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## Michael Hutchins

### Education

University of Washington, Department of Earth and Space Sciences, Seattle, WA

**PhD in Earth and Space Science**

Expected Graduation: Spring 2014

University of California Santa Barbara, Department of Physics, Santa Barbara, CA

**BS in Physics, 2009**

Edinburgh University, Department of Physics, Edinburgh, Scotland

Study Abroad, 2007-2008

### Experience and Skills

**Predoctoral Research Associate** Researched the source, propagation, and effects of lightning in the Earth-Ionosphere System. Developed, deployed, and maintained VLF radio stations for the World Wide Lightning Location Network. Experience in analyzing large geophysical datasets, using radio propagation models, and working extensively with lightning detection systems. I have presented my research at national and international conferences, authored papers, and collaborated internationally throughout my research.

**Teaching** Led undergraduate space science labs focused teaching students basic electronics in pursuit of building a weather balloon payload. Organized, developed, and graded written lab assignments. Mentored an undergraduate teaching assistant throughout the duration of a class.

**Analytical** Experienced data analysis skill set used with large multi-variable data sets. Developed new algorithms, upgrades, and efficiency models for a global geophysical network. Extensive experience with digital and analog signal processing.

**Communication** Excellent communication skills, in particular delivering complex ideas to a general audience. Skilled at developing and giving both formal and informal presentations. Able to quickly read, analyze, and synthesize large amounts of material.

**Computer and Electronics** Well versed in the three major operating systems (Windows, OS X, and Linux). Programming experience in MATLAB, python, Fortran, bash, and R along with tools such as git and LaTeX. Able to learn new languages quickly. Worked extensively designing and prototyping circuits (with EagleCAD), troubleshooting components, performing system tests, and incorporating embedded computers.

## **Research Workshops**

NASA/JPL Planetary Science Summer School (12 – 16 August 2013)

*Taking Remote and In-situ Data to Explore Neptune and Triton (TRIDENT)*

## **Committees and Outreach**

College of the Environment Student Advisory Council to the Dean (2013 – present)

Graduate and Professional Student Senate (2010 – Present)

GPSS Judicial Committee (2011 – 2012), Chair (2012 – Present)

Earth and Space Sciences Curriculum Committee (2012 – Present)

Earth and Space Sciences Research Gala Committee Co-Chair (2011 – 2012)

Space Faculty Search Committee (2011 – 2012)

Graduate Program Review Committee (2010 – 2011)

NASA's University Student Launch Initiative, UW Science Team Lead, (2010 – 2011)

## **Research**

My current research is focusing on the source, propagation, and effects of lightning in the Earth-Ionosphere system. At the source I am examining how lightning energies differ over continents compared to oceans, how temperature and specific humidity control lightning production, and the best way to cluster lightning into thunderstorms. I am examining the propagation of VLF sferics through the Earth-Ionosphere waveguide and how the attenuation changes with differing direction and surface properties. Lastly I am interesting in what is driving the global electric circuit and if it is possible to make an accurate estimate from lightning measurements.

Most of this is enabled by an upgrade I made to the World Wide Lightning Location Network (WWLLN) to measure the VLF radiated energy of the located lightning strokes. I am also active in expanding the WWLLN through the development of a relative detection efficiency model, station design, production of new stations, station development, network comparisons, and distributing data for collaborative work.

## **Awards and Grants**

GPSS Travel Grant, 2012

*University of Washington, Graduate and Professional Student Senate*

Best in Space Physics, 2012

*University of Washington, Earth and Space Sciences Research Gala*

Stephens Graduate Student Fund and the Dr. & Mrs. H. A. Coombs Scholarship (Goodspeed Geology Scholarship), 2012

*University of Washington, Department of Earth and Space Sciences*

Winglee Award: Best Space Physics Oral Presentation, 2013

*University of Washington, Earth and Space Sciences Research Gala*

Best Space Physics Presentation, 2014

*University of Washington, Earth and Space Sciences Research Gala*

## Continued Education

Stanford Introduction to Artificial Intelligence (2011)  
Udacity CS101 - Introduction to Computer Science: Building a Search Engine (2012)  
Udacity CS222 - Differential Equations in Action: Making Math Matter (2013)  
Coursera - Introduction to Data Science (2013)  
Coursera - Computing for Data Analysis (2013)  
Coursera - Data Analysis (2013)  
Coursera - Machine Learning (2013)  
Udacity CS617 - Introduction to Hadoop and MapReduce (2013)

## Publications

Connaughton, V., Briggs, M. S., Holzworth, R. H., **Hutchins, M. L.**, and 13 other authors (2010), Associations between Fermi GBM Terrestrial Gamma-ray Flashes and sferics from the WWLLN, *J. Geophys. Res.*, *115*, doi:10.1029/2010JA015681

Virts, K. S., Thornton, J. A., Wallace, J. M., **Hutchins, M. L.**, Holzworth, R. H., and Jacobson, A. R., (2011), Daily and intraseasonal relationships between lightning and NO<sub>2</sub> over the Maritime Continent, *Geophys. Res. Lett.*, *38*, L19803, doi:10.1029/2011GL048578

Xiong, S., Briggs, M. S., Connaughton, V., Fishman, G. J., Tierney, D., Fitzpatrick, G., Foley, S., Guiriec, S., Holzworth, R. H., **Hutchins, M. L.**, (2012), Location prediction of electron TGFs, *Journal of Geophysical Research*, *117*, A02309, 8pp. doi:10.1029/2011JA017085

**Hutchins, M. L.**, Holzworth, R. H., Rodger, C. J., Brundell J. B., (2012), Far-field power of lightning strokes as measured by the World Wide Lightning Location Network, *Journal of Atmospheric and Oceanic Technology*, *29*, 1102-1110, doi:10.1175/JTECH-D-11-00174.1

**Hutchins, M. L.**, Holzworth, R. H., Brundell, J. B., Rodger, C. J., (2012), Relative detection efficiency of the World Wide Lightning Location Network, *Radio Science*, *47*, RS6005, doi:10.1029/2012RS005049

Connaughton, V., Briggs, M. S., Xiong, S., Dwyer, J. R., **Hutchins, M. L.**, Grove, J. E., Chekhtman, A., et al. (2012). Radio signals from electron beams in Terrestrial Gamma-ray Flashes, *Journal of Geophysical Research*, doi:10.1029/2012JA018288

Briggs, M. S., Xiong, S., Connaughton, V., ... **Hutchins, M. L.** (2013), Terrestrial Gamma-ray Flashes in the Fermi Era: Improved Observations and Analysis Methods, *Journal of Geophysical Research*, doi:10.1002/jgra.20205

Virts, K. S., Wallace, J. M., **Hutchins, M. L.**, and Holzworth, R. H. (2013), Highlights of a new ground-based, hourly global lightning climatology, *Bulletin of the American Meteorological Society*, doi:10.1175/BAMS-D-12-00082.1

Burkholder, B. S., **Hutchins, M. L.**, McCarthy, M. P., Pfaff, R. F., Holzworth, R. H., (2013), Attenuation of Lightning-Produced Sferics in the Earth-Ionosphere Waveguide and Low-Latitude Ionosphere, *Journal of Geophysical Research*, doi: 10.1002/jgra.50351

**Hutchins, M. L.**, Holzworth, R. H., Virts, K. S., Wallace, J. M., Heckman, S. (2013), Radiated VLF energy differences of land and oceanic lightning, *Geophysical Research Letters*, doi:10.1002/grl.50406

**Hutchins, M.L.**, Jacobson, A. R., Holzworth, R. H., and Brundell, J. B, (2013), Azimuthal dependence of VLF propagation, *Journal of Geophysical Research Space Physics*, 118, doi:10.1002/jgra.50533

Virts, K. S., Wallace, J. M., **Hutchins, M. L.**, and Holzworth, R. H. (2013), Diurnal lightning variability over the Maritime Continent: Impact of low-level winds, cloudiness, and the MJO, *Journal of Atmospheric Science*, 70, doi:10.1175/JAS-D-13-021.1

## Talks

**Hutchins, M. L.**, et al., *Global estimates of lightning peak current from the WWLLN*, Fall AGU meeting, San Francisco, CA, 13-17 December 2010

**Hutchins, M. L.**, et al., *Relative power of terrestrial gamma ray flash correlated lightning strokes to local stroke activity*, TGF Workshop, Huntsville, AL, 13-14 July 2011

**Hutchins, M. L.**, et al., *WWLLN Absolute Detection Efficiencies*, Spring EGU Meeting, Vienna, Austria, 23-27 April 2012

**Hutchins, M. L.**, R. H. Holzworth, C. J. Rodger\*, S. Heckman, and J. B. Brundell, *WWLLN Absolute Detection Efficiencies and the Global Lightning Source Function*, Japan Geoscience Union Meeting, Chiba City, Japan, 20-25 May 2012

Holzworth, R. H., **M. L. Hutchins\***, *WWLLN: network status and science research at UW*, GOES-R Validation Meeting, Huntsville, AL, 19-21 September 2012

**Hutchins, M. L.**, R. H. Holzworth, Virts, K. S., Wallace, J. M., Heckman, S., *Energetic Difference of Oceanic and Continental Lightning*, Univ. of Washington ESS Research Gala, University of Washington, WA, 4-5 April, 2013

## Posters

**Hutchins, M. L.**, et al., *Radiated power of lightning from WWLLN*, Univ. of Washington ESS Research Gala, University of Washington, WA, 30-31 March, 2011

**Hutchins, M. L.**, et al., *Relative and Absolute Detection Efficiency of WWLLN*, Fall AGU meeting, San Francisco, CA, 5-9 December 2011

**Hutchins, M. L.**, et al., *Relative Detection Efficiency of WWLLN*, Univ. of Washington ESS Research Gala, University of Washington, WA, 29-30 March, 2012

**Hutchins, M. L.**, et al., *Energetic Differences of Land and Oceanic Lightning*, Fall AGU meeting, San Francisco, CA, 3-7 December 2012

**Hutchins, M. L.**, et al., *Estimates of the global electric circuit from global thunderstorm activity*, Fall AGU meeting, San Francisco, CA, 9-13 December 2013