

Ryan McGranaghan
3008 Bunker Hill Road
Mount Rainier, MD 20712, USA

Principal Data Scientist/Space Physicist
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MISSION STATEMENT

To be a leader and a student in the New Frontier that exists at the intersection of traditional approaches & physical understanding and state-of-the-art data-driven sciences and technologies that provide a clearer glimpse into the complexity of the human-natural world **for the sake of scientific discovery and societal flourishing**. To use a recognition of the importance of and capabilities to address the full data lifecycle (collection, management, analysis, and communication) to pose, explore, and make progress toward the most compelling questions, particularly in areas that are exceptionally challenging and that have been unyielding to research analysis. To act in service of curiosity and to facilitate and deliver progress commensurate with the needs of society. To embrace and pioneer the **transdisciplinary approaches** that progress in science and technology require.

CURRENT POSITION

The NASA Jet Propulsion Laboratory

Senior Data Scientist/Aerospace Engineering Scientist

Pasadena, CA

January 2023 - Present

- Explore complexity of our Earth and Space sciences and engineered systems and to design and implement the data science and collaborative tools that enable frontier discovery
- Facilitate NASA efforts toward multi-Center collaboration
- Expand on technological solutions (e.g., ML) to also include the cultural changes required to address complex science challenges
- Coordinate convergence research and create frameworks for broader collaboration

EDUCATION

NASA Jack Eddy Postdoctoral Research Fellow

Jet Propulsion Laboratory

2017-2019

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

TRANSDISCIPLINARY SCIENCE AND ENGINEERING EXPERIENCE

NASA Goddard Space Flight Center

Center for HelioAnalytics

Director of creative partnerships and knowledge architecture

May 2020 - Present

- Facilitate *transdisciplinary* connections, coordination and communications
- Apply knowledge in ways that help the Center, its members, and collaborations flourish
- Lead application of new approaches to knowledge representation to benefit modeling and scientific exploration

Atmospheric and Space Technology Research Associates (ASTRA) LLC

Boulder, CO

Principal Data Scientist/Aerospace Engineering Scientist

January 2019 - January 2023

- Apply state-of-the-art statistical inference tools and machine learning techniques to improve the understanding and prediction of space weather phenomena
- Lead ASTRA efforts toward advanced data processing architectures, data analytics, and machine learning and apply innovations to basic and applied scientific pursuits
- Coordinate directions, strategic objectives, and operation of the ASTRA Data Science Working Group

University Corporation for Atmospheric Research

Jet Propulsion Laboratory

Jack Eddy Postdoctoral Research Fellow

January 2017 - January 2019

- Apply state-of-the-art statistical inference tools and machine learning techniques to improve the understanding and prediction of space weather phenomena
- Principal Investigator for the JPL Data Science Working Group pilot project 'Stretching Global Navigation Satellite Systems (GNSS) signals for Space Weather Discovery'
- 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 taught 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 Ames/SETI Institute

Top technical expert, advisor, and consultant for space weather team

Summers 2017-Present

- Coordinate, advise, and lead a radically interdisciplinary team of data scientists and space physicists to develop cutting-edge technologies and models for ionospheric prediction as part of the NASA Frontier Development Laboratory (FDL).

Jet Propulsion Laboratory Heliophysics Mission Design Summer School

Pasadena, CA

June - August 2020

- Instruments Lead

Remote Sensing and Atmospheric Research Department

University of Colorado Boulder

Research Assistant

September 2012 - May 2016

- Program: National Science Foundation Space Weather Directorate
- <https://www.chessscience.com/sim-game-workshop>
- Use a novel approach to convergent research (a ‘simulation game’) to assess the preparedness of the US power grid to geomagnetic activity and identify the research and development gaps that arise from a holistic view of the sun-to-power grid system and to begin to build data systems to address them.
- Design and lead a space weather-to-power grid ‘simulation game,’ a low-risk, cost-effective environment to unite researchers, decision-makers, and operators to assess the preparedness for threats and hazards posed by space weather on the electric power grid.
- Design and facilitate the in-person workshop for the simulation game around three days: simulation game, synthesis/sense-making, and system-building.

PRISM Project for Interconnection Analysis

May 2019 - Present

- Program: National Science Foundation Harnessing the Data Revolution
- “Predictive Risk Investigation System (PRISM) for Multi-layer Dynamic Interconnection Analysis”
- <https://sites.google.com/view/prism-prj/home>
- Represent the space science domain in a transdisciplinary network approach to understanding human-natural systems

“Heliophysics Enrichment of NASA Astrophysics Data System (ADS)”

May 2022 - December 2022

- Create a set of concepts and their semantic representation that extends the coverage of Heliophysics literature by NASA ADS; Provide that extension in manner interoperable with the Unified Astronomy Thesaurus
- Produce recommendations (in the form of reports and demos) for a structure of Heliophysics scientific concepts to guide Heliophysics information infrastructure development (separate from NASA ADS)

NASA GSFC “Opening Pathways”

June 2018 - Present

- Identify, open, and curate opportunities for next-generation Heliophysics and transdisciplinary science at Goddard Space Flight Center
- Director of creative partnerships and knowledge architecture for the Center for HelioAnalytics
- Liaison and strategic developer for the NASA Frontier Development Laboratory Program

COgnitive Radio Freq. Utilization by Constellations of Spacecrafts

August 2019 - February 2020

- Led the NASA Small Business Innovative Research grant to advance intelligent communication approaches to maximize science data return and resource utilization and ensure resilience in the unpredictable space environment across constellations of satellites

NASA WHPI Initiative

June 2019 - Present

- Geospace Lead and Coordinator of Digital Infrastructure for the *Whole Heliosphere and Planetary Interactions (WHPI) Initiative*

NASA JPL Data Science Working Group Pilot Project

June 2019 - Present

- “Stretching Global Navigation Satellite Systems (GNSS) signals for space weather discovery”
- Coordinate a transdisciplinary team of space physicists, computer scientists, Earth scientists, and data scientists to advance space weather prediction for GNSS signals

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](#))

FACILITATING COORDINATION, CONNECTION, CULTURE

*contact for more comprehensive list

Origins Podcast

Host, Producer

May 2019 - Present

- Origins are conversations with thought-leaders across an eclectic mix of disciplines (science, engineering, art, and design), crafted specifically for the category-defying society that we live in. We explore the thoughts, passions, and stories that defined these pioneers' fascinating trajectories, arriving at the origins of the pivotal moments across their lives.

Flourishing Salons

Director of Creative Vision and Facilitation

Spring 2019 - Present

- Gatherings designed in the format of the salons of the 1800s as the seat of cultural hubs and actuators of cultural and intellectual development with the purpose of growing Communities of Practice that operate in the spaces between traditional disciplinary fields.
- Events are designed for culture-altering exchange of ideas, providing the critical discussion, information and tools to identify and explore new directions and opportunities
- Now associated with the Cultural Programs of the National Academy of Science (CPNAS)

Flourishing Commons

Writer, Community Cultivator

Spring 2023 - Present

- Writer of *The Flourishing Commons*, a newsletter attempting to give language to and be a space for knowledge and cultural commons. Posts are musings about the flourishing of these commons across science, community, writing, design, complexity, engineering, music and the intriguing echoes between them.
- Cultivator of community around the newsletters, supporting multiscale (person-to-person, small groups, large gatherings) and trans-medium communication and sensemaking.

PUBLICATIONS REVEALING TRANSDISCIPLINARY ACHIEVEMENT

*Full list available at ORCID: <https://orcid.org/0000-0002-9605-0007> or

<https://scholar.google.com/citations?user=BKrgcwUAAAAJ&hl=en>

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] **Ryan M. McGranaghan** and J. Ziegler, T. Bloch, S. Hatch, E. Camporeale, K. Lynch, M. Owens, J. Gjerloev, B. Zhang, S. Skone. (2021) Toward a next generation particle precipitation model: Mesoscale prediction through machine learning (a case study and framework for progress). *Space Weather*, n/a(n/a):e2020SW002684. e2020SW002684.
- [3] Rebecca Ringuette, Alec Engell, Oliver Gerland, **Ryan M. McGranaghan**, and Barbara Thompson. (2022) The DIARieS Ecosystem – A software ecosystem to simplify Discovery, Implementation, Analysis, Reproducibility, and Sharing of scientific results and environments in Heliophysics. *Advances in Space Research*. 10.1016/j.asr.2022.05.012.
- [4] Upendran, Vishal and Tigas, Panagiotis and Ferdousi, Banafsheh and Bloch, Tèo and Cheung, Mark C. M. and Ganju, Siddha and Bhatt, Asti and **McGranaghan, Ryan M.** and Gal, Yarin. (2022) Global Geomagnetic Perturbation Forecasting Using Deep Learning. *Space Weather*. 10.1029/2022SW003045.
- [5] A. Probst, **Ryan M. McGranaghan**, et al. (2022) Sun Sailing Polar Orbiting Telescope (SunSPOT): A solar polar imaging mission design. *Advances in Space Research*. 10.1016/j.asr.2022.04.060.
- [6] J. Ziegler and **Ryan M. Mcgranaghan** Harnessing expressive capacity of Machine Learning modeling to represent complex coupling of Earth’s auroral space weather regimes. *2021 20th IEEE International Conference on Machine Learning and Applications (ICMLA)*, 1189-1196. 10.1109/ICMLA52953.2021.00193.
- [7] Toshi Nishimura, **Ryan M. McGranaghan**, and et al. Advances in ionospheric research. In *Multiscale Dynamics in the High-Latitude Ionosphere. In Ionosphere Dynamics and Applications (eds C. Huang, G. Lu, Y. Zhang and L.J. Paxton). AGU Monograph: Solar/Heliosphere*, chapter 3. American Geophysical Union, 2021. <https://doi.org/10.1002/9781119815617.ch3>
- [8] A. Kellerman, **Ryan M. Mcgranaghan**, J. Bortnik, B. Carter, J. Hughes, R. Arrit, K. Venkataramani, C. Perry, J. McCormick, C. Ngwira, M. Cohen, J. Yue Geomagnetically Induced Currents at Middle Latitudes: 1. Quiet-time Variability. *Space Weather*, n/a(n/a):e2021SW002729. e2021SW002729.
- [9] J. Hughes, **Ryan M. Mcgranaghan**, A. Kellerman, J. Bortnik, R. Arrit, K. Venkataramani, C. Perry, J. McCormick, C. Ngwira, M. Cohen Revealing Novel Connections Between Space Weather and the Power Grid: Network Analysis of Ground-Based Magnetometer and Geomagnetically Induced Currents (GIC) Measurements. *Space Weather*, n/a(n/a):e2021SW002727. e2021SW002727 2021SW002727.
- [10] J.P. Che-Castaldo, R. Cousin, SJ Daryanto, **Ryan M. Mcgranaghan**, et al. Critical Risk Indicators (CRIs) for the electric power grid: a survey and discussion of interconnected effects. *Environ Syst Decis*, 594–615. <https://doi.org/10.1007/s10669-021-09822-2>.
- [11] Haines, C. and Owens, M.J., Barnard, L., Lockwood, M., Ruffenach, A., Boykin, K. and **Ryan M. McGranaghan**. Forecasting Occurrence and Intensity of Geomagnetic Activity with Pattern-Matching Approaches. *Space Weather*, n/a(n/a):e2020SW002624 2020SW002624. e2020SW002624.
- [12] O. Verkhoglyadova, O., X. Meng, A. J. Mannucci, J. -S. Shim, and **Ryan M. McGranaghan**. Evaluation of total electron content prediction using three ionosphere-thermosphere models. *Space Weather*, n/a(n/a):e2020SW002452. e2020SW002452 2020SW002452.

- [13] P. R. Shreedevi, R. K. Choudhary, Smitha V. Thampi, Sneha Yadav, T. K. Pant, Yiqun Yu, **Ryan M. McGranaghan**, Evan G. Thomas, Anil Bhardwaj, and A. K. Sinha. Geomagnetic storm induced plasma density enhancements in the southern polar ionospheric region: a comparative study using st. patrick's day storms of 2013 and 2015. *Space Weather*, n/a(n/a):e2019SW002383. e2019SW002383 2019SW002383.
- [14] Qingyu Zhu, Yue Deng, Arthur Richmond, **Ryan M. McGranaghan**, and Astrid Maute. Impacts of multiscale FACs on the ionosphere-thermosphere system: GITM simulation. *Journal of Geophysical Research: Space Physics*, 124(5):3532–3542, 2019.
- [15] **Ryan M. McGranaghan**. Scintillation prediction. In Monica Bobra, Chris Holdgraf, James Mason, Paul Wright, Carlos José Díaz Baso, and Ariel Rokem, editors, *HelioML/HelioML: HelioML 0.2.0 (2019-02-22)*, chapter 5. February 2019.
- [16] **Ryan M. McGranaghan**, J. E. Borovsky, and M. Denton. How do we accomplish system science in space? *Eos*, 99, 2018.
- [17] **Ryan M. McGranaghan**, Anthony J. Mannucci, Brian D. Wilson, Christian A. Mattmann, and Richard Chadwick. New capabilities for prediction of high-latitude ionospheric scintillation: A novel approach with machine learning. *Space Weather*, 0, 2018.
- [18] Yiqun Yu, Vania K. Jordanova, **Ryan M. McGranaghan**, and Stanley C. Solomon. Self-consistent modeling of electron precipitation and responses in the ionosphere: Application to low-altitude energization during substorms. *Geophysical Research Letters*, 45(13):6371–6381, 2018.
- [19] E. Camporeale, S. Wing, J. Johnson, C. M. Jackman, and **Ryan M. McGranaghan**. Space Weather in the Machine Learning era: A multi-disciplinary approach. *Space Weather*, 2018.
- [20] **Ryan M. McGranaghan**, 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.
- [21] **Ryan M. McGranaghan**, 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.
- [22] 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.
- [23] **Ryan M. McGranaghan**, 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.
- [24] **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.
- [25] **Ryan M. 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.
- [26] **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.

- [27] **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 DMSF energetic electron precipitation observations: Empirical orthogonal function analysis. *Journal of Geophysical Research: Space Physics*, 2015.
- [28] 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.
- [29] 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.
- [30] **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.
- [31] **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.
- [32] **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**, SJ Klein, A. Cameron, Agnes, E. Young, S. Schonfeld, A. Higginson, R. Ringuette, A. Halford, C. Bard, A. Narock, B. Thompson,. *The need for a Space Data Knowledge Commons*. Structuring Collective Knowledge Journal, <https://knowledgestructure.pubpub.org/pub/space-knowledge-commons> August 2021.
- [2] **Ryan M. McGranaghan**. *Next generation particle precipitation: Mesoscale prediction through machine learning (a case study and framework for progress)*. arXiv, arXiv:2011.10117v1. January 2021.
- [3] Joseph Hughes and **Ryan M. McGranaghan**, Adam Kellerman, Robert Arritt, Jacob Bortnik, Morris Cohen, Karthik Venkataramani, Chigo Ngwira, and Charles Perry. *Revealing Novel Connections Between Space Weather and the Power Grid: Network Analysis of Ground-Based Magnetometer and Geomagnetically Induced Currents (GIC) Measurements*. essoar. doi: 10.1002/essoar.10505933.1. January 2021.
- [4] Cogan Shimizu, **Ryan M. McGranaghan**, Aaron Eberhart, and Adam C. Kellerman. *Towards a Modular Ontology for Space Weather Research*. arXiv, arXiv:2009.12285. September 2020.
- [5] **Ryan M. McGranaghan**, Adam Kellerman, Robert Arritt, Jacob Bortnik, Morris Cohen, Karthik Venkataramani, Jackson McCormick, Joseph Hughes, Chigo Ngwira, and Charles Perry. The heliophysics and space weather open knowledge network: The convergence hub for the exploration of space science (chess). *Earth and Space Science Open Archive*, page 15, 2020.
- [6] **Ryan M. McGranaghan**, Daniel Crichton, Richard Doyle, Barbara Thompson, and Madhulika Guhathakurta. Antidisciplinary: Tackling the technical and social challenges to data science-driven discovery. *Earth and Space Science Open Archive*, page 1, 2020.

- [7] **Ryan M. McGranaghan**, Enrico Camporeale, Kristina Lynch, Jesper Gjerloev, Téo Bloch, Spencer Hatch, Binzheng Zhang, Pete Riley, Mathew Owens, Yuri Shprits, and et al. Novel approaches to geospace particle transfer in the digital age: Progress through data science. *Earth and Space Science Open Archive*, page 1, 2020.
- [8] Anthony Mannucci, Delores Knipp, Huixin Liu, **Ryan M. McGranaghan**, Xing Meng, Surjalal Sharma, Bruce Tsurutani, and Olga Verkhoglyadova. A Chapman Conference on Space Weather: Recommendations for the Community, February 2020.
- [9] Anthony Mannucci, Delores Knipp, Huixin Liu, **Ryan M. McGranaghan**, Surja Sharma, Xing Meng, Bruce Tsurutani, and Olga Verkhoglyadova. The Scientific Challenge of Space Weather Forecasting: Chapman Conference Introduction, February 2020.
- [10] **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.swx-school.lanl.gov/papers/report2014.pdf>, 2014.
- [11] **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.
- [12] 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.
- [13] 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.
- [14] **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.
- [15] 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.
- [16] 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.
- [17] 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.
- [18] 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.

- [19] **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.

COMMUNITY LEADERSHIP, GUIDANCE, AND SERVICE

NASA Living With a Star Program Analysis Group (LPAG)	
Executive Committee	2020 - Present
New Jersey Institute of Technology's Institute for Space Weather Sciences (ISWS)	
External Advisory Board	2020 - Present
NASA Center for HelioAnalytics - Senior Director	2020 - Present
Living With a Star Jack Eddy Symposium - Chair of the Steering Committee	2020 - Present
Super Magnetometer Initiative (SuperMAG) - Steering Committee	2018 - Present
Network for Earth-space Research, Education and Innovation with Data (NEREID) - Council	2021 - Present
Associate Editor - Journal of Space Weather and Space Climate	2020 - Present
Member - CEDAR Diversity, Equity, and Inclusion Initiative	2020 - Present
Whole Heliosphere and Planetary Interactions (WHPI) Initiative - Geospace Lead	2019 - Present
AGU Space Physics and Aeronomy Advocacy Committee	2019 - Present
AGU Fellows Nomination Task Force	2018 - Present
Communications Editor - Data Science in Science Journal	2022 - Present
Associate Editor - Journal of Space Weather and Space Climate	2021 - Present
Review Editor - Frontiers in Astronomy and Space Sciences	2021 - Present
Proposal Review Panelist - NASA	2017 - Present
Proposal Review Panelist - NSF	2017 - Present
Journal Reviewer - JGR Space Physics, GRL, Annales Geophysicae, Frontiers in Astronomy,	
Space Weather, Journal of Space Weather and Space Climate, Risk Analysis	2015 - Present
Participant - AGU Congressional Visits Day	September 2018

SELECTED DATA AND SOFTWARE DEVELOPMENT

R. M. McGranaghan (2019-ongoing development): Resources, tools, and best practices for data science-for-science education, development, and action. This repository is a community-curated resource that serves researchers in the Earth and Space Sciences (or any discipline) interested to learn about data science and machine learning and to find the most efficacious tools to guide their use. It includes curated lists of resources, challenge data sets and use cases that have applied them effectively, and actionable advice on how to get started.

R. M. McGranaghan, Mannucci, Anthony; Mattmann, Chris; Wilson, Brian; Chadwick, Richard (2018): Jupyter notebook script to demonstrate the use of the machine learning databases and analysis for Journal of Geophysical Research: Space Physics manuscript: "New capabilities for prediction of high-latitude ionospheric scintillation: A novel approach with machine learning.". figshare. Dataset.

R. M. McGranaghan, ryan.mcgranaghan@colorado.edu; <https://orcid.org/0000-0002-9605-0007>; Mannucci, Anthony; <http://orcid.org/0000-0003-2391-8490>; Mattmann, Chris; et al. (2018): Machine learning databases used for Journal of Geophysical Research: Space Physics manuscript: "New capabilities for prediction of high-latitude ionospheric scintillation: A novel approach with machine learning.". figshare. Dataset.

Extended list available on GitHub: rmcgranaghan

SELECTED AWARDS, GRANTS & HONOURS

- PI or Co-I on over 12 funded proposals (between 2013-present).
 Recognized as an Early Career pioneer in Heliophysics
 through NASA Early Career Investigator Program 2021 - Present
 University Center for Atmospheric Research/NASA Living
 With a Star Jack Eddy Postdoctoral Fellow 2017 - 2018
 National Science Foundation Graduate Research Fellow 2013 - 2016
 27nd International Union of Geodesy and Geophysics
 Young Scientist Award 2019
 Principle Investigator NASA Jet Propulsion Laboratory Data
 Science Working Group Pilot Project - “Stretching GNSS signals for space weather discovery” 2018
 Peer Award NASA Goddard Space Flight Center 2019
 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
 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
 Tau Beta Pi (national engineering honor society) 2010 - Present
 Best Group Presentation: NASA MSFC Internship Program Summer 2009

SELECTED PROFESSIONAL COMMUNICATION/ORGANIZATION EXPERIENCE

Public Lectures/Communication

- Origins Podcast - Host and Producer 2019-Present
 McGranaghan, R., *A podcast exploring the pivotal moments in thought-leaders’ trajectories*
 NASA in Silicon Valley Podcast - Guest May 25, 2018
 Mountain View, CA - NASA Ames Research Center
 McGranaghan, R., *Lika Guhathakurta and Ryan McGranaghan Talk About Space Weather*
 NASA Headquarters Seminar May 16, 2018
 Washington, D.C.
 McGranaghan, R., *The importance of weather in space and how data science will help us understand it*
 National Academy of Sciences: Committee on Solar and Space Physics (CSSP) October 6, 2016
 Fall Meeting - Washington, D.C.

McGranaghan, R., *Ionospheric Data Assimilation*

- 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*
- TEDx University of Colorado Boulder (TEDxCU) - Boulder, CO April 11, 2015
 McGranaghan, R., *Living with a star*

Selected Organizational Experience

- National Science Foundation Machine Learning in Geospace Exploratory Committee 2020 - Present
 McGranaghan, R. Coupling, Energetics, and Dynamics of Atmospheric Regions (CEDAR) Liaison
- NASA Data Infrastructure Workshop Organizing Committee - Virtual May, 2021
- NASA Second AI and Data Science Workshop for Earth and Space Sciences Program Committee - Virtual February, 2021
- First Jack Eddy Cross-Disciplinary Symposium on Sun-Climate Research Organizing Committee - Virtual June, 2021
- American Geophysical Union (AGU) Fall Meeting - Washington, DC December, 2019
 McGranaghan, R. Town Hall Session Convener: *Antidisciplinary: Science and Engineering in the Digital Age*
 McGranaghan, R. Session Convener: *Space Weather Across the Solar System: New Progress and the Whole Heliosphere and Planetary Interactions (WHPI) Initiative*
 McGranaghan, R. Session Convener: *Machine Learning in Space Weather*
- International Space Sciences Institute (ISSI) - Bern, Switzerland 2019
 McGranaghan, R. Project Coordinator and Principal Investigator: *Novel approaches to multiscale geospace particle transfer: Improved understanding and prediction through uncertainty quantification and machine learning*
- American Geophysical Union (AGU) Fall Meeting - Washington, DC December, 2018
 McGranaghan, R. Town Hall Session Convener: *Data Science and a New Scientific Frontier in Space Science*
 McGranaghan, R. Session Convener: *Convergence in Space Physics and Earth Science: Discovery Through Machine Learning*
 McGranaghan, R. Session Convener: *Machine Learning in Space Weather*
- NASA Goddard Workshop on Artificial Intelligence - Greenbelt, MD November, 2018
 McGranaghan, R. Organizer
- Exploring Systems-Science Techniques for the Earth's Magnetosphere-Ionosphere-Thermosphere - Los Alamos, NM July, 2018
 McGranaghan, R. Session Convener: *Machine Learning in Geospace*
- American Geophysical Union (AGU) Fall Meeting - New Orleans, LA December, 2017
 McGranaghan, R. Session Convener: *Frontier Solar-Terrestrial Science Enabled by the Combination of Data-Driven Techniques and Physics-Based Understanding*
- Lorentz Workshop, Space Weather: A multi-disciplinary approach - Leiden, Netherlands 2017
 McGranaghan, R. Session Convener: *Machine Learning for Space Weather*
- Coupling, Energetics, and Dynamics of Atmospheric Regions (CEDAR)
 Summer Meeting 2020 – McGranaghan, R. Session Convener: *Data Science in CEDAR: Progress, Capacity-Building, and Traversing Disciplines*

Summer Meeting 2019 – McGranaghan, R. Session Convener: *The challenge, opportunity, and art of data science for geospace*

Summer Meeting 2018 – McGranaghan, R. Session Convener: *Next Generation Systems Science*

VOLUNTEER WORK

Council of State Governments Justice Center 2019 - present
 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- 2016
 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
 American Institute of Aeronautics and Astronautics 2008 - Present

PROFESSIONAL AND CONTINUING EDUCATION

- *Project leadership and principal investigator role:* NASA Jet Propulsion Laboratory Planetary Science Summer School, NASA Jet Propulsion Laboratory Heliophysics Mission Design School, NASA PI Launchpad, Science Traceability Matrix, requirements and flowdown, networking across institutions and public and private sectors, storytelling
- *Data science:* Earth Science Informatics Partners (ESIP), NASA Center for HelioAnalytics, NASA Frontier Development Laboratory
- *Science communication and teaching:* Curriculum development, public communication, AGU Space Physics and Aeronomy Advocacy Committee, Podcasting
- *Information representation:* Relational and graph databases, knowledge graphs, data infrastructure
- *Cross- and trans-disciplinary collaboration:* NASA Transformation to Open Science (TOPS), NASA JPL Scientific Understanding through Data Science (SUDS), Science of Team Science, NSF Convergence Program, NSF Harnessing the Data Revolution Program, Founder of ‘Flourishing Salons’ series, Founder of ‘AGU Art @ the Science’ initiative, MIT Media Lab, Santa Fe Institute, Center for Scientific Collaboration and Community Engagement (CSCCE), The Turing Way
- *Web programming and development:* Front-end/user design, integrative data analysis systems, rapid prototyping, HTML, Java, d3.js

TECHNICAL SKILLS

- *Programming Languages*: Experienced with Python, Matlab, L^AT_EX, Fortran, Satellite Tool Kit (STK)
- *High Performance Computing*: Apache Spark, Hadoop Distributed File System, Cloud computing, Map-Reduce Paradigm
- *Machine Learning*: Python SciKit Learn, TensorFlow, Keras, NetworkX
- *Cloud Environments*: AWS, Google Cloud Platform
- *Version Control/Collaborative*: GitHub, Jupyter, Docker, Slack, Zoom, Webex, Miro
- *Future of Publication*: PubPub, Binder, Zenodo, FigShare