Curriculum Vitae

Alexander D. Shane

Postdoctoral Associate
Department of Aerospace Engineering Sciences
University of Colorado, Boulder
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Education

PhD in Climate and Space Sciences and Engineering
University of Michigan, Ann Arbor, MI, Apr. 2022
Advisor: Dr. Michael Liemohn
Dissertation Title: *Wave-Particle Interactions and Their Effect on Electron Transport on the Crustal Fields of Mars*

Masters of Science in Climate and Space Sciences and Engineering
University of Michigan, Ann Arbor, MI, Dec. 2020

B.S.E in Earth Systems Science and Engineering
University of Michigan, Ann Arbor, MI, Dec. 2016
Summa Cum Laude

Research Experience

University of Colorado Boulder Mar 2022-Present

Mentor: Dr. Robert A. Marshall

- Data Analysis: Combining RBSP and GLD360 data to pair lightning generated whistlers with ground lightning measurements
- Modeling: Running the Stanford Ray Tracer to model energy transfer from lightning to the magnetosphere
- Data Analysis: Analyzing POES precipitating electron data to calculate electron lifetimes from LEO

University of Michigan Jan 2015-Feb 2022

Mentor: Dr. Michael W. Liemohn

- Data Analysis: Performed statistical analysis of electron pitch angle distributions using MGS and MAVEN data
- Theory: Investigated the possibility of whistler wave interactions with superthermal electrons at Mars using quasi-linear theory
- Numerical Modeling: Created a bounce-averaged quasi-linear diffusion equation solver for Mars

NASA Goddard Space Flight Center June 2016-Sept. 2017
Planetary Magnetospheres Laboratory

Mentor: Dr. Jared Espley

- Intern with the Mars Atmosphere and Volatile EvolutioN (MAVEN) Magnetometer research team
- Data Analysis: Investigated the distribution of magnetic waves in the Martian ionosphere

Publications

1. **Shane, A. D.**, and Liemohn, M. W. (2022) Modeling wave-particle interactions with photoelectrons on the dayside crustal fields of Mars. *Geophysical Research Letters*, 49, e2021GL096941. doi:10.1029/2021GL096941
2. **Shane, A. D.**, and Liemohn, M. W. (2021). Whistler wave interactions with superthermal electrons on Martian crustal magnetic fields: Bounce-averaged diffusion coefficients and time scales. *Journal of Geophysical Research: Space Physics*, 126, e2021JA029118. https://doi.org/10.1029/2021JA029118
3. Liemohn, M. W., **Shane, A. D.**, Azari, A. R., Petersen, A. K., Swiger, B. M. and Mukhopadhyay, A. (2021). RMSE is not enough: Guidelines to robust data-model comparisons for magnetospheric physics. *Journal of Atmospheric and Solar-Terrestrial Physics*, 218, 105624. https://doi.org/10.1016/j.jastp.2021.105624.
4. **Shane, A. D.**, Liemohn, M. W., Florie, C., and Xu, S. (2019). Misbehaving high-energy electrons: Evidence in support of ubiquitous wave-particle interactions on dayside Martian closed crustal magnetic fields. *Geophysical Research Letters*, 46, 11689-11697. doi:10.1029/2019GL084919
5. **Shane, A. D.**, Xu S., Liemohn M. W., and Mitchell D. L. (2016), Mars nightside electrons over strong crustal fields, *Journal of Geophysical Research: Space Physics*, 121, 3808-3823, doi:10.1002/2015JA021947.

Oral Presentations

1. **Shane, A. D.**, R. A. Marshall, and A. M. Wold, "GLD360 to RBSP: Mapping the Energy Input of Lightning Generated Whistlers into the Magnetosphere", 10th VERSIM Workshop, November 2023, Sodankylä, Finland.
2. **Shane, A. D.**, M. W. Liemohn, and R. Krasny, "Modeling of Wave-Particle Interactions on Mars Crustal Fields", American Geophysical Union Fall Meeting, December 2021, New Orleans, LA
3. **Shane, A.D.**, M. W. Liemohn, C. Florie, and S. Xu, "Misbehaving high-energy electrons: Evidence in support of ubiquitous wave-particle interactions on dayside Martian closed crustal magnetic fields.", EPSC, September, 2019, Geneva, Switzerland
4. **Shane, A.D.**, M. W. Liemohn, C. Florie, S. Xu, "Isotropic High Energy Photoelectron Pitch Angle Distributions at Mars". International Conference on Mars Aeronomy, May, 2017, Boulder, CO.

Poster Presentations

1. **Shane, A. D.**, Marshall, R. A., Wold, A. M., "GLD360 to RBSP: Mapping the Energy Input of Lightning Generated Whistlers into the Magnetosphere". American Geophysical Union. Fall Meeting, December 2022, Chicago, IL.
2. **Shane, A. D.**, E. McMurchie, R. A. Marshall, and J. Pettit. "Spatiotemporal Variations of Radiation Belt Electron Precipitation at LEO using REACH/POES". American Geophysical Union. Fall Meeting, December 2022, Chicago, IL.

3. **Shane, A.D.**, R. A. Marshall, and A. Wold "GLD360 to RBSP: Mapping the Energy Input of Lightning Generated Whistlers into the Magnetosphere". GEM Workshop 2022, Honolulu, HI.

4. **Shane, A.D.**, and M.W. Liemohn. "Whistler wave interactions with superthermal electrons on Martian crustal magnetic fields: Bounce-averaged diffusion coefficients and time scales". American Geophysical Union, Fall Meeting, December, 2020, Virtual.

5. **Shane, A.D.**, and M.W. Liemohn. "Investigating Wave Particle Interactions in the Martian Space Environment with MAVEN Observations". American Geophysical Union, Fall Meeting, December, 2019, San Francisco, CA.

6. **Shane, A.D.**, and M.W. Liemohn. "Investigating wave-particle interactions in the Martian space environment with MAVEN observations". MAVEN Project Science Group Meeting, October, 2019, Boulder, CO.

7. **Shane, A.D.**, and M.W. Liemohn. "Misbehaving high-energy electrons: Evidence in support of ubiquitous wave-particle interactions on dayside Martian closed crustal magnetic fields." Ninth International Mars Conference, July, 2019, Pasadena, CA.

8. **Shane, A.D.**, and M.W. Liemohn. "Misbehaving high-energy electrons: Evidence in support of ubiquitous wave-particle interactions." MAVEN Project Science Group Meeting, April, 2019, College Park, MD.

9. **Shane, A.D.**, M.W. Liemohn, S. Xu, and D. Mitchell. "Photoelectron pitch angle distributions at Mars". American Geophysical Union, Fall Meeting, December, 2018, Washington DC.

10. **Shane, A.D.**, M.W. Liemohn, and S. Xu. "Photoelectron pitch angle distributions and controlling processes at Mars". MAVEN Project Science Group Meeting, September, 2018, Boulder, CO.

11. **Shane, A.D.**, M.W. Liemohn, S. Xu and C. Florie. "Misbehaving Electrons: Investigating Whistler Mode Waves at Mars". MAVEN Project Science Group Meeting, March, 2018, Boulder, CO.

12. **Shane, A.D.**, M.W. Liemohn, S. Xu and C. Florie. "Investigating Whistler Mode Wave Diffusion Coefficients at Mars". American Geophysical Union, Fall Meeting, December, 2017, New Orleans, LA.

13. **Shane, A.D.**, J. Espley, J. Gruesbeck, G. DiBraccio, M.W. Liemohn, J.Halekas, C. Fowler "A Statistical Analysis of Magnetic Waves in the Martian Ionosphere". MAVEN Project Science Group Meeting, Oct, 2017, Tucson, AZ.

14. **Shane, A.D.**, J. Espley, J. Gruesbeck, G. DiBraccio, M.W. Liemohn "A Statistical Analysis of the Magnetic Wave Power in the Martian Ionosphere". International Conference on Mars Aeronomy, May, 2017, Boulder, CO.

15. **Shane, A.D.**, J. Espley, J. Gruesbeck, G. DiBraccio, J. Halekas, "MAVEN Observations of the Variable Nature of Ionospheric Waves". American Geophysical Union, Fall Meeting, December, 2016, San Francisco, CA.

16. **Shane, A.D.**, J. Espley, "MAVEN Observations of the Variable Nature of Ionospheric Waves". NASA Goddard Summer Intern Poster Session, August, 2016, Greenbelt, MD.

17. **Shane, A.D.**, S. Xu, M.W. Liemohn, and D.L. Mitchell. "Mars Nightside Electrons Over Strong Crustal Fields". American Geophysical Union, Fall Meeting, December, 2015, San Francisco, CA.

Professional Services

Peer Review
Journal of Geophysical Research: Space Physics
Geophysical Research Letters
Journal of Geophysical Research: Planets

NASA Review Panel: Executive Secretary
2018, 2021

Affiliations

American Geophysical Union 2015-Present

Awards

Michigan Space Grant 2019
Rackham Predoctoral Fellowship 2021