Ryan McGranaghan

Aerospace Engineer

November 29, 1988

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EDUCATION

NASA Jack Eddy Postdoctoral Research Fellow — 2017
Jet Propulsion Laboratory

National Science Foundation Graduate Research Fellow — 2013-2016

University of Colorado Boulder — Boulder, CO
PhD, in Astrodynamics and Satellite Navigation — 2011-2016
Graduated May 2016

- Graduate Research Associate in Colorado Center for Astrodynamics Research, Remote Sensing and Atmospheric Research, and Space Environment and Data Analysis groups

- 3.755/4.00 GPA

MS in Astrodynamics and Satellite Navigation — 2011-2013

- Graduated with Honors Magna Cum Laude

- 3.733/4.00 GPA; Dean's List 2012-2013

University of Tennessee — Knoxville, TN
BS in Aerospace Engineering — 2007 - 2011

- Graduated with Honors Magna Cum Laude

- 3.73/4.00 GPA; Dean's List Fall 2007, Spring 2009, 2010-2011

SCIENCE AND ENGINEERING EXPERIENCE

University Corporation for Atmospheric Research — Jet Propulsion Laboratory
Jack Eddy Postdoctoral Research Fellow — *January 2017 - Present*

- Applying state-of-the-art statistical inference tools and machine learning techniques to improve the understanding and prediction of space weather phenomena

- Coordinating international collaborations for advanced analyses of the Sun-Earth system

New Hampshire NASA Space Grant Visiting Young Scientist — Dartmouth College
Visiting Research Professor — *July 2016 - January 2017*

- Teaching
    Designed and instructed a graduate-level course on Data Assimilation Techniques
    at the Thayer School of Engineering

- Interdisciplinary Research
    Coordinated and conducted space science research with the Thayer School
    of Engineering, Astronomy and Physics Department, and Applied Math Department

Frontier Development Laboratory — NASA
Space Sciences Teams Mentor — *Summer 2017*

- Providing leadership for space science artificial intelligence research and development teams

Remote Sensing and Atmospheric Research Department   University of Colorado Boulder
Research Assistant   *September 2012 - May 2016*

- Used satellite data surrounding solar events to accurately describe the local and global high-latitude ionospheric electrodynamics in Earth's atmosphere

Colorado Center for Astrodynamics Research   University of Colorado Boulder
Research Assistant   *October 2011 - May 2016*

- Linked, Autonomous, Interplanetary Satellite Orbit Navigation (LiAISON)
  Characterized the performance of autonomous orbit determination architecture in precise tracking of geosynchronous, lunar-orbiting, interplanetary departure, and noisy manned spacecraft

Los Alamos National Laboratory - Space Weather Summer School   Los Alamos, NM
                                                                    Summer 2014

- Recipient of Vela Fellowship to conduct data assimilative research focused on characterization of fine spatio-temporal features of the ionosphere-thermosphere system

NCAR Advanced Scholars Program Summer Colloquium   Boulder, CO
                                                         July 2015

Jet Propulsion Laboratory Visiting Engineer   Pasadena, CA
                                                         May 2015

Jet Propulsion Laboratory Planetary Sciences Summer School   Pasadena, CA
                                                                  June 2013 - August 2013

- Lead systems engineer

- Principal investigator for magnetospheric science

High Altitude Observatory Space Weather Summer School   Boulder, CO
                                                             July 2013

Aerospace Concepts Pty Ltd   Canberra Captal Territory, Australia
                                        June 2012 - August 2012

NASA Marshall Space Flight Center   Huntsville, AL
                                                 June 2009 - August 2009

University of Tennessee - Senior Design   Knoxville, TN
                                                     August 2010 - August 2011

Teaching Experience

Dartmouth College   Hanover, NH
ENGG-199: Introduction to Data Assimilation   *July 2016 - January 2017*

- Crafted and taught a graduate-level course focused on a survey of data assimilation methods applicable across engineering, science, and applied mathematics disciplines

- Offered through the Thayer School of Engineering

Aerospace Engineering Sciences Department   University of Colorado Boulder
Teaching Assistant   *Spring 2016*

- Teaching assistant and lecturer for Aerospace Environments and Space Weather course (Course number: ASEN 5335, *link*)

Publications

Peer Reviewed

[1] **Ryan M. McGranaghan**. *Determining global ionospheric conductivity in the satellite and data assimilation age and assessing its influence on the Magnetosphere-Ionosphere-Thermosphere system.* PhD thesis, University of Colorado Boulder, Boulder, CO, May 2016.

[2] E. Camporeale, S. Wing, J. Johnson, C. M. Jackman, and **McGranaghan, Ryan M.** Space Weather in the Machine Learning era: A multi-disciplinary approach. *Space Weather*, 2018.

[3] **McGranaghan, Ryan M.**, Asti Bhatt, Tomoko Matsuo, Anthony J. Mannucci, Joshua L. Semeter, and Seebany Datta-Barua. Ushering in a new frontier in geospace through data science. *Journal of Geophysical Research: Space Physics*, 2017.

[4] **McGranaghan, Ryan M.**, Anthony J. Mannucci, and Colin Forsyth. A comprehensive analysis of multiscale field-aligned currents: Characteristics, controlling parameters, and relationships. *Journal of Geophysical Research: Space Physics*, 2017.

[5] A. J. Mannucci, O. P. Verkhoglyadova, X. Meng, and **Ryan M. McGranaghan**. On the role of neutral flow in field-aligned currents. *Annales Geophysicae*, 36(1):53–57, 2018.

[6] **McGranaghan, Ryan M.**, Anthony J. Mannucci, Olga Verkhoglyadova, and Nishant Malik. Finding multiscale connectivity in our geospace observational system: Network analysis of total electron content. *Journal of Geophysical Research: Space Physics*, 2017.

[7] **Ryan M. McGranaghan**, Delores J. Knipp, and Tomoko Matsuo. High-latitude ionospheric conductivity variability in three dimensions. *Geophysical Research Letters*, 43(15):7867–7877, 2016.

[8] Ryan McGranaghan, Delores J. Knipp, Tomoko Matsuo, and Ellen Cousins. Optimal interpolation analysis of high-latitude ionospheric Hall and Pedersen conductivities: Application to assimilative ionospheric electrodynamics reconstruction. *Journal of Geophysical Research: Space Physics*, 2016.

[9] **Ryan M. McGranaghan**, Delores J. Knipp, Stanley C. Solomon, and Xiaohua Fang. A fast, parameterized model of upper atmospheric ionization rates, chemistry, and conductivity. *Journal of Geophysical Research: Space Physics*, 120(6):4936–4949, 2015.

[10] **Ryan M. McGranaghan**, Delores J. Knipp, Tomoko Matsuo, Humberto Godinez, Robert J. Redmon, Stanley C. Solomon, and Steven K. Morley. Modes of high-latitude auroral conductance variability derived from DMSP energetic electron precipitation observations: Empirical orthogonal function analysis. *Journal of Geophysical Research: Space Physics*, 2015.

[11] Siamak Hesar, Jeffrey S. Parker, Jason M. Leonard, **Ryan M. McGranaghan**, and George H. Born. Lunar far side surface navigation using linked autonomous interplanetary satellite orbit navigation (LiAISON). *Acta Astronautica*, (AA-D-14-00679R1), 2015.

[12] Farah Alibay, Philip Fernandes, **Ryan M. McGranaghan**, Jason Leonard, and JPL PSSS team. Design of a high-value, low-cost mission to the Neptunian system. In *In Proceedings of the 2014 IEEE Aerospace Conference*, Big Sky, Montana, Mar. 2014. Jet Propulsion Laboratory.

[13] **Ryan M. McGranaghan**, Delores Knipp, Robert McPherron, and Linda A. Hunt. Impact of equinoctial high-speed stream structures on thermospheric responses. *Journal of Geophysical Research: Space Weather*, 12(001045), 2014.

[14] **Ryan M. McGranaghan**, Brent Sagan, Gemma Dove, Aaron Tullos, James Evans Lyne, and J.P. Emery. A survey of mission opportunities to trans-neptunian objects. *Advances in the Astrodynamical Sciences Series*, 142(CP11-615), 2012.

[15] **Ryan M. McGranaghan**, Brent Sagan, Gemma Dove, Aaron Tullos, James Evans Lyne, and J.P. Emery. A survey of mission opportunities to trans-neptunian objects. *Journal of the British Interplanetary Society*, 64(296M), 2011.

Non-Peer Reviewed

[1] **Ryan M. McGranaghan**, H. Godinez, S. Morley, D. Knipp, and T. Matsuo. Global high-latitude conductivity modeling: New data and improved methods. *Los Alamos Space Weather Summer School Research Reports, http://www.lanl.gov/projects/national-security-education-center/space-earth-center/space-weather-school/_assets/docs/swx-report-2014.pdf,*2014.

[2] **Ryan M. McGranaghan**, Jason M. Leonard, Jeffrey S. Parker, George H. Born, Ann Dietrich, and Siamak Hesar. LiAISON tracking for a lunar far-side sample return mission. In *In Proceedings of the 24th Annual AIAA/AAS Spaceflight Mechanics Meeting*, number 14-432, Santa Fe, NM, Jan. 2014. University of Colorado at Boulder.

[3] Siamak Hesar, **Ryan M. McGranaghan**, Jeffrey S. Parker, Jason M. Leonard, Kohei Fujimoto, and George H. Born. Application of LiAISON orbit determination architecture in navigating a rover on the lunar surface. In *In Proceedings of the AAS Astrodynamics Specialist Conference*, number AAS 13-738, Hilton Head, SC, Aug. 2013. University of Colorado at Boulder.

[4] Jason M. Leonard, Jeffrey S. Parker, Rodney L. Anderson, **Ryan M. McGranaghan**, Kohei Fujimoto, and George H. Born. Supporting crewed lunar exploration with LiAISON navigation. In *In Proceedings of the 35th AAS Guidance and Control Conference*, number AAS 13-053, Breckenridge, Colorado, February 2013. University of Colorado at Boulder and Jet Propulsion Laboratory.

[5] **Ryan M. McGranaghan**, Jason Leonard, Jeffrey Parker, George Born, Kohei Fujimoto, and Rodney Anderson. Interplanetary departure stage navigation by means of LiAISON orbit determination architecture. In *Proceedings of the 23rd Annual AIAA/AAS Spaceflight Mechanics Meeting*, number 13-207. American Astronautical Society, 2013/02/11 2013.

[6] Jeffrey Parker, **Ryan M. McGranaghan**, Jason Leonard, George Born, Kohei Fujimoto, and Rodney Anderson. Navigating a crewed lunar vehicle using LiAISON. In *Proceedings of the 23rd Annual AIAA/AAS Spaceflight Mechanics Meeting*, number 13-330. American Astronautical Society, 2013/02/11 2013.

[7] Jeffrey Parker, Rodney Anderson, George Born, Kohei Fujimoto, Jason Leonard, and **Ryan M. McGranaghan**. Navigation between geosynchronous and lunar L1 orbiters. In *Proceedings of the AIAA/AAS Astrodynamics Specialist Conference*. American Institute of Aeronautics and Astronautics, 2012/10/11 2012.

[8] Jason Leonard, **Ryan M. McGranaghan**, Jeffrey Parker, George Born, Kohei Fujimoto, and Rodney Anderson. LiAISON-supplemented navigation for geosynchronous and lunar L1 orbiters. In *Proceedings of the AIAA/AAS Astrodynamics Specialist Conference*. American Institute of Aeronautics and Astronautics, 2012/10/11 2012.

[9] Kohei Fujimoto, Jason Leonard, **Ryan M. McGranaghan**, Jeffrey Parker, Rodney Anderson, and George Born. Simulating the LiAISON navigation concept in a GEO + Earth-Moon halo constellation. In *Proceedings of the 23rd International Symposium on Space Flight Dynamics*, Pasadena, CA, Oct - Nov 2012. Jet Propulsion Laboratory.

[10] **Ryan M. McGranaghan**, Brent Sagan, Gemma Dove, Aaron Tullos, J. E. Lyne, and Joshua P. Emery. A survey of mission opportunities to trans-neptunian objects. In *Proceedings of the AAS/AIAA Astrodynamics Specialists Conference*, number AAS 11-615. American Institute of Aeronautics and Astronautics, August 2011.

AWARDS, GRANTS & HONOURS

University Center for Atmospheric Research/NASA Living
　　With a Star Jack Eddy Postdoctoral Fellow 2017
Research Spotlight Article Eos.org - Tracing Electric Currents That
　　Flow Along Earth's Magnetic Field 2018
32nd Union of Radio Science General Assembly and
　　Scientific Symposium Young Scientist Award 2017
Selected as New Leader in Space Science
　　National Academy of Sciences and Chinese Academy of Sciences 2018
Lorentz Workshop *Space Weather: A multi-disciplinary approach* Invited participant 2017
New Hampshire NASA Space Grant Visiting Young Scientist 2016
Dartmouth College Plasma Physics Seminar Coordinator 2016
1st place: Coupling Energetics and Atmospheric Dynamics Student Poster Competition . . . 2016
Outstanding Student Paper Award (top 3-5%) - AGU Fall Meeting San Francisco, CA 2015
Selected Speaker - Technology, Entertainment, and Design (TEDx) Boulder 2015
Most Outstanding Student Presentation - NASA Living With a Star Meeting 2014
3rd International Conference on GPS Radio Occultation - Taipei, Taiwan 2016
　　1. Selected Student Representative
　　2. Outstanding Student Award
National Science Foundation Graduate Research Fellow . . . . 2013 - Present
Los Alamos National Laboratory Space Weather Summer School Vela Fellow . . . . Summer 2014
Best Presentation: Los Alamos National Laboratory Space Weather Summer School Summer 2014
Top 5/100: Coupling Energetics and Atmospheric Dynamics Student Poster Competition . . 2014
Selected Speaker - Smead Symposium . . . . May 2014
Engineer in Training . . . . Passed FE in 2011
Tau Beta Pi (national engineering honor society) . . . . 2010 - Present
Best Group Presentation: NASA MSFC Internship Program . . . . Summer 2009
National Society of Collegiate Scholars . . . . 2010 - 2011

SELECTED PROFESSIONAL COMMUNICATION

Public Lectures

TEDx University of Colorado Boulder (TEDxCU) - Boulder, CO　　　　　　　　　April 11, 2015
　　McGranaghan, R., *Living with a star*
Ignite Boulder - Boulder, CO　　　　　　　　　　　　　　　　　　　　　　　　May 19, 2016
　　McGranaghan, R., *Our space is a place with weather*
High Altitude Observatory (HAO) 75th Anniversary - Boulder, CO　　　　　September, 2015
　　McGranaghan, R., *Living with a star*
National Academy of Sciences: Committee on Solar and Space Physics (CSSP)　　October 6, 2016
　　Fall Meeting - Washington, D.C.
　　McGranaghan, R., *Ionospheric Data Assimilation*

Selected Conferences/Workshops

7th New Leaders in Space Science Forum - Guangzhou, China　　　　　　　　　　　2018

McGranaghan, R. Selected Participant: *Space weather as a complex system: Improving conductivity modeling for the satellite and assimilation age*

Lorentz Workshop, Space Weather: A multi-disciplinary approach - Leiden, Netherlands   2017

McGranaghan, R. Session Convener: *Machine Learning for Space Weather*

Union of Radio Science (URSI) General Assembly & Scientific Symposium - Montreal, Canada   2017

McGranaghan, R., et al. *Gaining the most utility from our geospace observational system: Network analysis of total electron content as a means to understand space weather to the point of prediction*

4th Swarm Science Meeting and Geodetic Missions Workshop - Banff, AB, Canada   2017

McGranaghan, R., et al.: *Utilizing data-driven approaches in geospace: Network Analysis of total electron content data and extension with Swarm*

Coupling, Energetics, and Dynamics of Atmospheric Regions (CEDAR) Summer
   Meeting - Keystone, CO   2017

McGranaghan, R. Session Convener: *Next Generation Systems Science*

American Geophysical Union (AGU) Fall Meeting - San Francisco, CA   December, 2016

McGranaghan, R. et al., *New understanding of three-dimensional ionospheric conductivities and application to global analysis of magnetosphere-ionosphere-thermosphere coupling*

(Co-author) *Making sense of high-latitude geospace observations through Bayesian state estimation for Gaussian processes*

(Co-author) *Empirical orthogonal function (EOF) analysis of short-term GPS total electron content variations*

Coupling, Energetics, and Dynamics of Atmospheric Regions (CEDAR) Summer
   Meeting - Santa Fe, NM   2016

McGranaghan, R. et al., *Conductivity: Enabling system science*

McGranaghan, R. et al., *Data fusion in conductivity specification*

Geospace Environment Modeling (GEM) Summer Meeting - Santa Fe, NM   2016

McGranaghan, R., *State of ionospheric conductivity research and what's coming next (or should)*

3rd International Conference on GPS Radio Occultation - Taipei, Taiwan   March, 2016

McGranaghan, R. et al., *Reconstruction of three-dimensional auroral ionospheric conductivities via an assimilative technique and extension using COSMIC data*

Space Weather Workshop - Broomfield, CO   April, 2016

McGranaghan, R. et al., *Determining Global Ionospheric Conductivity in the Satellite and Assimilation Age and Assessing its Influence on the Magnetosphere-Ionosphere-Thermosphere System*

European Geophysical Union (EGU) General Assembly - Vienna, Austria   April, 2016

(Co-author) *Conductance Distributions for Empirical Orthogonal Function Analysis and Optimal Interpolation*

American Geophysical Union (AGU) Fall Meeting - San Francisco, CA   December, 2015

1. (Co-author) *Assimilative Mapping of Interhemispheric Polar Ionospheric Electrodynamics*

2. (Co-author) *Which Solar and Geomagnetic Drivers Control Earth's Upper Atmosphere Thermostat?*

Coupling, Energetics, and Dynamics of Atmospheric Regions (CEDAR) Summer
   Meeting - Seattle, WA   2015

McGranaghan, R. et al., *Primary modes of high-latitude conductance variability: Improved modeling and Empirical Orthogonal Function (EOF) analysis*

Triennial Earth-Sun Summit (TESS) - Indianapolis, IN   2015

McGranaghan, R. et al., *Modes of high-latitude conductance variability derived from DMSP F6-F8 and F16-F18 energetic electron precipitation observations: Empirical Orthogonal Function (EOF) analysis*

Living With a Star - Portland, OR   2014

McGranaghan, R., *Forecasting the impact of equinoctial high-speed stream structures on thermospheric responses and an extension to solstitial events*

Coupling and Energetics of Atmospheric Regions (CEDAR) Data Assimilation and Inverse Problems
Workshop - Seattle, WA   2014
    McGranaghan, R. et al., *Adaptive technique for conductivity covariance refinement*
American Institute of Aeronautics and Astronautics (AIAA)/American Astronautical Society (AAS)
Spaceflight Mechanics Conference - Santa Fe, NM   2014
    McGranaghan, R. et al., *LiAISON tracking for a lunar far-side sample return mission*
AAS/AIAA Specialist Conference - Kauai, HI   2013
    1. McGranaghan, R. et al., *Interplanetary departure stage navigation by means of LiAISON orbit
determination architecture*
    2. McGranaghan, R. et al., *Navigating a crewed lunar vehicle using LiAISON*
AAS/AIAA Specialist Conference - Girdwood, AK   2011
    McGranaghan, R. et al., *A Survey of mission opportunities to trans-neptunian objects*

Seminars/Team Meetings/Summer Schools
Massachusetts Institute of Technology Media Lab - Boston, MA   November, 2017
    McGranaghan, R. et al., *Ushering in a new frontier in space science*
UCLA - Los Angeles, CA   April, 2017
    McGranaghan, R. et al., *Space weather as a complex system: Improving understanding of
magnetosphere-ionosphere coupling in the age of assimilation and data science*
Boston College (Institute for Scientific Research Seminar Series) - Chestnut Hill, MA   December, 2016
    McGranaghan, R. et al., *Assimilative specification of three dimensional ionospheric conductivity and
application to global magnetosphere-ionosphere-thermosphere modeling*
Dartmouth College (Departments of Applied Math, Engineering, and Physics and Astronomy Seminar
Series) - Hanover, NH   January, 2016
    McGranaghan, R. et al., *Space weather as a complex system: Improving conductivity modeling for
the satellite and assimilation age*
Arizona State University (Department of Applied Math Seminar Series) - Tempe, AZ   January, 2016
    McGranaghan, R. et al., *Space weather from the applied math perspective: Improving conductivity
modeling for the satellite and assimilation age*
Johns Hopkins University Applied Physics Laboratory - Baltimore, MD   November, 2015
    McGranaghan, R. et al., *Improving conductivity modeling for the satellite and assimilation age*
Laboratory for Atmospheric and Space Physics - Boulder, CO   October, 2015
    McGranaghan, R. et al., *Ionospheric conductivity: Importance and improved modeling*
Space Weather Prediction Center (SWPC) Weekly Colloquium - Boulder, CO   July 30, 2015
    McGranaghan, R. et al., *Advancing upper atmospheric research: space weather forecasting and
improved conductivity modeling*
Jet Propulsion Laboratory: Ionospheric and Atmospheric Remote Sensing Group Seminar - Pasadena,
CA   2015
    McGranaghan, R. et al., *Improving ionospheric conductivity modeling for the satellite and data
assimilation era*
Air Force Office of Space Research, Space Sciences Annual Review - Albuquerque, NM   2015
    McGranaghan, R. et al., *Global conductivity modeling: A path to better ionospheric prediction*
Los Alamos National Laboratory Space Weather Summer School - Los Alamos, NM   2014
    McGranaghan, R. et al., *Multi-layered conductivity modeling for 3-D high-latitude ionospheric
electrodynamics analysis*
Jet Propulsion Laboratory Planetary Sciences Mission Review Board - Pasadena, CA   2013
    Alibay, F., McGranaghan, R. et al., *Taking Remote and In-situ Data to Explore Neptune and Triton
(TRIDENT): Systems engineering mission design*

Poster Presentations
Lorent Workshop (Space weather: A multi-disciplinary approach) - Leiden, Netherlands   2017

McGranaghan, R. et al., *Next Generation Methodologies to Advance Space Weather Monitoring and Predictability: A New Perspective through Network Analysis*

Jet Propulsion Laboratory Postdoc Research Day - Pasadena, CA   2017

McGranaghan, R. et al., *Next Generation Methodologies to Advance Space Weather Monitoring and Predictability: A New Perspective through Network Analysis*

Coupling, Energetics, and Dynamics of Atmospheric Research (CEDAR) and Geospace Environment Modeling (GEM) Workshop - Keystone, CO   2017

McGranaghan, R. et al., *Finding multi-scale connectivity in our geospace observational system: Network analysis of total electron content*

Joint Coupling, Energetics, and Dynamics of Atmospheric Research (CEDAR) and Geospace Environment Modeling (GEM) Workshop - Santa Fe, NM   2016

McGranaghan, R. et al., *Reconstruction of three-dimensional auroral ionospheric conductivities via an assimilative technique*

3rd International Conference on GPS Radio Occultation (ICGPSRO) - Taipei, Taiwan   2016

McGranaghan, R. et al., *Reconstruction of three-dimensional auroral ionospheric conductivities via an assimilative technique and extension using COSMIC data*

American Geophysical Union Fall Meeting - San Francisco, CA   2015

McGranaghan, R. et al., *Reconstruction of three-dimensional auroral ionospheric conductivities via an assimilative technique*

National Center for Atmospheric Research (NCAR) Advanced Studies
Program (ASP) Summer Colloquium - Boulder, CO   2015

McGranaghan, R. et al., *Primary modes of high-latitude conductance variability: Improved modeling and Empirical Orthogonal Function (EOF) analysis*

Geospace Environment Modeling (GEM) Summer Meeting - Snowmass, CO   2015

McGranaghan, R. et al., *Primary modes of high-latitude conductance variability: Improved modeling and Empirical Orthogonal Function (EOF) analysis*

Space Weather Workshop - Boulder, CO   2015

McGranaghan, R. et al., *A fast, parameterized model of upper atmospheric ionization rates, chemistry, and conductivity*

American Geophysical Union Fall Meeting - San Francisco, CA   2014

McGranaghan, R. et al., *High-latitude conductivity modeling: New data and improved methods*

Coupling, Energetics, and Dynamics of Atmospheric Regions (CEDAR) - Seattle, WA   2014

McGranaghan, R. et al., *Forecasting the impact of equinoctial high-speed stream structures on thermospheric response*

Space Weather Workshop - Boulder, CO   2014

McGranaghan, R. et al., *Forecasting the impact of equinoctial high-speed stream structures on thermospheric responses*

American Geophysical Union Fall Meeting - San Francisco, CA   2013

1. McGranaghan, R. et al., *Signatures of the seasonal variation in thermospheric density*
2. Day, M. D., McGranaghan, R. et al., *Neptune and Triton: A study in future exploration*

Coupling, Energetics, and Dynamics of Atmospheric Regions (CEDAR) - Boulder, CO   2013

McGranaghan, R. et al., *Signature of Russell-McPherron effect on thermospheric density*

NASA Marshall Spaceflight Center Summer Student Symposium   2009

McGranaghan, R. et al.*Damage tolerance capabilities of graphite composite materials for the ARES I interstage*

Volunteer Work

Mentor: Boulder Valley School District
 (BVSD) Science Research Seminar (SRS) . . . . 2014 - 2016
Instructor/Mentor: We Want Our Future (WeWOF) . . . . 2011 - 2016
Executive Board Member: Students for the
 Exploration and Development of Space (SEDS) . . . . 2011- Present
Volunteer: Love Soup Kitchen . . . . 2011 - 2012
Volunteer: Goodwill Industries . . . . 2011 - 2012

MEMBERSHIPS

American Astronomical Society . . . . 2015 - Present
American Astronautical Society . . . . 2013 - Present
American Geophysical Union . . . . 2013 - Present
Society of Satellite Professionals . . . . 2013 - Present
Tau Beta Pi (national engineering honor society) . . . . 2010 - Present
American Institute of Aeronautics and Astronautics . . . . 2008 - Present
Brother in Sigma Chi Fraternity Beta Sigma Chapter . . . . 2007 - Present

TECHNICAL SKILLS

- *Programming Languages*: Experienced with Matlab, Python, LaTeX, Fortran, IDL, git, Satellite Tool Kit (STK), C++, Copernicus, Mission Analysis and Operational Navigation and Toolkit Environment (MONTE)

- *Software*: Mac OS X, Microsoft Office, Linux (Ubuntu and Redhat Distributions specifically)

- *High Performance Computing*: Hadoop Spark, Hadoop Distributed File System, Cloud computing, Map-Reduce Paradigm

- *Machine Learning*: Python SciKit Learn, Keras