

# Michael J. Peterson, Ph.D.

Curriculum Vitae, 12/07/17

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## SUMMARY

An Atmospheric Scientist that specializes in using large volumes of ground- and satellite-based observations to study lightning, electrified weather, and the Global Electric Circuit.

<b>Ph.D.</b> in Atmospheric Sciences	<b>\$100K yr<sup>-1</sup></b> in awards as a Principle Investigator	<b>10 articles</b> in major peer- reviewed journals	<b>9 presentations</b> at national scientific conferences
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### Professional Appointments

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○ 2016 Post-Doc **University of Maryland**  
Earth System Science Interdisciplinary Center  
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○ 2014 Post-Doc **National Center for Atmospheric Research**  
High Altitude Observatory

### Education

○ 2014 Ph.D. **The University of Utah**  
Atmospheric Sciences with Chuntao Liu & Ed Zipser  
↑  
○ 2011 M.S. **The University of Utah**  
Atmospheric Sciences with Chuntao Liu  
↑  
○ 2009 B.S. **Iowa State University**  
Meteorology

### Languages

+ *most frequent*  
▪ Python  
▪ IDL  
▪ BASH  
▪ JavaScript  
▪ HTML  
▪ FORTRAN  
▪ Perl  
▪ PHP  
▪ Matlab  
▪ NCL  
▪ GRADS  
- *least frequent*

### Developed Software

#### Passive Microwave Electric Field Retrieval Algorithm

Description: FORTRAN retrieval of 3D electric field  
vector above electrified clouds  
Outcomes: Excellent agreement with Carnegie  
curve and measured Wilson currents

#### Virtual Reality VHF Lightning

Automated system that creates VR videos of  
DCLMA lightning sources  
25 DC cases posted online; collaborated  
with HyLMA to show extreme lightning case

### Research Interests

Lightning                      Lightning measurements add context to meteorological satellite observations. It is both a hazard and diagnostic of convective processes in thunderstorms.

The Global  
Electric Circuit                Electrified clouds produce conduction (Wilson) currents that help regulate the ionospheric potential. The GEC can be used to monitor climate variations.

## PROFESSIONAL APPOINTMENTS

- 2016/08 – **University of Maryland Earth System Science Interdisciplinary Center**  
present College Park, MD  
*Post-Doctoral Research Fellow*
- Maintained the 10-sensor DC Lightning Mapping Array (DCLMA). Developed software using its VHF measurements for information, education and outreach, and Geostationary Lightning Mapper (GLM) intercomparison. Prepared custom/developmental NOAA geospatial products for integration into AWIPS. Administered UNIX systems in Lightning Mapping Array (LMA) sensors.
- 2014/08 – **National Center for Atmospheric Research**  
2016/08 Boulder, CO  
*Post-Doctoral Research Fellow*
- Developed an algorithm from NASA ER-2 aircraft passive microwave and electric field measurements to estimate the electric field and Wilson current over electrified weather. Used this algorithm to quantify the total current provided to the ionosphere through the GEC from 17 years of Tropical Rainfall Measuring Mission (TRMM) and 2 years of Global Precipitation Measurement (GPM) observations.
- 2014/05 – **The University of Utah**  
2014/08 Salt Lake City, UT  
*Post-Doctoral Research Fellow*
- Constructed an interactive real-time data analysis portal for ~2 TB of radar, passive microwave, and lightning satellite data integrated into a Web Map Service (WMS).

## EDUCATION

- 2014/08 **Ph.D. in Atmospheric Sciences**  
The University of Utah, Salt Lake City, UT
- 2011/11 **M.S. in Atmospheric Sciences**  
The University of Utah, Salt Lake City, UT
- 2009/05 **B.S. in Meteorology**  
Iowa State University, Ames, IA

## FUNDED RESEARCH

- 2017 **Peterson, M.J.** and S. Rudlosky, 2017: Leveraging the TRMM/LIS Record to Maximize the Scientific Impact of the ISS-LIS and GOES-R GLM. NASA N6-WEATHER16-0045. \$100,000 yearly for 3 years.

## PROFESSIONAL SERVICE

- 2017 **NASA Global Hydrology Resource Center DAAC User Working Group**  
*Incoming Chair for 2018*
- 2016 **NASA Global Hydrology Resource Center DAAC User Working Group**  
*Member*
- 2015 **NCAR Early Career Scientist Assembly (ECSA) Steering Committee**  
*Member*
- High Altitude Observatory (HAO) Strategic Plan Committee**  
*Goal Team Leader*

## PRESS AND RECOGNITION

- 10/2017 **AGU Research Spotlight**  
"Ocean Showers Power the Global Electric Circuit"  
*In press*
- Cooperative Institute for Climate and Satellites - Maryland (CICS-MD) Website**
- 9/2017 "Hurricane Harvey Lightning as seen by GOES-16"  
<http://cicsmd.umd.edu/hurricane-harvey-lightning-as-seen-by-goes-16/>
- 12/2016 "CICS readies for data from new GOES-R satellite"  
<http://essic.umd.edu/joom2/index.php/current-news/featured-essic/2326>
- CICS-MD Circular Newsletter**
- 6/2017 "Striking Views of Lightning from Above and Below"  
[http://cicsmd.umd.edu/assets/1/7/June\\_2017\\_CICS-MD\\_Circular.pdf](http://cicsmd.umd.edu/assets/1/7/June_2017_CICS-MD_Circular.pdf)
- CICS-MD Weekly Reports to NOAA**
- 10/2017 "Hurricanes Harvey and Maria"  
[http://cicsmd.umd.edu/assets/1/7/CICS\\_Weekly\\_Report\\_10-13-17.pdf](http://cicsmd.umd.edu/assets/1/7/CICS_Weekly_Report_10-13-17.pdf)
- "TRMM and GPM Satellite s Measure Earth's Electrical Circuit"  
[http://cicsmd.umd.edu/assets/1/7/CICS\\_Weekly\\_Report\\_10-6-17.pdf](http://cicsmd.umd.edu/assets/1/7/CICS_Weekly_Report_10-6-17.pdf)
- 8/2017 "Virtual Reality Applications for Lightning Safety"  
[http://cicsmd.umd.edu/assets/1/7/CICS\\_Weekly\\_Report\\_8-25-17.pdf](http://cicsmd.umd.edu/assets/1/7/CICS_Weekly_Report_8-25-17.pdf)
- NCAR High Altitude Observatory (HAO) Website**
- 5/2016 "Meet Michael Peterson"  
<https://www2.hao.ucar.edu/news/2016-may/meet-michael-peterson>
- UCARConnect**
- 2016 "Investigating Electrical Connections and Consequences"  
<https://ucarconnect.ucar.edu/students/careers/profiles/michael-peterson#.WNH0p461t5M>

## Vaisala

- 2016 “Tool for Enthusiasts and Experts Alike”  
<https://www.vaisala.com/en/blog/2017-07/tool-enthusiasts-and-experts-alike>

## AWARDS

- 2015 **Vaisala Open Weather Data Challenge**  
*Finalist*
- 2014 **National Science Foundation (NSF) Visualization Challenge**  
*Finalist*

## SOFTWARE AND MEDIA

- 2009-2014 **The TRMM Data Analysis Tool ([trmm.chpc.utah.edu/gmaptool/](http://trmm.chpc.utah.edu/gmaptool/)):**  
An on-demand WMS that allows users to explore Tropical Rainfall Measuring Mission (TRMM) satellite data.
- 2014-2017 **The Weather Archive ([www.wxarchive.com](http://www.wxarchive.com)):**  
A geoscience cyberinfrastructure development initiative; finalist in 2015 NSF Visualization Challenge and 2016 Vaisala Open Weather Data Challenge.
- 2017 **The LIS-A-Day Twitterbot (@WeatherArchive):**  
Dives deep into the Lightning Imaging Sensor (LIS) science data to automatically identify and animate “interesting” flashes. Then, posts the videos to Twitter.
- 2017 **Virtual Reality with the DCLMA:**  
An initial proof of concept for applying VR technologies to geospatial data (in this case lightning radio emissions). Created 360° photos/videos of lightning sources around an observer as a thunderstorm passes overhead.

### *Featured videos and interactive visualizations:*

[https://www.youtube.com/playlist?list=PLMnO7H\\_BwO8EizYtGgoHPDWKGCiP1DwPO](https://www.youtube.com/playlist?list=PLMnO7H_BwO8EizYtGgoHPDWKGCiP1DwPO)

## JOURNAL PUBLICATIONS

- 2017 **Peterson, M. J.**, S. Rudlosky, and W. Deierling, 2017: The evolution and structure of extreme optical lightning flashes. *J. Geophys. Res.*, accepted and in press.
- Jansky, J., G. M. Lucas, C. Kalb, V. Bayona, **M. J. Peterson**, W. Deierling, N. Flyer, and V. Pasko, 2017: Analysis of the diurnal variation of the Global Electric Circuit obtained from different numerical models. , *J. Geophys. Res.*, **122**, doi: 10.1002/2017JD026515.
- Peterson, M. J.**, W. Deierling, C. Liu, D. Mach, C. Kalb, 2017: A TRMM/GPM retrieval of the mean generator current for the Global Electric Circuit, *J. Geophys. Res.*, **122**, doi: 10.1002/2016JD026336.

- Rudlosky, S., **M. Peterson**, and D. Kahn, 2017: GLD360 Performance relative to TRMM/LIS. *J. Atmos. Oceanic Technol.*, **34**, 1307-1322, doi:10.1175/JTECH-D-16-0243.1.
- 2016 **Peterson, M. J.**, W. Deierling, C. Liu, D. Mach, C. Kalb, 2016: The properties of optical lightning flashes and the clouds they illuminate, *J. Geophys. Res.*, **122**, 116, 423-442.
- Kalb, C. P., W. D. Deierling, A. Baumgaertner, **M. J. Peterson**, C. Liu, and D. Mach, 2016: Parameterizing total storm conduction currents in the Community Earth System Model, *J. Geophys. Res.*, **121**, 13,715-13,734, doi: 10.1002/2016JD02537.
- 2015 **Peterson, M. J.**, C. Liu, D. Mach, W. Deierling, C. Kalb, 2015: A method of estimating electric fields above electrified clouds from passive microwave observations, *J. Atmos. Oceanic Technol.*, **32**, 8, 1429-1446.
- 2014 Garstang, M., R. E. Davis, K. Leggett, O. W. Frauenfeld, S. Greco, E. Zipser, and **M. Peterson**, 2014: Response of African elephants (*Loxodonta africana*) to seasonal changes in rainfall, *Pub. Lib. Sci. One*, **9**, (10), e108736, doi: 10.1371/journal.pone.0108736.
- 2013 **Peterson, M. J.** and C. Liu, 2013: Characteristics of lightning flashes with exceptional illuminated areas, durations, and optical powers and surrounding storm properties in the tropics and inner subtropics, *J. Geophys. Res. Atmos.*, **118**, 11,727-11,740, doi: 10.1002/jgrd.50715.
- 2011 **Peterson, M. J.** and C. Liu, 2011: Global statistics of lightning in anvil and stratiform regions over the tropics and subtropics observed by TRMM, *J. Geophys. Res. Atmos.*, **116**, D23, doi: 10.1029/2011JD015908.

#### INSTITUTIONAL PUBLICATIONS

- 2014 **Peterson, M. J.**, 2014: Variations of optical and radio lightning characteristics and the relationship between storm convective intensity and above-cloud electric fields, *Ph.D. dissertation*, 253 pages.
- 2011 **Peterson, M. J.**, 2011: Satellite and ground based observations of lightning flashes in the stratiform and anvil regions of convective systems, *M.S. thesis*, 139 pages.

#### CONFERENCE PRESENTATIONS

- 2017 Rudlosky, S., **M. J. Peterson**, and L. A. Da Silva, 2017: Applying Virtual Reality Technology to Improve Lightning Safety. *NOAA Emerging Tech. Workshop*, poster.
- Peterson, M. J.**, W. Deierling, C. Liu, D. M. Mach, and T. Kalb, 2015: On the variations of electric fields, lightning and storm properties. *AGU Fall Meeting 2015*, AE31C-0460, poster.

- 2016 **Peterson, M. J.**, and S. Rudlosky, 2016: Optical and Radio Perspectives on Lightning Flash Propagation. *AGU Fall Meeting 2016*, AE12A-08, 32 slides.
- Peterson, M. J.**, and S. Rudlosky, 2016: Monitoring Climate with the Global Electric Circuit. *CICS Sci. Conf. 2016*, 21 slides.
- 2015 **Peterson, M. J.**, W. Deierling, C. Liu, D. M. Mach, and T. Kalb, 2015: On the variations of electric fields, lightning and storm properties. *AGU Fall Meeting 2015*, AE31C-0460, poster.
- Deierling, W., C. Kalb, **M. J. Peterson**, C. Liu, D. Mach, and R. Blackeslee, 2015: Conduction Currents in Oceanic and Continental electrified Clouds. *AGU Fall Meeting 2015*, AE31C-0458, poster.
- Kalb, C., W. Deierling, **M. J. Peterson**, and C. Liu, 2015: Total Storm Conduction Currents Derived Using a Global Climate Model. *AGU Fall Meeting 2015*, AE12A-08, poster.
- 2014 **Peterson, M. J.**, W. Deierling, C. Liu, D. M. Mach, and T. Kalb, 2014: A comparison of satellite-based estimates of global electricity. *AGU Fall Meeting 2014*, AE13B-3363, poster.
- Peterson, M. J.**, C. Liu, D. M. Mach, W. Deierling, and T. Kalb, 2014: A microwave retrieval algorithm of above cloud electric fields. *XV International Conference on Atmospheric Electricity*, 12 pages.
- 2013 **Peterson, M. J.**, C. Liu, D. M. Mach, W. Deierling, and T. Kalb, 2013: Of ice and charging: a look at thundercloud electric fields and passive microwave observations. *AGU Fall Meeting 2013*, AE13B-0347, poster.
- Deierling, W., C. Kalb, D. Mach, C. Liu, and **M. Peterson**, 2013: Total storm currents in relation to storm type and lifecycle. *AGU Fall Meeting 2013*, AE23B-0427, poster.
- Kalb, C., W. Deierling, D. Mach, C. Liu, and **M. Peterson**, 2013: Total storm currents and their relationship to microphysical and dynamical cloud properties. *AGU Fall Meeting 2013*, AE23B-0421, poster.
- 2012 **Peterson, M. J.** and C. Liu, 2012: The properties of thunderstorms with lightning flashes illuminating large areas. *AGU Fall Meeting 2012*, poster
- 2011 **Peterson, M. J.** and C. Liu, 2011: A TRMM survey of lightning flashes illuminating large areas. *AGU Fall Meeting 2011*, poster.
- Davis, R. E., M. Garstang, K. Leggett, E. Zipser, S. Greco, and **M. Peterson**, 2011: Weather and climate influences on the movement patterns of the African elephant (*Loxodonta africana*) and the role of infrasound. *19th International Congress of Biometeorology*.
- 2010 Liu, C., E. Zipser, H. Jiang, and **M. J. Peterson**, 2010: Improvements of University of Utah precipitation feature database. *PMM Science Meeting 2010*, poster.
- Peterson, M. J.** and C. Liu, 2010: Stratiform and anvil lightning: a TRMM perspective. *AGU Fall Meeting 2010*, poster

## INSTITUTIONAL AND INVITED TALKS

- 2017      **Peterson, M. J.**, 2017: Optical Lightning Measurements from GOES-16 GLM and Ground-Based Cameras in Washington, DC. *University of Alabama in Huntsville Atmospheric Science Dep't*, 19 slides.
- 2016      **Peterson, M. J.**, 2016: Orbital and ground-based perspectives on the characteristics of lightning flashes and thunderstorms. *Earth Networks*, 65 slides.
- Peterson, M. J.**, 2016: A TRMM/NLDN look at the properties of lightning flashes and thunderstorms. Vaisala, 54 slides.
- Peterson, M. J.**, 2016: Using TRMM/GPM to diagnose current sources for the Global Electric Circuit. *University of Utah Atmospheric Sciences Dep't.*, 72 slides.
- Peterson, M. J.**, 2016: Current contributions of electrified clouds to the Global Electric Circuit: a satellite based approach. *Naval Research Laboratory*, 70 slides.
- Peterson, M. J.**, 2016: Lightning, electrified clouds, and the Global Electric Circuit. *RAL Seminar Series*, 59 slides
- 2015      **Peterson, M. J.**, 2015: Lightning, thunderstorms, and the Global Electric Circuit. *CU Boulder ATOC*, 49 slides
- Ignite NCAR-VII**  
<https://youtu.be/mHWLQiBom58>
- Peterson, M. J.**, W. Deierling, C. Liu, D. M. Mach, and T. Kalb, 2015: A TRMM and GPM Examination of Electrified Clouds and Implications for the temporal Variability of the Global Electric Circuit. *FESD Biannual Meeting*, 45 slides
- Peterson, M. J.**, 2015: An Interactive Data Analysis and Visualization Software for the Web Browser. *UCAR Software Engineering Assembly*, 43 slides
- Peterson, M. J.**, 2015: A Data Visualization and Analysis Software in “the Cloud.” *Ignite NCAR VII*, 20 slides
- Peterson, M. J.**, 2015: The Weather Archive. *CU Boulder ATOC*, 63 slides
- Peterson, M. J.**, 2015: The Weather Archive. *UNIDATA*, 22 slides
- 2014      **Peterson, M. J.**, C. Liu, D. M. Mach, W. Deierling, and T. Kalb, 2014: A Microwave Retrieval Algorithm of Above-Cloud Electric Fields. *FESD Biannual Meeting*, 32 slides

## SPOKEN LANGUAGES

- English - fluent
- Spanish - conversational

## **PROFESSIONAL SOCIETIES**

2005 – **American Meteorological Society**  
present *Member*

2009 – **American Geophysical Union**  
present *Member*

## **REFERENCES**

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