557 New Engineering Building
1064 Center Drive
Gainesville, FL 32611
352-392-0634

ROBERT C. MOORE

email: moore@ece.ufl.edu
website: www.vlf.ece.ufl.edu

Permanent Address:
10124 SW 17th Place
Gainesville, FL 32607
352-871-5107

EDUCATION:

STANFORD UNIVERSITY, Stanford, California.

Ph.D. Electrical Engineering, Electromagnetic Waves concentration, April 2007.
Dissertation: ELF/VLF Waves Generated by Modulated HF Heating of the Auroral Electrojet.

M.S.E. Electrical Engineering, Wireless Communications concentration, January 2001.

B.S.E. Electrical Engineering, Computer Software concentration, June 1999.
Hettinger Scholarship recipient, 1998, 1999.

Wellesley High School, Wellesley, Massachusetts, June 1995.
Valedictorian (1/191), Senior Cup Recipient (elected by senior class).

WORK & RESEARCH EXPERIENCE:

August 2014-Present — **Associate Professor,** ECE Department, University of Florida, Gainesville, Florida.

May 2007-August 2014 — **Assistant Professor,** ECE Department, University of Florida, Gainesville, Florida.
Workload includes teaching courses in electromagnetics and conducting ionospheric research using remote sensing methods at frequencies between 10 Hz and 10 MHz.

June 1999-March 2007 — **Research Assistant**, EE Department, Stanford University, Stanford, California.

- Conducted active experiments investigating the properties of ELF/VLF waves generated via ionospheric HF heating by the HAARP facility in Gakona, AK.
  - Experimentally identified and quantified the deviation of the observed ELF/VLF amplitude from a power-law dependence on HF power level.
  - Associated the observed ELF/VLF amplitude 'saturation' effect with the nonlinear dependence of the ionospheric electron temperature on the energy losses due to the excitation of vibrational modes in molecular oxygen.
  - Demonstrated the ability to remote-sense spatial variations within the ELF/VLF source region using observations of amplitude saturation as a function of HF beam direction.
  - Identified and quantified an optimal HF power level maximizing ELF/VLF wave amplitude observed at ground-based receivers for modulation depths < 100%.
  - Reported the detection of ELF waves generated by modulated HF heating at a ground distance of ~4400 km, the largest distance to date.
- Quantitatively connected ionospheric disturbances associated with sprite halos to early/fast VLF events, a specific type of perturbation of the amplitude and phase of VLF signals propagating in the Earth-ionosphere waveguide.
- Developed a new MSK demodulation algorithm for accurate calculation of the propagation phase of MSK-modulated VLF signals at high time resolution.
- Designed and implemented a real-time narrowband (200 Hz) and broadband (100 kHz) data acquisition software package that operates 24/365 at more than 20 locations worldwide.
- Antarctic Research: upgraded hardware at Palmer, McMurdo, and South Pole Stations.

Summer 1998 — **Research Intern**, Aero/Astro Department, Stanford University, Stanford, California.
Developed a data-transfer mechanism for GPS pseudolites used in mining car automation.

Summer 1997 — **Quality Assurance Engineer**, Baan USA, Inc., Santa Clara, California.
Designed and implemented automated test suites for the Baan V Internet application.

Autumn 1996-Spring 1997 — **Teaching Assistant**, CS Department, Stanford University, Stanford, California.
Led a section of ~10 students in the Introduction to Computer Science course (C and Java).

Summer 1996 — **Computer Analyst**, Fidelity Investments, Inc., Boston, Massachusetts.
Developed test tools for a newly developed order entry system.

RESEARCH INTERESTS:

- Non-linear, energetic interactions in the ionosphere.
- Remote-sensing applications of ELF/VLF wave propagation in the Earth-ionosphere waveguide, including global position, navigation, and timing solutions.
- Both the direct and the indirect effects of electromagnetic radiation emanating from lightning on the lower ionosphere/upper thermosphere, with particular emphasis on measurements in the ELF/VLF frequency range.

PROFESSIONAL ACTIVITIES:

- American Geophysical Union (AGU)
  Secretary, Atmospheric and Space Electricity Focus Group, 2014-2017
  AGU Fall Meeting Planning Committee 2015, 2016
  Atmospheric and Space Electricity Focus Group Executive Committee Member, 2009-2013
  Member, 2000-present
- International Union of Radio Science (URSI), Commission H
  Chair (American Chapter), August 2017-present
  Vice-Chair (American Chapter), August 2014-2017
  Secretary (American Chapter), August 2011-2014
  Member, 2007-present
- RF Ionospheric Interactions Workshop Steering Committee
  Steering Committee Chair, 2014-present
  Program Committee Chair, 2015, 2016, co-chair 2017
  Member, 2009-present
- Institute of Electrical and Electronics Engineers (IEEE) – Member, 2007-present
- Institute of Navigation – Member, 2016-present
- U.S. Science Coordinator, Arrival Heights Site of Special Scientific Interest,
  Office of Polar Programs, National Science Foundation – 2010-present
- Arecibo Advisory Committee, National Science Foundation – 2016.
- Reviewer – *Journal of Geophysical Research*, *Geophysical Research Letters*, *Radio Science*, *IEEE Transactions on Electromagnetic Compatibility*, *IEEE Antennas and Wireless Propagation Letters*, *Journal of Atmospheric and Terrestrial Physics*, *Journal of Applied Physics*.
- Co-Advisor, Gator Amateur Radio Club (GARC), 2011-present
- Member, Board of Directors - Alumni and Friends of Gator Amateur Radio (AFGAR), 2016-present

REFEREED JOURNAL PUBLICATIONS:

28. Kotovsky, D. A., and R. C. Moore (2017), Modeling long recovery early events (LOREs) produced by lightning-induced ionization of the nighttime upper mesosphere, *J. Geophys. Res. Space Physics*, *122*, 7761–7780, doi:10.1002/2017JA023996.
27. Carvalho, F. L., M. A. Uman, D. M. Jordan, J. D. Hill, S. A. Cummer, D. A. Kotovsky, and R. C. Moore (2017), Triggered lightning sky waves, return stroke modeling, and ionosphere effective height, *J. Geophys. Res. Atmos.*, *122*, doi:10.1002/2016JD026202.
26. Carvalho, F. L., M. A. Uman, D. M. Jordan, and R. C. Moore (2017), Frequency domain analysis of triggered lightning return stroke luminosity velocity, *J. Geophys. Res. Atmos.*, *122*, 2334–2350, doi:10.1002/2016JD025863.
25. Kotovsky, D. A., et al. (2016), Initial breakdown and fast leaders in lightning discharges producing long-lasting disturbances of the lower ionosphere, *J. Geophys. Res. Space Physics*, *121*, 5794–5804, doi:10.1002/2015JA022266.
24. Hare, B. M., et al. (2016), Ground-level observation of a terrestrial gamma ray flash initiated by a triggered lightning, *J. Geophys. Res. Atmos.*, *121*, 6511–6533, doi:10.1002/2015JD024426.
23. Kotovsky, D. A., and R. C. Moore (2016), Photochemical response of the nighttime mesosphere to electric field heating – Onset of electron density enhancements, *J. Geophys. Res. Space Physics*, *121*, doi:10.1002/2015JA022054.
22. Kotovsky, D. A., and R. C. Moore (2016), Photochemical response of the nighttime mesosphere to electric field heating – Recovery of electron density enhancements, *Geophys. Res. Lett.*, *43*, doi:10.1002/2015GL067014.

21. Maxworth, A. S., M. Gołkowski, M. B. Cohen, R. C. Moore, H. T. Chorsi, S. D. Gedney, and R. Jacobs (2015), Multistation observations of the azimuth, polarization, and frequency dependence of ELF/VLF waves generated by electrojet modulation, *Radio Sci.*, *50*, 1008–1026, doi:10.1002/2015RS005683.
20. Kotovsky, D. A., and R. C. Moore (2015), Classifying onset durations of early VLF events: Scattered field analysis and new insights, *J. Geophys. Res. Space Physics*, *120*, doi:10.1002/2015JA021370.
19. Gołkowski, M., N. C. Gross, R. C. Moore, B. R. T. Cotts, and M. Mitchell (2014), Observation of local and conjugate ionospheric perturbations from individual oceanic lightning flashes, *Geophys. Res. Lett.*, *41*, doi:10.1002/2013GL058861.
18. Moore, R. C., S. Fujimaru, D. A. Kotovsky, and M. Gołkowski (2013), Observations of Ionospheric ELF and VLF Wave Generation by Excitation of the Thermal Cubic Nonlinearity, *Phys. Rev. Lett.*, *111*, 235007, doi:10.1103/PhysRevLett.111.235007.
17. Langston, J., and R. C. Moore (2013), High Time Resolution Observations of HF Cross-Modulation within the *D*-Region Ionosphere, *Geophys. Res. Lett.*, *40*, 1912-1916, doi:10.1002/grl.50391.
16. Gołkowski, M., M. Cohen, and R. C. Moore (2013), Modulation of auroral electrojet currents using dual modulated HF beams with ELF phase offset, a potential *D*-region ionospheric diagnostic, *J. Geophys. Res.*, *118*, 2350-2358, doi:10.1002/jgra.50230.
15. Afshar-Mohajer, N., C.-Y. Wu, R. C. Moore, N. Sorloaica-Hickman (2014), Design of an electrostatic lunar dust repeller for mitigating dust deposition and evaluation of its removal efficiency, *Journal of Aerosol Science*, *69*, 21-31, doi:10.1016/j.jaerosci.2013.11.005.
14. Cohen, M. B., R. C. Moore, M. Gołkowski, and N. G. Lehtinen (2012), ELF/VLF wave generation from the beating of two HF ionospheric heating sources, *J. Geophys. Res.*, *117*, A12310, doi:10.1029/2012JA018140.
13. Agrawal, D., and R. C. Moore (2012), Dual-beam ELF wave generation as a function of power, frequency, modulation waveform, and receiver location, *J. Geophys. Res.*, *117*, A12305, doi:10.1029/2012JA018061.
12. Moore, R. C., S. Fujimaru, M. Cohen, M. Gołkowski, and M. J. McCarrick (2012), On the altitude of the ELF/VLF source region generated during "beat-wave" HF heating experiments, *Geophys. Res. Lett.*, *39*, L18101, doi:10.1029/2012GL053210.
11. Cotts, B. R. T., M. Gołkowski, and R. C. Moore (2011), Ionospheric effects of whistler waves from rocket-triggered lightning, *Geophys. Res. Lett.*, *38*, L24805, doi:10.1029/2011GL049869.
10. Fujimaru, S., and R. C. Moore (2011), Analysis of time-of-arrival observations performed during ELF/VLF wave generation experiments at HAARP, *Radio Sci.*, *46*, RS0M03, doi:10.1029/2011RS004695.
9. Moore, R. C., and D. Agrawal (2011), ELF/VLF wave generation using simultaneous CW and modulated HF heating of the ionosphere, *J. Geophys. Res.*, *116*, A04217, doi:10.1029/2010JA015902.
8. Moore, R. C. and Y. T. Morton (2011), Magneto-ionic polarization and GPS signal propagation through the ionosphere, *Radio Sci.*, 46, RS1008, doi:10.1029/2010RS004380.
7. Moore, R. C., and M. T. Rietveld (2009), Comment on "Geometric modulation: A more effective method of steerable ELF/VLF wave generation with continuous HF heating of the lower ionosphere" by M. B. Cohen, U. S. Inan, and M. A. Gołkowski, *Geophys. Res. Lett.*, 36, L04101, doi:10.1029/2008GL036002.
6. Moore, R. C., U. S. Inan, T. F. Bell, and E. J. Kennedy (2007), ELF waves generated by modulated HF heating of the auroral electrojet and observed at a ground distance of ~4400 km, *J. Geophys. Res.*, *112*, A05309, doi:10.1029/2006JA012063.
5. Inan, U. S., N. G. Lehtinen, R. C. Moore, K. Hurley, S. Boggs, D. M. Smith, and G. J. Fishman (2007), Massive disturbance of the daytime lower ionosphere by the giant γ–ray flare from magnetar SGR 1806-20, *Geophys. Res. Lett.*, *34*, L08103, doi:10.1029/2006GL029145.
4. Inan, U. S., M. Gołkowski, M. K. Casey, R. C. Moore, W. Peter, P. Kulkarni, P. Kossey, E. Kennedy, S. Meth, and P. Smit (2007), Subionospheric VLF observations of transmitter-induced precipitation of inner radiation belt electrons, *Geophys. Res. Lett.*, *34*, L02106, doi:10.1029/2006GL028494.
3. Moore, R. C., U. S. Inan, and T. F. Bell (2006), Observations of amplitude saturation in ELF/VLF wave generation by modulated HF heating of the auroral electrojet, *Geophys. Res. Lett.*, *33*, L12106, doi:10.1029/2006GL025934.
2. Inan, U. S., M. Gołkowski, D. L. Carpenter, N. Reddell, R. C. Moore, T. F. Bell, E. Paschal, P. Kossey, E. Kennedy, and S. Z. Meth (2004), Multihop Whistler-mode ELF/VLF signals and triggered emissions excited by the HAARP HF heater, *Geophys. Res. Lett.*, *31*, L24805, doi:10.1029/2004GL021647.
1. Moore, R. C., C. P. Barrington-Leigh, U. S. Inan, and T. F. Bell (2003), Early/fast VLF events produced by electron density changes associated with sprite halos, *J. Geophys. Res.*, *108*(A10), 1363, doi:10.1029/2002JA009816.

REFEREED PROCEEDINGS PUBLICATIONS:

4. Moore, R. C. (2015). Experimental Observations of ELF/VLF Wave Generation Using Optimized Beam-Painting. *Proceedings of the 14th International Ionospheric Effects Symposium*, Alexandria, VA, May 12-14 (6 pages).
3. Ruddle, J. and R. C. Moore (2015). Expanding the frequency resolution of TOA analysis applied to ELF/VLF Wave Generation Experiments at HAARP. *Proceedings of the 14th International Ionospheric Effects Symposium*, Alexandria, VA, May 12-14 (7 pages).
2. Morton, Y. T. , R. C. Moore, and F. van Grass (2010), GPS Signal Propagation Mode Impact on Receiver Position Errors, *Proceedings of the 2010 Institute of Navigation International Technical Meeting, San Diego, CA, January 2010* (7 pages).
1. R. C. Moore (2008), Ionospheric Effects of Lightning at Camp Blanding, Florida. *International Union of Radio Science (URSI) XXIX General Assembly Proceedings, Paper No. E06.9, Invited* (4 pages).

BOOK CHAPTERS UNDER REVIEW (SUBMITTED):

1. Moore, R. C. (2015), ELF/VLF Wave Generation in *HF Heating for Dummies.* Springer. Editors: M. Kosch and T. Pederson. Contract signed 14 April 2013.

INVITED ORAL PRESENTATIONS: *INTERNATIONAL UNIVERSITIES*

1. Moore, R. C. (2016), Energetic Electrodynamics of the Lower Ionosphere, University of Bath Lecture Series, Bath, United Kingdom, 19 August 2016.

INVITED CONFERENCE ORAL PRESENTATIONS: *INTERNATIONAL*

11. Moore, R. C., A. J. Erdman, and D. A. Kotovsky (2017), Lightning/Ionosphere Interactions and Experimental Observations, XXXIInd URSI General Assembly, Montreal, Canada, 19-26 August 2017.
10. Arnold, D., H. C. Burch, M. F. Mitchell, A. Garraud, and R. C. Moore (2017), Spinning Magnets: An Unconventional Method for Compact Generation of ELF Radio Signals, 2017 IEEE International Symposium on Antennas and Propagation/USNC-URSI Radio Science Meeting, San Diego, California, 9-14 July 2017.
9. Moore, R. C. (2017), Dynamic D-Region Heating Experiments at HAARP, 15th International Workshop on Technical and Scientific Aspects of MST radar (MST15/iMST2) and 18th EISCAT Symposium (EISCAT18), National Institute of Polar Research, Tachikawa, Tokyo, Japan, 26-31 May 2017.
8. Moore, R. C. (2016), Characterizing the D-Region Ionosphere Using Narrowband VLF Transmitter Signals, 7th VERSIM (VLF/ELF Remote Sensing of Ionospheres and Magnetospheres) Workshop, Hermanus, Western Cape, South Africa, 19-23 September.
7. Moore, R. C., D. A. Kotovsky, Y. Zhu, J. T. Pilkey, V. Rakov, D. M. Jordan, and M. A. Uman (2015). Characteristics of Standard and Long Recovery Early VLF Events. 26th International Union of Geodesy and Geophysics (IUGG) General Assembly, Prague, Czech Republic, June 22 – July 2.
6. Moore, R. C. (2014). High Power Radio Wave Interactions within the D-Region Ionosphere (SA32A-01). American Geophysical Union Fall Meeting, San Francisco, CA, December 15-19.
5. Moore, R. C. (2013), ELF/VLF Antarctic Research, RF Ionospheric Interactions Workshop, TALK SA41C-06 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec.
4. Moore, R. C. (2010), *D*-region modification at HAARP: An overview of recent experimental observations obtained by the University of Florida, (TALK SA31C-04), American Geophysical Union, AGU, San Francisco, CA.
3. Moore, R. C. (2008), Ionospheric Effects of Lightning at Camp Blanding, Florida, XXIXth URSI General Assembly, Chicago, IL, August 7-16.
2. Moore, R. C. (2008), Observations of HAARP-generated ELF/VLF waves as a function of HF power, 37th Committee on Space Research (COSPAR) Scientific Assembly, CSA/NRC/COSPAR, Montreal, Canada, July 13-20.
1. Moore, R. C., and U. S. Inan (2007), ELF/VLF amplitude saturation as a function of HF frequency, The VII International URSI Suzdal Symposium on "Modification of Ionosphere by Powerful Radio Waves", URSI/IZMIRAN/Russian Academy of Sciences, Troitsk, Moscow Region, Russia, October 16-18.

INVITED CONFERENCE ORAL PRESENTATIONS: *NATIONAL*

21. Erdman, A. J., and R. C. Moore (2017), D-Region Heating Interactions, 23rd Annual RF Ionospheric Interactions Workshop, Denver, CO, 15-17 May 2017.
20. Kotovsky, D. A., and R. C. Moore (2017), Ion Dynamics in Lightning-Induced Heating of the Lower Ionosphere, International Union of Radio Science, USNC/URSI, Boulder, CO, January 4-7.
19. Moore, R. C. (2016), D-Region Heating Tutorial, RF Ionospheric Interactions Workshop, Kirtland Air Force Base, Albuquerque, NM, May 9-11.
18. Moore, R. C. (2015). Ground-based ELF/VLF Observations in Antarctica (4.a.2). Measurement Techniques in Solar and Space Physics (MTSSP), Boulder, CO, April 20-24.
17. Moore, R. C. (2014). Optimization considerations for ELF/VLF Wave Generation. 20th RF Ionospheric Interactions Workshop, Arecibo, Puerto Rico, April 27-30.
16. Fujimaru, S., and R. C. Moore (2013), Time-of-Arrival Analysis Applied to ELF/VLF Wave Generation at HAARP, RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM, April 21-24.
15. Agrawal, D., and R. C. Moore (2013), Approximating Ambient *D*-Region Electron Densities using Dual-Beam HF Heating Experiments at HAARP, RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM, April 21-24.
14. Moore, R. C. (2012), HAARP Studies of the Ionosphere, Polar Aeronomy and Radio Science Summer School, ONR/AFRL/NSF/IHY, Fairbanks, AK, July 31-Aug 10.
13. Moore, R. C. (2012), Physical Applications of TOA Analysis, RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM, April 15-18.
12. Fujimaru, S., and Moore, R. C. (2012), Comparison of ELF/VLF TOA observations during AM, STF, and Beat-Wave HF heating formats, RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM, April 15-18.
11. Moore, R. C. (2012), High-Power Radio Wave Heating of the *D*-Region Ionosphere above HAARP, International Union of Radio Science, USNC/URSI, Boulder, CO, January 4-7.
10. Moore, R. C. (2011), Ionospheric modification experiments conducted by the University of Florida, RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM, April 22-25.
9. Agrawal, D., and Moore, R. C. (2011), Modeling HAARP-Modified Absorption for Signals > 25 MHz, RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM, April 22-25.
8. Gołkowski M., M. Cohen, and Moore, R. C. (2011), Collaborative Work on Novel Approaches to ELF/VLF Wave Generation, RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM, April 22-25.
7. Moore, R. C. and T. Wang (2011), A new method for VLF remote-sensing of lightning-induced ionospheric disturbances, International Union of Radio Science, USNC/URSI, Boulder, CO, January 4-7.
6. Fujimaru, S. and R. C. Moore (2011), Analysis of time-of-arrival observations performed during ELF/VLF wave generation experiments at HAARP, USNC/URSI, Boulder, CO, January 4-7.
5. Moore, R. C. (2010), *D*-region absorption of HF waves, Polar Aeronomy and Radio Science Summer School, ONR/AFRL/NSF/IHY, Fairbanks, AK, July 13-23.
4. Moore, R. C. (2008), ELF wave generation, Polar Aeronomy and Radio Science Summer School, ONR/AFRL/NSF/IHY, Fairbanks, AK, July 19-31.
3. Moore, R. C. (2008), Characterization of the *D*-region ionosphere using ELF/VLF wave generation experiments: An interpretation and review of experimental facts, International Union of Radio Science, USNC/URSI, Boulder, CO, January 3-6.
2. Moore, R. C. (2007), HF heating of the ionosphere and ELF wave generation, Polar Aeronomy and Radio Science Summer School, ONR/AFRL/NSF/IHY, Fairbanks, AK, July 23 - August 3.
1. Moore, R. C. (2007), ELF/VLF waves generated by modulated HF heating of the auroral electrojet, RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM, April 22-25.

INVITED PRESENTATIONS TO THE LOCAL COMMUNITY

2. Moore, R. C. (2015). Space Weather and Radio Science in Antarctica, presented to the *Sons of the American Revolution, Gainesville, FL Chapter*. Alachua, FL, January 20.
1. Moore, R. C. (2012). Remote Sensing of the Ionosphere at HAARP, presented to the Gainesville Amateur Radio Society. Gainesville, FL, May 16.

CONTRIBUTED CONFERENCE ORAL PRESENTATIONS: *INTERNATIONAL*

15. Kim, D., and R. C. Moore, R. C. (2017), Conjugate LEP Events Observed at Palmer Station, Antarctica, XXXIInd URSI General Assembly, Montreal, Canada, 19-26 August 2017.

14. Moore, R. C. (2017), Optimizing the ELF/VLF Source Above HAARP, XXXIInd URSI General Assembly, Montreal, Canada, 19-26 August 2017.
13. R. C. Moore (2017), HF Heating of the Ionosphere: An Interesting Source of ELF and VLF Waves, 2017 IEEE International Symposium on Antennas and Propagation/USNC-URSI Radio Science Meeting, San Diego, California, 9-14 July 2017.
12. Moore, R. C., S. A. Cummer, M. Gołkowski, M. Cohen, V. A. Rakov, and M. A. Uman (2016), ADVICE: Advanced Diagnostics for VLF Ionospheric Channel Estimation, Joint Navigation Conference, Dayton, OH, June 6-9.
11. Moore, R. C. (2015). HAARP-based Investigations of Lightning-induced Nonlinearities within the D-Region Ionosphere (AE22A-08). American Geophysical Union Fall Meeting, San Francisco, CA, December 14-18.
10. Moore, R. C. (2015). Experimental Observations of ELF/VLF Wave Generation Using Optimized Beam-Painting. 14th International Ionospheric Effects Symposium, Alexandria, VA, May 12-14.
9. Ruddle, J. and R. C. Moore (2015). Expanding the frequency resolution of TOA analysis applied to ELF/VLF Wave Generation Experiments at HAARP. 14th International Ionospheric Effects Symposium, Alexandria, VA, May 12-14.
8. Williams, E. et. al. 2014. Inversion of Multi-Station Schumann Resonance Background Records for Global Lightning Activity in Absolute Units (AE24A-08). American Geophysical Union Fall Meeting, San Francisco, CA, December 15-19.
7. Kotovsky, D., R. C. Moore, Y. Zhu, J. Pilkey, V. Rakov, D. Jordan, and M. A. Uman. 2014. Properties of lightning associated with long recovery early VLF events (#2825). XXXIth URSI General Assembly and Scientific Symposium, Beijing, China, August 16-23.
6. Moore, R. C. 2014. Interharmonic modulation products as a means to quantify nonlinear D-region interactions (C5.1-0008-14). 40th COSPAR Scientific Assembly, Moscow, Russia, August 2-10.
5. Moore, R. C. 2014. Recent advances in VLF remote sensing (C0.4-0003-14). 40th COSPAR Scientific Assembly, Moscow, Russia, August 2-10.
4. Moore, R. C. (2011), *D*-Region Modification Experiments at HAARP, TALK SM34A-04, American Geophysical Union Fall Meeting, San Franciso, CA.
3. Gołkowski, M., M. Cohen, R. C. Moore, S. Fujimaru, F. G. Zoghzoghy, J. Li, E. Kennedy, and P. Kossey (2011), Multi-Perspective Comprehensive Experiments on ELF/VLF Wave Generation via HF Heating, TALK SA42A-05, American Geophysical Union Fall Meeting, San Franciso, CA.
2. Inan, U. S., R. C. Moore, B. R. Decker (2000), Holographic imaging of lightning-induced disturbances in the lower ionosphere (A11E-02), American Geophysical Union, AGU, San Francisco, CA.
1. Inan, U. S., T. F. Bell, M. W. Chevalier, and R. C. Moore (2000), VLF remote sensing of relativistic electron precipitation events and the auroral electrojet (SM22A-06), American Geophysical Union, AGU, Washington, DC.

CONTRIBUTED CONFERENCE ORAL PRESENTATIONS: *NATIONAL*

40. Sarker, S. R., M. Gołkowski, C. Renick, R. C. Moore, and N. Dupree (2017), LWPC Analysis of Lightning Sferic Propagation Velocity, International Union of Radio Science, USNC/URSI, Boulder, CO, January 4-7.
39. Moore, R. C. (2016), Overview of Recent D-region Heating Work, RF Ionospheric Interactions Workshop, Kirtland Air Force Base, Albuquerque, NM, May 9-11.
38. Hare, B., et al. (2016). Report of a second terrestrial gamma ray flash induced by rocket-and-wire triggered lightning, TALK HE1-2 presented at the 2015 NRSM, USNC/URSI, Boulder, CO, January 6-9.
37. Chorsi, H. T., M. Gołkowski, R. C. Moore (2016). Role of magnetospheric ducts in observations of energetic electron precipitation in the conjugate hemisphere, TALK HE1-3 presented at the 2015 NRSM, USNC/URSI, Boulder, CO, January 6-9.
36. Gołkowski, M., A. S. Maxworth, M. B. Cohen, R. C. Moore (2016). Azimuth and frequency dependence of ELF/VLF waves generated at the HAARP facility by ionospheric electrojet modulation, TALK HG1-4 presented at the 2015 NRSM, USNC/URSI, Boulder, CO, January 6-9.
35. Moore, R. C. and D. A. Kotovsky (2014), Interharmonic modulation products as a means to quantify nonlinear D-region interactions, TALK GH1-11 presented at the 2014 NRSM, USNC/URSI, Boulder, CO, 8-11 Jan.
34. Fujimaru, S., and R. C. Moore (2014), Optimized beam-painting as a more efficient alternative to geometric modulation for ELF/VLF wave generation, TALK GH1-10 presented at the 2014 NRSM, USNC/URSI, Boulder, CO, 8-11 Jan.

33. Greene, S. N., R. C. Moore, and J. Langston (2014), HF cross modulation as a function of HF power, TALK GH1-7 presented at the 2014 NRSM, USNC/URSI, Boulder, CO, 8-11 Jan.
32. Dupree, N. A., and R. C. Moore (2014), An analysis of ELF sferics produced by rocket-triggered lightning, TALK EGH1-11 presented at the 2014 NRSM, USNC/URSI, Boulder, CO, 8-11 Jan.
31. Gross, N. C., M. Gołkowski, R. C. Moore, and B. R. T. Cotts (2014), Local and conjugate ionospheric disturbances from high peak current oceanic lightning events, TALK EGH1-8 presented at the 2014 NRSM, USNC/URSI, Boulder, CO, 8-11 Jan.
30. Kotovsky, D. A., and R. C. Moore (2014), Characterization of onset durations for early VLF scattering events, TALK EGH1-7 presented at the 2014 NRSM, USNC/URSI, Boulder, CO, 8-11 Jan.
29. Dupree, N., and R. C. Moore (2013), The Effect of Lightning Return Stroke Speed on Earth-Ionosphere Waveguide Excitation, International Union of Radio Science, USNC/URSI, Boulder, CO.
28. Finch, B., S. Fujimaru, D. Agrawal, and R. C. Moore (2013), Dual-Beam ELF/VLF TOA Measurements as a Function of HF Power, International Union of Radio Science, USNC/URSI, Boulder, CO.
27. Fujimaru, S. and R. C. Moore (2013), Synthesizing Arbitrary HF Beam Patterns for ELF/VLF Wave Generation, International Union of Radio Science, USNC/URSI, Boulder, CO.
26. Greene, S., and R. C. Moore (2013), A Statistical Analysis of Q-burst observations at Arrival Heights, Antarctica, International Union of Radio Science, USNC/URSI, Boulder, CO.
25. Kotovsky, D., and R. C. Moore (2013), Spectral Observations of Early/Fast VLF Scattering Events, International Union of Radio Science, USNC/URSI, Boulder, CO.
24. Langston, J., and R. C. Moore (2013), Quantification of D-Region Absorption using HF Cross-Modulation, International Union of Radio Science, USNC/URSI, Boulder, CO.
23. Mitchell, M., and R. C. Moore (2013), Spread-Spectrum VLF Remote Sensing of LEP Events, International Union of Radio Science, USNC/URSI, Boulder, CO.
22. Moore, R. C., S. Fujimaru, and D. Kotovsky (2013), Nonlinear Multi-Beam Interactions in the D-Region Ionosphere, International Union of Radio Science, USNC/URSI, Boulder, CO.
21. Moore, R. C., D. Kotovsky, and M. Mitchell (2012), On Spread-Spectrum VLF Scattering Associated with LEP and Early/Fast Events, CEDAR Workshop, NSF, Santa Fe, NM, June 24-29.
20. Agrawal, D., and R. C. Moore (2012), Approximating *D*-Region Electron Densities Using ELF/VLF Wave Generation Experiments at HAARP, International Union of Radio Science, USNC/URSI, Boulder, CO.
19. Fujimaru, S., and R. C. Moore (2012), High Frequency Resolution and High Spatial Resolution TOA Analysis for ELF/VLF Wave Generation Experiments at HAARP, International Union of Radio Science, USNC/URSI, Boulder, CO.
18. Biagi, C., and R. C. Moore (2012), Theoretical analysis of elves generated by rocket triggered lightning, International Union of Radio Science, USNC/URSI, Boulder, CO.
17. Biagi, C., R. C. Moore, and M. Gołkowski (2012), Ionospheric effects of whistler waves launched by rocket-triggered lightning, International Union of Radio Science, USNC/URSI, Boulder, CO.
16. Fujimaru, S. and R. C. Moore (2011), Analysis of time-of-arrival observations performed during ELF/VLF wave generation experiments at HAARP, USNC/URSI, Boulder, CO, January 4-7.
15. Moore, R. C. (2009), A new device performing measurements of optical return stroke speeds in lightning, International Union of Radio Science, USNC/URSI, Boulder, CO.
14. Moore, R. C., and S. Fujimaru (2010), Time-frequency analysis applied to ELF/VLF wave generation experiments at HAARP, International Union of Radio Science, USNC/URSI, Boulder, CO.
13. Moore, R. C. (2009), Early/Fast VLF events observed in Florida, International Union of Radio Science, USNC/URSI, Boulder, CO.
12. Moore, R. C., S. Fujimaru, and T. Wang (2009), Location of the dominant ELF/VLF source region for ground-based observations, International Union of Radio Science, USNC/URSI, Boulder, CO.
11. Moore, R. C. (2008), Observations of ELF/VLF waves produced using the HAARP HF transmitter in dual-beam configuration, International Union of Radio Science, USNC/URSI, Boulder, CO.
10. Moore, R. C. (2008), Dual-frequency amplitude and phase measurements by blind demodulation of MSK-modulated VLF signals, URSI, USNC/URSI, Boulder, CO.
9. Moore, R. C. (2007), ELF/VLF wave generation by modulated HF heating of the auroral electrojet, Ph.D. Oral Defense, Stanford University, Stanford, CA.
8. Moore, R. C., U. S. Inan, and T. F. Bell (2006), Long-distance detection of ELF waves generated via modulated heating of the auroral electrojet, International Union of Radio Science, USNC/URSI, Boulder, CO.

7. Moore, R. C., U. S. Inan, T. F. Bell, E. J. Kennedy, and P. A. Kossey (2005), ELF/VLF waves generated by modulated heating of the auroral electrojet with the HAARP HF transmitter, International Union of Radio Science, USNC/URSI, Boulder, CO.
6. Moore, R. C. and U. S. Inan (2005), Blind demodulation of continuous-phase minimum-shift-keyed signals in the very low frequency (3-30 kHz) band, URSI, USNC/URSI, Boulder, CO.
5. Gołkowski, M., U. S. Inan, R. C. Moore, D. L. Carpenter, and T. F. Bell (2005), Investigation and statistical survey of ducted whistler mode wave injection by the HAARP HF heater, International Union of Radio Science, USNC/URSI, Boulder, CO.
4. Inan, U. S., M. Gołkowski, D. L. Carpenter, N. Reddell, R. C. Moore, and T. F. Bell (2005), Multi-hop whistler-mode ELF/VLF signals and triggered emissions excited by the HAARP HF heater, International Union of Radio Science, USNC/URSI, Boulder, CO.
3. Moore, R. C., C. P. Barrington-Leigh , and U. S. Inan (2002), Early/fast disturbances of the lower ionosphere, International Union of Radio Science, USNC/URSI, Boulder, CO.
2. Moore, R. C. (2001), VLF *D*-region diagnostics, RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM.
1. Inan, U. S., T. F. Bell, M. W. Chevalier, R. C. Moore (2000), Very low frequency remote sensing of relativistic electron precipitation and the position and intensity of the auroral electrojet, Chapman Conference on Space Weather: Progress and Challenges in Research and Applications, NSF/NASA/IAGA/NOAA/ COSPAR, Clearwater, FL.

CONTRIBUTED CONFERENCE POSTER PRESENTATIONS: *INTERNATIONAL*

40. Burch, H. C., and R. C. Moore (2016), VLF Radio Wave Propagation Across the Day/Night Terminator (SA21A-2351), American Geophysical Union Fall Meeting, San Francisco, CA, December 12-16.
39. Erdman, A. J., and R. C. Moore (2016), Detection and Analysis of Partial Reflections of HF Waves from the Lower Ionosphere (AE23B-0422), American Geophysical Union Fall Meeting, San Francisco, CA, December 12-16.
38. Flint, Q., and R. C. Moore (2016), ELF Transients Detected Around the Globe: First Results from Palmer Station, Antarctica (SM23A-2478), American Geophysical Union Fall Meeting, San Francisco, CA, December 12-16.
37. Kim, D., and R. C. Moore (2016), Conjugate LEP Events at Palmer Station, Antarctica: Hemisphere-Dependent Timing (SM23A-2480), American Geophysical Union Fall Meeting, San Francisco, CA, December 12-16.
36. Moore, R. C. (2016), An Alternative Explanation for "Step-Like" Early VLF Events (AE33B-0444), American Geophysical Union Fall Meeting, San Francisco, CA, December 12-16.
35. Kotovsky, D. A., and R. C. Moore (2015). Photo-chemical response of the night-time mesosphere to electric field heating (AE33C-0504). American Geophysical Union Fall Meeting, San Francisco, CA, December 14-18.
34. Dupree, N., and R. C. Moore (2015). Oceanic Lightning versus Continental Lightning: VLF Peak Current Discrepancies (AE31A-0424). American Geophysical Union Fall Meeting, San Francisco, CA, December 14-18.
33. Ruddle, J. and R. C. Moore. 2014. High Frequency Resolution TOA Analysis for ELF/VLF Wave Generation Experiments at HAARP (SA11A-3929). American Geophysical Union Fall Meeting, San Francisco, CA, December 15-19.
32. Greene, S. and R. C. Moore. 2014. Power-Stepped HF Cross-Modulation Experiments: Simulations and Experimental Observations (SA11A-3928). American Geophysical Union Fall Meeting, San Francisco, CA, December 15-19.
31. Maxworth, A., M. Gołkowski, M. Cohen, and R. C. Moore. 2014. Multiple-Station Observation of Frequency Dependence and Polarization Characteristics of ELF/VLF waves generated via Ionospheric Modification (SA11A-3930). American Geophysical Union Fall Meeting, San Francisco, CA, December 15-19.
30. Kotovsky, D., R. C. Moore, Y. Zhu, J. Pilkey, J. Caicedo, B. Hare, V. Rakov, D. Jordan, and M. A. Uman. 2014. Characteristics of Lightning Associated with Long Recovery Early VLF Events (AE31B-3414). American Geophysical Union Fall Meeting, San Francisco, CA, December 15-19.
29. Dupree, N., R. C. Moore, J. Pilkey, J. Caicedo, B. Hare, T. Ngin, D. Jordan, and M. A. Uman. 2014. Analysis of ELF Radio Atmospherics Radiated by Rocket-Triggered Lightning (AE31B-3416). American Geophysical Union Fall Meeting, San Francisco, CA, December 15-19.
28. Greene, S., and R. C. Moore. 2014. D-Region Nonlinearities Observed using Cross-Modulation Experiments (#2821). XXXIth URSI General Assembly and Scientific Symposium, Beijing, China, August 16-23.

27. Moore, R. C., N. Dupree, J. Pilkey, D. Jordan, and M. A. Uman. 2014. An analysis of ELF sferics produced by rocket-triggered lightning (#2826). XXXIth URSI General Assembly and Scientific Symposium, Beijing, China, August 16-23.
26. Kotovsky, D. and R. C. Moore (2013), Characteristics of early, long recovery VLF scattering events, Abstract AE33A-0331 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec.
25. Mitchell, M. and R. C. Moore (2013), Characteristics of a new MSK-demodulator applied to VLF remote sensing, Abstract AE33A-0332 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec.
24. Fujimaru, S., and R. C. Moore (2013), Optimizaing an ELF/VLF Phased Array at HAARP, Abstract SA21A-2014 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec.
23. Dupree, N., R. C. Moore, and A. C. Fraser-Smith (2013), ELF sferics produced by rocket-triggered lightning and observed at great distances, Abstract AE33A-0333 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec.
22. Greene, S., R. C. Moore, and J. Langston (2013), Power-stepped HF cross-modulation experiments at HAARP, Abstract SA21A-2015 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec.
21. Gross, N. C., M. Gołkowski, R. C. Moore, and B. Cotts (2013), Local and conjugate ionospheric disturbances from rare high peak current oceanic lightning events, Abstract AE33A-0321 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec.
20. Dupree, N., and R. C. Moore (2012), ELF Sferics Observed at Large Distances, Abstract AE43A-0249 presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec.
19. Kotovsky, D., and R. C. Moore (2012), A New Observation Technique Applied to Early/Fast VLF Scattering Events, Abstract AE43A-0248 presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec.
18. Langston, J., and R. C. Moore (2012), Quantification of D-region Absorption, Abstract SA13A-2140 presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec.
17. Mitchell, M., and R. C. Moore (2012), Experimental Observations and Theoretical Modeling of VLF Scattering During LEP Events, Abstract SM31B-2291 presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec.
16. Moore, R. C., and S. Fujimaru (2012), Time-of-arrival analysis applied to ELF/VLF wave generation experiments at HAARP, Abstract SA13A-2141 presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec.
15. Gołkowski, M., M. Cohen, and R. C. Moore (2012), Modulation of auroral electrojet currents using dual HF beams with ELF phase offset, Abstract SA13A-2142 presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec.
14. Fujimaru, S., and R. C. Moore (2011), TOA Analysis Applied to Improve ELF/VLF Wave Generation Efficiency at HAARP, POSTER SA43A-1881, American Geophysical Union Fall Meeting, San Francisco, CA.
13. Santeler, C., and R. C. Moore (2011), High speed photometric imaging of elves, POSTER AE21A-0219, American Geophysical Union Fall Meeting, San Franciso, CA.
12. Agrawal, D., B. Cotts, M. Gołkowski, and R. C. Moore (2011), Ionospheric effects of whistler waves from rocket-triggered lightning, POSTER SM13B-2081, American Geophysical Union Fall Meeting, San Francisco, CA.
11. Mitchell, M., T. Wang, and R. C. Moore (2011), Spread-spectrum VLF observations of early/fast and LEP events, POSTER AE21A-0230, American Geophysical Union Fall Meeting, San Francisco, CA.
10. Dupree, N., and R. C. Moore (2011), Comparison between model predictions and observations of ELF radio atmospherics generated by rocket-triggered lightning, POSTER AE21A-0229, American Geophysical Union Fall Meeting, San Francisco, CA.
9. Braun, E. M., and R. C. Moore (2010), Analysis of *D*-region absorption via HF cross-modulation experiments at HAARP, (POSTER SA33A-1764), American Geophysical Union, AGU, San Francisco, CA.
8. Fujimaru, S., and R. C. Moore (2010), Time-of-arrival analysis applied to ELF/VLF wave generation experiments at HAARP, (POSTER SA33A-1761), American Geophysical Union, AGU, San Francisco, CA.
7. Moore, R. C., B. Kunduri, S. Anand, N. Dupree, M. Mitchell, and D. Agrawal (2010), Modeling long-distance ELF radio atmospherics generated by rocket triggered lightning, (POSTER AE21B-0275), American Geophysical Union, AGU, San Francisco, CA.
6. Agrawal, D., and R. C. Moore (2010), Dual-beam ELF/VLF wave generation at HAARP, (POSTER SA33A-1762), American Geophysical Union, AGU, San Francisco, CA.
5. Wang, T., and R. C. Moore (2010), Spread-Spectrum VLF Observations at Arrival Heights, Antarctica During Solar X-Ray Flares, (POSTER SA33B-1780), American Geophysical Union, AGU, San Francisco, CA.

4. Gołkowski, M., M. Cohen, R. C. Moore, U. S. Inan (2010), On the effective altitude of the HAARP induced ionospheric ELF/VLF current modulation and multi-beam vertical ELF/VLF interference (POSTER SA33A-1763), American Geophysical Union, AGU, San Francisco, CA.
3. Moore, R. C., S. Fujimaru, and T. Wang (2008), High-Resolution Ranging of the ELF/VLF Source Region Generated by the HAARP HF Transmitter (POSTER SA43B-1593), American Geophysical Union, AGU, San Francisco, CA.
2. Moore, R. C. (2007), A lack of electron density production during long-pulse ionospheric HF heating experiments (POSTER SA11A-0293), American Geophysical Union, AGU, San Francisco, CA.
1. Moore, R. C., U. S. Inan, and T. F. Bell (2004), ELF/VLF waves generated by an artificially-modulated auroral electrojet above the HAARP HF transmitter (POSTER SA21C-0377), American Geophysical Union, AGU, San Francisco, CA.

CONTRIBUTED CONFERENCE POSTER PRESENTATIONS: *NATIONAL*

21. Greene, S., and R. C. Moore. 2014. Analysis of Power-Stepped HF Cross-Modulation Experiments at HAARP. 20th RF Ionospheric Interactions Workshop, Arecibo, Puerto Rico, April 27-30.
20. Ruddle, J., and R. C. Moore. 2014. High frequency resolution ELF/VLF TOA Observations at HAARP. 20th RF Ionospheric Interactions Workshop, Arecibo, Puerto Rico, April 27-30.
19. Dupree, N., and R. C. Moore (2012), Modeling ELF Wave Generation at Large Distances, RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM, April 21-24.
18. Greene, S., R. C. Moore, and D. Kotovsky (2012), ELF/VLF Wave Generation by Excitation of the Thermal Cubic Nonlinearity, RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM, April 21-24.
17. Moore, R. C., D. Kotovsky, and M. Mitchell (2012), On Spread-Spectrum VLF Scattering Associated with LEP and Early/Fast Events, CEDAR Workshop, NSF, Santa Fe, NM, June 24-29.
16. Mitchell, M., and R. C. Moore (2012), Spread-Spectrum VLF Remote Sensing of Ionospheric Disturbances, CEDAR Workshop, NSF, Santa Fe, NM, June 24-29.
15. Agrawal, D., and R. C. Moore (2012), Electron Densities Derived from Dual-Beam HF Heating Experiments, RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM, April 15-18.
14. Ames, A., S. Fujimaru, and R. C. Moore (2012), ELF/VLF Source Current Properties Derived from Multiple Site Observations, RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM, April 15-18.
13. Kotovsky, D., and R. C. Moore (2012), ELF/VLF Wave Generation by Ionospheric Intermodulation During Two- and Three-Frequency Interactions, RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM, April 15-18.
12. Langston, J., and R. C. Moore (2012), High Time Resolution Observations of HF Cross-Modulation During Modulated Heating Cycles, RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM, April 15-18.
11. Wang, T., and R. C. Moore (2011), Spread Spectrum VLF Scattering Observations at HAARP (POSTER), RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM, April 17-20.
10. Fujimaru, S., and R. C. Moore (2011), Time-of-Arrival Analysis Applied to ELF/VLF Waves Generated at HAARP using Different HF Beam Patterns (POSTER), RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM, April 17-20.
9. Fujimaru, S., and R. C. Moore (2010), Advances in ELF/VLF source region characterization above HAARP (POSTER), RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM, April 18-21.
8. Agrawal, D., and R. C. Moore (2010), Dual-beam ELF/VLF wave generation: Comparison of model and experimental results for different electron density and atmosphere profiles (POSTER), Presented at the RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM, April 18-21.
7. Fujimaru, S., R. C. Moore, and T. Wang (2009), 2-D Mapping of the dominant ELF/VLF source region generated using the HAARP HF transmitter (POSTER), RF Ionospheric Interactions Workshop, NSF, Boulder, CO.
6. Wang, T., R. C. Moore, and S. Fujimaru (2009), ELF/VLF amplitude as a function of modulation duty-cycle and HF power (POSTER), RF Ionospheric Interactions Workshop, NSF, Boulder, CO.
5. Moore R. C. (2008), Dual-beam ELF/VLF wave generation experiments at HAARP (POSTER), Presented at the RF Ionospheric Interactions Workshop, NSF, Boulder, CO.
4. Zhang, X. and R. C. Moore (2008), ELF/VLF wave generation at HAARP as a function of HF power, HF polarization, and modulation frequency (POSTER), RF Ionospheric Interactions Workshop, NSF, Boulder, CO.
3. Moore, R. C., U. S. Inan, and T. F. Bell (2005), Long-distance detection of ELF/VLF waves generated via modulated HF heating of the auroral electrojet (POSTER), RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM.

2. Moore, R. C., U. S. Inan, and T. F. Bell (2004), Properties of HAARP-induced ELF/VLF waves observed during the March 2002 and November 2002 HAARP campaigns (POSTER), RF Ionospheric Interactions Workshop, NSF, Santa Fe, NM.
1. Moore, R. C. and U. S. Inan (2003), Direction-finding of scattered fields produced during non-ducted LEP events as measured at Palmer Station, Antarctica (POSTER), Presented at the Coupling, Energetics, and Dynamics of Atmospheric Regions Workshop, CEDAR, Longmont, CO.

AWARDS AND HONORS:

4. University of Florida College of Engineering International Educator of the Year, August 2014.
3. Young Scientist Award for XXIXth URSI General Assembly, Chicago, Illinois, USA, 2008.
2. Recipient: National Science Foundation Antarctic Service Medal, 2006.
1. Hewlett Packard Project Award for Analog Design, Stanford University, 1998.

STUDENTS' AWARDS AND HONORS:

5. Neal Dupree (2015): Outstanding Student Paper Award, Atmospheric and Space Electricity, American Geophysical Union Fall Meeting, San Francisco, CA, December 14-18.
4. Michael Mitchell (2012): Recipient of the National Science Foundation Antarctic Service Medal.
3. Neal Dupree (2012): Named as Student Representative, American Geophysical Union Atmospheric and Space Electricity Focus Group, 2012-2014.
2. Divya Agrawal (2011): Named as Student Representative, Steering Committee for the RF Ionospheric Interactions Workshop, 2011-2013.
1. Shuji Fujimaru (2011): Second Prize, Student Paper Competition, USNC/URSI, Boulder, CO, January 4-7.

TEACHING:

5. EEL 4473/5486: UGrad EM Fields & Applications II/Grad EM Field Theory & Applications I
Level: Undergraduate/Graduate
Semesters: Fall 2015, Fall 2016
Average Undergrad Evaluation (out of 5): 4.71, 5.00
Average Graduate Evaluation (out of 5): 4.50, 5.00

4. EEL 3473: Electromagnetic Fields & Applications II
Level: Undergraduate
Semesters: Fall 2010
Average Evaluation (out of 5): 4.69

3. EEL 3472: Electromagnetic Fields & Applications I
Level: Undergraduate
Semesters: Spring 2011, Spring 2012
Average Evaluation (out of 5): 3.36, 4.03

2. EEL 6487: Electromagnetic Field Theory & Applications II
Level: Graduate
Semesters: Spring 2008, Spring 2009, Spring 2010, Spring 2013, Spring 2014, Spring 2015, Spring 2016
Average Evaluations (out of 5): 4.33, 4.50, 4.92, 4.89, 3.67, 4.75, TBD

1. EEL 6486: Electromagnetic Field Theory & Applications I
Level: Graduate
Semesters: Fall 2007, Fall 2008, Fall 2009, Fall 2011, Fall 2012, Fall 2013, Fall 2014
Average Evaluations (out of 5): 4.36, 4.24, 4.69, 4.60, 5.00, 4.50, 4.75

ADVISING: DOCTORAL THESIS CHAIR

4. Response of the nighttime upper mesosphere to electric field changes produced by lightning discharges
Student: Daniel A. Kotovsky
Date: 12/2016

3. Very Low Frequency Remote Sensing of the Lower Ionosphere
Student: Michael F. Mitchell
Date: 5/2015

2. **Optimization of beam painting for ELF/VLF wave generation at HAARP using time-of-arrival analysis**
   Student: Shuji Fujimaru
   Date: 5/2014
1. **Approximating Ambient *D*-Region Electron Densities using Dual-Beam HF Heating Experiments at HAARP**
   Student: Divya Agrawal
   Date: 5/2013

ADVISING: MASTER'S THESIS CHAIR

2. **Time-of-Arrival Analysis Applied to the Spatially Distributed ELF/VLF Source Region Above HAARP**
   Student: Shuji Fujimaru
   Date: 8/2011
1. **Modeling ELF radio atmospherics generated by rocket-triggered lightning**
   Student: Bharat Kunduri
   Date: 6/2010

ADVISING: UNDERGRADUATE THESIS CHAIR

1. **Ionospheric Disturbances Through Real-Time Data Analysis and Reporting via the Internet**
   Student: Juan Bij-Kebbe
   Date: 5/2010