 2007-08 Program on Risk Analysis, Extreme Events and Decision Theory, Opening workshop, 16 – 19 September, 2007, Research Triangle Park, North Carolina, U.S.A.
32. The Extremes Toolkit: Weather and Climate Applications of Extreme Value Statistics. 4<sup>th</sup> Conference on Extreme Value Analysis: Probabilistic and Statistical Models and their Applications, 15 - 19 August, 2005, Gothenburg, Sweden.

## Educational Services

### College Courses (while at NCAR)

1. Lecturer for MATH 3382: Statistical Theory. University of Colorado, Denver. Spring 2019 semester.
2. Lecturer for MATH 6330: Workshop in Statistical Consulting. University of Colorado, Denver. Spring 2018 semester.

### Short Courses

1. Crash-Course in Extremes, 21 May 2019. STATMOS Workshop on Spatial and Spatio-temporal EVA and Oceanography, 21 to 24 May 2019, San Diego, California, U.S.A. (co-organizer).
2. STATMOS is sponsored by the U.S. National Science Foundation (NSF). 9th International Extreme Value Analysis Conference Satellite Workshop on Statistical Computing for Extremes, 14 June 2015, Ann Arbor, Michigan (invited co-organizer/instructor).
3. Introduction to R, Siparcs workshop, 20 May 2015 (invited instructor/organizer) WCRP-ITCP Summer School on Attribution and Prediction of Extreme Events. 21 July – 1 August 2014, Trieste, Italy (invited instructor).
4. Statistical Analysis of Weather and Climate Extremes, The American Meteorological Society's 22nd Conference on Probability and Statistics in the Atmospheric Sciences, 2 February 2014, Atlanta, Georgia (co-organizer and instructor).
5. Introduction to R, Siparcs/HPC workshop, 21 May 2013 (invited instructor/organizer) An introduction to the analysis of extreme values using R and extRemes. Graybill VIII/6<sup>th</sup> International Conference on Extreme Value Analysis. Colorado State University, Fort Collins, Colorado. 22 – 26 June 2009 (invited co-organizer/instructor).
6. Intense course for young researchers on R Statistical software for climate research with an introduction to extreme value analysis, Interdisciplinary Workshop: Effects of climate change: coastal systems, policy implications, and the role of statistics Workshop. Preluna Hotel and Spa, Sliema, Malta. 16 – 17 March 2009 (invited organizer/instructor).

## Graduate Students

1. Working with and planning to serve on Vitaly Kholodovsky's Ph.D. committee at University of Maryland, Baltimore Campus.
2. Served on Tian Yu Yen's Ph.D. committee at University of Colorado, Denver's Department of Mathematical and Statistical Sciences. Defended on 14 July 2021.
3. Dissertation Committee Member, Diego Garzena, Ph.D., Universit\_a degli Studi di Torino, 17 February 2017.
4. NCAR Staff Sponsor for NCAR's Advanced Study Program (ASP) Graduate Student Visitor Program, Linyin Cheng, University of California, Irvine, (2013) Resulted in the papers Cheng et al. (2014a,b). Linyin is now a professor at University of Arkansas.
5. Thesis Committee Member, Apputhurai Pragalathan, Ph.D., Swinburne University of Technology, (2012).

## Colloquia and Workshops for Students

1. Co-organizer for the STATMOS Workshop on Spatial and Spatio-Temporal Extreme-Value Analysis Applied to Oceanography, 21 to 24 May 2019, San Diego, California, U.S.A.
2. Organizing committee for the 2011 ASP Colloquium on "Statistical Assessment of Extreme Weather Phenomena under Climate Change." (<http://www.aspcar.edu/colloquium/2011/index.php>).
3. Problem presenter for the 2009 Industrial Mathematical and Statistical Modeling (IMSM) Workshop for Graduate Students. Center for Research in Scientific Computation, Raleigh, North Carolina and the Statistical and Applied Mathematical Sciences Institute (SAMSI), Research Triangle Park, North Carolina, 20{28 July 2009. The topic was "Large-scale indicators for severe weather." Resulted in the Heaton et al. (2011) paper (see refereed publications above).
4. Problem presenter for the 2010 IMSM Workshop for Graduate Students. Center for Research in Scientific Computation, Raleigh, North Carolina and SAMSI, Research Triangle Park, North Carolina, 19{27 July 2010. The topic was "Space-time forecast verification: generalizing the image warp method from the spatial domain to the space-time domain." Resulted in an NCAR Technical Note (Gilleland et al., 2010, see references above).

## Reading Groups

- Statistical Analysis of Extremes in Geophysical Science (<http://www.ral.ucar.edu/staff/ericg/extremereading.html>).
- Forecast Verification (<http://www.ral.ucar.edu/staff/ericg/vxreading.html>).

## Other Synergistic Activities

### Committee Service

1. Program Chair-Elect 2022 for the American Statistical Association Statistics and the Environment (ENVR) Section (9/2021 – 9/2022). Program Chair (9/2022 – 9/2023).
2. Member: World Meteorological Organization (WMO) World Weather Research Devision's Joint Working Group on Forecast Verification Research (JWGFVR), 2/22/2018 – 12/31/2021.
3. NCAR node director for STATMOS (1/1/14 – 6/1/2019), [https://www.statmos.washington.edu/?page\\_id=266](https://www.statmos.washington.edu/?page_id=266)).
4. American Meteorological Society's Probability and Statistics Committee (Committee Member: 1/16/2011 – 2/15/15, Committee Chair, 2/15/15 – 1/15/18).
5. Organizing committee of the Mesoscale Verification Intercomparison in Complex Terrain (Meso-VICT) project.
6. Lead organizer of the Spatial Forecast Verification Methods Inter-Comparison Project (ICP, <http://www.ral.ucar.edu/projects/icp/>).



## Conference Organization

1. Co-organizer of the 30th Conference on Climate Variability and Change, 24th Conference on Probability and Statistics, and 16th Conference on Artificial Intelligence, 28 – 29 July 2017, Baltimore, Maryland, U.S.A.
2. Co-chair for the 4th International Workshop on Climate Informatics. 25 - 26 September 2014, National Center for Atmospheric Research, Boulder, Colorado, U.S.A.  
(<https://www2.image.ucar.edu/event/ci2014>).
3. Organizing Chair for the 4th Annual UCAR/NCAR Early Career Scientists Assembly (ECSA) Junior Faculty Forum on Future Scientific Directions, 1 – 3 August 2006, Boulder, CO.

## Software Development

- R software packages (author and maintainer): distillery, extRemes/in2extRemes, smoothie, and SpatialVx.
- Advisory role on the stand-alone software package: Model Evaluation tools (MET, <https://dtcenter.org/met/users/>).
- Contributor to R packages: RadioSonde, fields.
- Maintainer of R packages: ismev, verification.

## Journal Service

Associate Editor: Monthly Weather Review, 1/2014 – present.

Journal reviewer for: Agricultural and Forest Meteorology, American Water Resources Association, Annals of Applied Statistics, J. Applied Meteorology and Climatology, Atmospheric Chemistry and Physics, Atmospheric Research, Canadian Journal of Forest Research, Chance Magazine, J. Climate, Climatic Change, Climate Dynamics, Communications in Statistics, Environmetrics, J. Environmental Management, Environmental Modelling and Software, Environmental Processes, Eos, Extremes, J. Geophys. Res., Geophys. Res. Lett., J. Hydrology, J. Hydrometeorology, Meteorol. Appl., Meteorologische Zeitschrift, Mon. Wea. Rev., Nature, Nonlin. Proc. Geophys., Journal of the Royal Statistical Society C, SIAM J. Uncertainty Quant., Stoch. Environ. Res. Risk Assess., Water Resources Research, Weather and Forecasting, Wind Energy.

## Professional Society Memberships

American Geophysical Union, American Meteorological Society, American Statistical Association, and The International Environmetrics Society.