Greg Lucas

Curriculum Vitae

Experience

2017–Present **Mendenhall Postdoctoral Fellow**, *United States Geological Survey*, Golden, CO.

Investigating geoelectric induction hazards caused by geomagnetic storms.

- Created a software package to process and analyze geomagnetic and geoelectric field data.
- Determine hazards within the US power grid from geomagnetic storms
  - Coupling magnetic fields with physical properties of the solid Earth and power grids.

2012–2017 **Research Assistant**, *University of Colorado*, Boulder, CO.

Focus on atmospheric electricity with an emphasis on the Global Electric Circuit (GEC).

- Developed the first physics-based model of the GEC for global climate models.
  - Open-source code written in Fortran that will be included in future climate model code releases as a default module.
- Developed a statistical analysis framework for investigating arrays of electric field mills.
  - Involved the analysis of more than 4 TB of data from 31 instruments to quantify the relationships between unique signals discovered within the data.

2015–2017 **Affiliate Professor**, *Regis University*, Denver, CO.

Taught a calculus based physics laboratory.

2009–2013 **Member of the Technical Staff**, *Sandia National Laboratories*, Albuquerque, NM.

Worked on risk analysis related to launching nuclear material into space.

- Designed a new monte carlo code suite for stastical consequence analysis
  - Takes releases from the ground and transports them through the atmosphere and determines the health effect outcome.
  - Centered around a modular framework to allow new codes to be integrated seamlessly in the future.
- Parallelized previous codes to enable many more simulations to be completed.
- Recognized by review panel for innovative approaches to risk analysis.

Education

2012–2017 **Ph.D. in Aerospace Engineering**, *University of Colorado*, Boulder, CO.

Title Investigating the physical mechanisms that impact electric fields in the atmosphere

Conentration Remote sensing

Advisor Professor Jeffrey Thayer

2005–2010 **MS in Medical Physics**, *University of Wisconsin*, Madison, WI.

Focus on particle transport applications for radiation treatment programs.

2005–2010 **BS in Nuclear Engineering**, *University of Wisconsin*, Madison, WI.

2005–2009 **Certificate (minor) of Computer Science**, *University of Wisconsin*, Madison, WI.

Focus on numerical methods and scientific programming.

Computer skills

Programming	Python (numpy, pandas, scikit-learn), Fortran, Java, C, Matlab
Other	Linux, MPI, Version Control

Affiliations

American Nuclear Society

American Geophysical Union

Awards

USGS Mendenhall Postdoctoral Fellowship

Nuclear Regulatory Commission Scholarship

Dean's Honor List (every semester)

Nuclear Engineering Scholarship (2)

Freshman Academic Achievement Award

Teaching Experience

Regis University affiliate professor: Physics laboratory

University of Wisconsin: 1 credit supplemental engineering statics and dynamics

University of Wisconsin: Teaching assistant for reactor core design on senior projects

Publications

Papers

1 J. J. Love, G. M. Lucas, A. Kelbert, and P. A. Bedrosian, "Geoelectric hazard maps for the mid-atlantic united states: 100-year extreme values and the 1989 magnetic storm," *Geophysical Research Letters*, 2017. 2017GL076042.

2 J. Jansky, G. M. Lucas, C. Kalb, V. Bayona, M. J. Peterson, W. Deierling, N. Flyer, and V. P. Pasko, "Analysis of the diurnal variation of the global electric circuit obtained from different numerical models," *Journal of Geophysical Research: Atmospheres*, 2017. 2017JD026515.

3 G. M. Lucas, J. P. Thayer, and W. Deierling, "Statistical analysis of spatial and temporal variations in atmospheric electric fields from a regional array of field mills," *Journal of Geophysical Research: Atmospheres*, 2017. 2016JD025944.

4 G. M. Lucas, A. J. G. Baumgaertner, and J. P. Thayer, "A global electric circuit model within a community climate model," *Journal of Geophysical Research: Atmospheres*, Jan. 2015.

5 V. Bayona, N. Flyer, G. M. Lucas, and A. J. G. Baumgaertner, "A 3-D RBF-FD solver for modeling the atmospheric global electric circuit with topography (GEC-RBFFD v1.0)," *Geosci. Model Dev.*, vol. 8, pp. 3007–3020, Oct. 2015.

6 A. J. G. Baumgaertner, G. M. Lucas, J. P. Thayer, and S. A. Mallios, "On the role of clouds in the fair weather part of the global electric circuit," *Atmos. Chem. Phys.*, vol. 14, pp. 8599–8610, Aug. 2014.

7 X. Liu, W. Wang, J. P. Thayer, A. Burns, E. Sutton, S. C. Solomon, L. Qian, and G. Lucas, "The winter helium bulge revisited," *Geophysical Research Letters*, p. 2014GL061471, Sept. 2014.

8 A. J. G. Baumgaertner, J. P. Thayer, R. R. Neely, and G. Lucas, "Toward a comprehensive global electric circuit model: Atmospheric conductivity and its variability in CESM1(WACCM) model simulations," *J. Geophys. Res.*, vol. 118, no. 16, pp. 9221–9232, 2013.

9 L. Akin *et al.*, "Final safety analysis report for the mars science laboratory mmrtg launch approval addendum.," 2010. SAND2010-2547.

10 L. Akin *et al.*, "Final safety analysis report for the mars science laboratory mmrtg launch approval addendum update.," 2010. SAND2010-5559.

Conferences

11 G. M. Lucas, J. J. Love, and E. J. Rigler A. Kelbert, P. A. Bedrosian. Calculating realistic voltages across the us power grid utilizing measured impedances and magnetic fields, 2017.

12 A. Kelbert, C. C. Balch, G. M. Lucas, and E. J. Rigler. Geoelectric field estimation and power-line integration using a 3d electrical conductivity model of the united states, 2017.

13 G. M. Lucas, J. P. Thayer, and W. Deierling. Analysis of surface electric field measurements from an array of electric field mills, 2016.

14 G. M. Lucas and J. P. Thayer. Coupling of thunderstorms and ionospheric potentials through the global electric circuit, 2016.

15 G. M. Lucas, W. Deierling, and J. P. Thayer. Variability of surface electric fields, 2016.

16 G. M. Lucas and J. P. Thayer. Magnetospheric coupling to the global electric circuit, 2015.

17 G. M. Lucas, A. J. G. Baumgaertner, J. P. Thayer, V. Bayona, and N. Flyer. Model simulations of the diurnal and seasonal variations of the global electric circuit using a consistent 3d model framework, 2014.

18 G. M. Lucas, A. J. G. Baumgaertner, and J. P. Thayer. Numerical modeling of the global electric circuit, 2014.

19 G. M. Lucas, E. Lehto, A. J. G. Baumgaertner, J. P. Thayer, J. M. Forbes, and X. Zhang. Modeling the electrical characteristics of the global electric circuit, 2013.

20 Greg Lucas, Andreas Baumgaertner, and Jeffrey Thayer. Analytic model of the global electric circuit, 2013.

21 GM Lucas, NE Bixler, and RJ Lipinski. Dose calculations for nuclear thermal rocket exhaust, February 2013. Nuclear and Emerging Technologies in Space.

22 DJ Clayton and GM Lucas. Solid propellant behavior in radioisotope power systems accident sequence modeling. `http://www.lpi.usra.edu/meetings/nets2012/pdf/3046.pdf`, February 2012. Nuclear and Emerging Technologies in Space.

23 DJ Clayton, GM Lucas, and TE Radel. Resulting source term from the mars science laboratory safety analysis. http://www.lpi.usra.edu/meetings/nets2012/pdf/3009.pdf, February 2012. Nuclear and Emerging Technologies in Space.

24 DJ Clayton, GM Lucas, TE Radel, and BD Wiberg. Accident sequence modeling for radioisotope power systems. http://www.lpi.usra.edu/meetings/nets2012/pdf/3008.pdf, February 2012. Nuclear and Emerging Technologies in Space.

25 Greg Lucas. Microstructural evolution of iridium cladding, September 2011. Poster, International Nuclear Fuels Conference.

26 Tracy Radel and Greg Lucas. Modeling solid propellant shielding phenomena for launch accident analysis, November 2009. American Nuclear Society.

27 L Yu, GM Lucas, AN Primak, OP Dzyubak, X Liu, and CH McCollough. Dual-source dual-energy ct (dect) combined images can provide improved image quality relative to single-energy ct with no increase in patient dose, 2007. Radiological Society of North America, Abstract 5011915.