

## Hadi Madanian

Ph.D. Space Physics (2017)

University of Kansas, Lawrence, KS, USA

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### Curriculum Vitae

#### 1. Employment History

- Research associate, Laboratory for Atmospheric and Space Physics, University of Colorado in Boulder, CO. (2022 - ~)
  - Research scientist, Space Science and Engineering Division, Southwest Research Institute, San Antonio, TX. (2020 – 2022)
  - Postdoctoral fellow, University of Iowa, Iowa City, IA. (2018 – 2020)
  - Postdoctoral fellow, University of Kansas, Lawrence, KS. (2017 – 2018)
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#### 2. Honors and Awards

- Early Career Award for the NASA MMS mission, 2021.
  - Certificate for outstanding contribution to European Space Agency's Rosetta mission, 2017.
  - Graduate research competition award, University of Kansas, 2016.
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#### 3. Teaching and Mentoring Experience

- Occasional substitute lecturer for Advanced Electrodynamics and Space Plasma Physics courses, (graduate level).
  - Instructor for Algebra-based and Calculus-based undergraduate physics laboratories.
  - Mentoring undergraduate students for summer research experience program. Number of students mentored: 3
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#### 4. Professional Services and Membership

- Regular reviewer for the following journals: Geophysical Research Letters; Physical Review Letters; The Astrophysical Journal; Journal of Geophysical Research -Space Physics; Annales Geophysicae; Astronomy & Astrophysics. Reviewing 3-4 manuscripts/year.
  - AGU Outstanding Student Paper Awards (OSPA) judge.
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#### 4.1. Instrument and Mission Science Team Involvement

- Co-I on the 3DI instrument proposal submitted for the Geospace Dynamics Constellation (GDC) mission.
  - Instrument team member of the RBSPICE instrument, Van Allen Probes mission.
  - Science team member on: (1) Magnetospheric Multiscale (MMS) mission, (2) INMS instrument, Cassini mission; (3) RPC-IES instrument, Rosetta mission; (4) CoDICE instrument on Interstellar Mapping and Acceleration Probe (IMAP).
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#### 4.2. Membership in Professional Communities

- MMS Science Working Team Meetings, Session chair on the Shock Physics.
  - Heliophysics 2050 Workshop, Secretary for Shocks session.
  - Member of an International Space Science Institute (ISSI) team on Magnetic Depressions in Space Plasmas.
  - American Physical Society (APS)
  - American Geophysical Union (AGU)
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### 5. Publications

#### 5.1. Peer-reviewed

- 2022 **Madanian, Hadi**, Terry Zixu Liu, Tai-Duc Phan, Karlheinz Trattner, Tomas Karlsson, and Michael W. Liemohn. 2022. "Asymmetric Interaction of a Solar Wind Reconnecting Current Sheet and Its Magnetic Hole with Earth's Bow Shock and Magnetopause". *Journal of Geophysical Research: Space Physics*. doi: 10.1029/2021JA030079.
- 2021 Karlsson, Tomas, Henriette Trollvik, Savvas Raptis, Hans Nilsson, and **Hadi Madanian**. 2021. "Solar Wind Magnetic Holes Can Cross the Bow Shock and Enter the Magnetosheath." *Preprint (submitted to Journal of Geophysical Research: Space Physics)*. Solar System Physics. doi: 10.1002/essoar.10507799.1.
- Schwartz, Steven J., Robert Ergun, Harald Kucharek, Lynn Wilson, Li-Jen Chen, Katherine Goodrich, Drew Turner, Imogen Gingell, **Hadi Madanian**, Daniel Gershman, and Robert Strangeway. 2021. "Evaluating the DeHoffmann-Teller Cross-Shock Potential at Real Collisionless Shocks." *Journal of Geophysical Research: Space Physics* 126(8). doi: 10.1029/2021JA029295.
- Madanian, Hadi**, Steven J. Schwartz, Stephen A. Fuselier, David Burgess, Drew L. Turner, Li-Jen Chen, Mihir I. Desai, and Michael J. Starkey. 2021. "Direct Evidence for Magnetic Reflection of Heavy Ions from High Mach Number Collisionless Shocks." *The Astrophysical Journal Letters* 915(1):L19. doi: 10.3847/2041-8213/ac0aee.
- Madanian, H.**, M. I. Desai, S. J. Schwartz, L. B. Wilson, S. A. Fuselier, J. L. Burch, O. Le Contel, D. L. Turner, K. Ogasawara, A. L. Brosius, C. T. Russell, R. E. Ergun, N. Ahmadi, D. J. Gershman, and P. A. Lindqvist. 2021. "The Dynamics of a High Mach

- Number Quasi-Perpendicular Shock: MMS Observations.” *The Astrophysical Journal* 908(1):40. doi: 10.3847/1538-4357/abcb88.
- Turner, D. L., L. B. Wilson, K. A. Goodrich, **H. Madanian**, S. J. Schwartz, T. Z. Liu, A. Johlander, D. Caprioli, I. J. Cohen, D. Gershman, H. Hietala, J. H. Westlake, B. Lavraud, O. Le Contel, and J. L. Burch. 2021. “Direct Multipoint Observations Capturing the Reformation of a Supercritical Fast Magnetosonic Shock.” *The Astrophysical Journal Letters* 911(2):L31. doi: 10.3847/2041-8213/abec78.
- Starkey, M. J., Fuselier, S. A., Desai, M. I., Schwartz, S. J., Russell, C. T., Wei, **H., Madanian**, H., Mukherjee, J., & Wilson III, L. B. (2021). MMS Observations of Energized He<sup>+</sup> Pickup Ions at Quasiperpendicular Shocks. *The Astrophysical Journal*, 913(2), 112. doi: 10.3847/1538-4357/abf4d9.
- 2020 **Madanian, Hadi**, Steven J. Schwartz, Jasper S. Halekas, and Lynn B. Wilson III. 2020. “Nonstationary Quasiperpendicular Shock and Ion Reflection at Mars.” *Geophysical Research Letters* 47(11). doi: 10.1029/2020GL088309.
- Madanian, H.**, J. L. Burch, A. I. Eriksson, T. E. Cravens, M. Galand, E. Vigren, R. Goldstein, Z. Nemeth, P. Mokashi, I. Richter, and M. Rubin. 2020. “Electron Dynamics near Diamagnetic Regions of Comet 67P/Churyumov- Gerasimenko.” *Planetary and Space Science* 187:104924. doi: 10.1016/j.pss.2020.104924.
- 2019 **Madanian, H.**, J. S. Halekas, C. Mazelle, N. Omid, J. R. Espley, D. L. Mitchell, and J. P. McFadden. 2019. “Magnetic Holes Upstream of the Martian Bow Shock: MAVEN Observations.” *Journal of Geophysical Research: Space Physics*. doi: 10.1029/2019JA027198.
- Timar, A., Z. Nemeth, K. Szego, M. Dósa, A. Opitz, and **H. Madanian**. 2019. “Estimating the Solar Wind Pressure at Comet 67P from Rosetta Magnetic Field Measurements.” *Journal of Space Weather and Space Climate* 9, A3. doi: 10.1051/swsc/2018050.
- 2017 Omid, N., A. H. Sulaiman, W. Kurth, **H. Madanian**, T. Cravens, N. Sergis, M. K. Dougherty, and N. J. T. Edberg. 2017. “A Single Deformed Bow Shock for Titan-Saturn System.” *Journal of Geophysical Research: Space Physics* 122(11). doi: 10.1002/2017JA024672.
- Timar, Aniko, Z. Nemeth, K. Szego, M. Dosa, A. Opitz, **H. Madanian**, C. Goetz, and I. Richter. 2017. “Modelling the Size of the Very Dynamic Diamagnetic Cavity of Comet 67P/Churyumov–Gerasimenko.” *Monthly Notices of the Royal Astronomical Society* 469 (Suppl\_2): S723–30. doi: 10.1093/mnras/stx2628.
- Volwerk, M., G. H. Jones, T. Broiles, J. Burch, C. Carr, A. J. Coates, E. Cupido, M. Delva, N. J. T. Edberg, A. Eriksson, C. Goetz, R. Goldstein, P. Henri, **H. Madanian**, H. Nilsson, I. Richter, K. Schwingenschuh, G. Stenberg Wieser, and K. H. Glassmeier.

2017. “Current Sheets in Comet 67P/Churyumov-Gerasimenko’s Coma.” *Journal of Geophysical Research: Space Physics*. doi: 10.1002/2017JA023861.

2016 **Madanian, H.**, T. E. Cravens, J. Burch, R. Goldstein, M. Rubin, Z. Nemeth, C. Goetz, C. Koenders, and K. Altwegg. 2016. “Plasma Environment Around Comet 67P/Churyumov-Gerasimenko at Perihelion: Model Comparison with Rosetta Data.” *The Astronomical Journal* 153(1):30. doi: 10.3847/1538-3881/153/1/30.

Nemeth, Zoltan, J. Burch, C. Goetz, R. Goldstein, Pierre Henri, C. Koenders, **H. Madanian**, K. Mandt, P. Mokashi, and I. Richter. 2016. “Charged Particle Signatures of the Diamagnetic Cavity of Comet 67P/Churyumov–Gerasimenko.” *Monthly Notices of the Royal Astronomical Society* 462 (Suppl\_1): S415–21. doi: 10.1093/mnras/stw3028

Broiles, T. W., G. Livadiotis, J. L. Burch, K. Chae, G. Clark, T. E. Cravens, R. Davidson, A. Eriksson, R. A. Frahm, S. A. Fuselier, J. Goldstein, R. Goldstein, P. Henri, **H. Madanian**, K. Mandt, P. Mokashi, C. Pollock, A. Rahmati, M. Samara, and S. J. Schwartz. 2016. “Characterizing Cometary Electrons with Kappa Distributions.” *Journal of Geophysical Research: Space Physics* 121(8):7407–22. doi: 10.1002/2016JA022972.

**Madanian, H.**, T. E. Cravens, A. Rahmati, R. Goldstein, J. Burch, A. I. Eriksson, N. J. T. Edberg, P. Henri, K. Mandt, G. Clark, M. Rubin, T. Broiles, and **N. L. Reedy**. 2016. “Suprathermal Electrons near the Nucleus of Comet 67P/Churyumov-Gerasimenko at 3 AU: Model Comparisons with Rosetta Data: Electrons Near Comet 67P: Rosetta Data.” *Journal of Geophysical Research: Space Physics* 121(6):5815–36. doi: 10.1002/2016JA022610.

**Madanian, H.**, T. E. Cravens, M. S. Richard, J. H. Waite, N. J. T. Edberg, J. H. Westlake, and J. E. Wahlund. 2016. “Solar Cycle Variations in Ion Composition in the Dayside Ionosphere of Titan.” *Journal of Geophysical Research: Space Physics* 121(8):8013–37. doi: 10.1002/2015JA022274.

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## 5.2. White papers

2021 Kollmann, P., et al., + **H. Madanian**. 2021. “Magnetospheric Studies: A Requirement for Addressing Interdisciplinary Mysteries in the Ice Giant Systems.” *Bulletin of the AAS* 53(4). doi: 10.3847/25c2cfed955f654.

Goetz, C., et al., + **H. Madanian**. 2021. “Cometary Plasma Science: Open Science Questions for Future Space Missions.” *Experimental Astronomy*. doi: 10.1007/s10686-021-09783-z.

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## 6. Invited Talks and Conference Presentations

### 6.1. Invited Talks

2021 **Madanian, H**, “Magnetic Reflection of Heavy Ions from High Mach Number Quasi-Perpendicular Shocks: MMS Observations”, *Bulletin of the American Physical Society*, 2021, CM10.5, Pittsburgh, PA.

2020 **Madanian, H**, M Desai, J Burch, S Fuselier, L Wilson III, O Le Contel, S Schwartz, D Turner, N Omid, K Ogasawara, R Ergun, N Ahmadi, C Russell, D Gershman, P Lindqvist, “The Dynamics of High Mach Number Quasi-Perpendicular Shocks”, *American Geophysical Union Fall Meeting*, 2020, SH047-02, Virtual.

**Madanian, H**, MI Desai, JL Burch, SA Fuselier, LB Wilson III, O Le Contel, SJ Schwartz, DL Turner, N Omid, K Ogasawara, C Russell, RE Ergun, N Ahmadi, DJ Gershman, PA Lindqvist. “Modulation of the quasi-perpendicular shock structure by reflected ions at high Mach numbers”, *The Geospace Environment Modeling (GEM) Workshop*, 2020, Virtual.

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### 6.2. Talks and Presentations

2021 **Madanian, H**, TZ Liu, KJ Trattner, T Karlsson, HA Elliott, MW Liemohn, M Volwerk, “The interaction of a solar wind reconnecting current sheet with Earth’s bow shock”, *American Geophysical Union Fall Meeting*, 2021, New Orleans, LA.

**Madanian, H**, S Schwartz, SA Fuselier, D Burgess, DL Turner, LJ Chen, MI Desai, MJ Starkey, “Magnetic Reflection of Heavy Ions from High Mach Number Collisionless Shocks”, *American Geophysical Union Fall Meeting*, 2021, New Orleans, LA.

**Madanian, H**, TZ Liu, KJ Trattner, T Karlsson, MW Liemohn, “Asymmetric interaction of a solar wind reconnecting current sheet with Earth’s bow shock and magnetosphere”, *MMS Community Workshop*, 2021, Waterville Valley, NH.

2020 **H Madanian**, T Karlsson, RA Frahm, JS Halekas, C Mazelle, N Omid, “Magnetic depressions in the Martian magnetosheath and upstream solar wind”, *AGU Fall Meeting Abstracts*, 2020, P046-12.

**H Madanian**, MI Desai, J Burch, SA Fuselier, LB Wilson III, O Le Contel, DL Turner, N Omid, K Ogasawara, R Ergun, N Ahmadi, CT Russell, DJ Gershman, P Lindqvist, “The Dynamics of High Mach Number Quasi-Perpendicular Shocks”, *AGU Fall Meeting Abstracts*, 2020, SH047-2.

**H Madanian**, SJ Schwartz, JS Halekas, LB Wilson III, BM. Jakosky, “Nonstationary Quasi-perpendicular Shock and Ion Reflection Observed by MAVEN”, *MAVEN Plasma Science Group Team Meeting*, 2020, Berkley, CA.

2019

**Madanian, H**, JS Halekas, C Mazelle, SA Fuselier, K Meziane, J Gruesbeck, DL Mitchell, “Nonuniform Bow Shock Boundary at Mars”, *AGU Fall Meeting Abstracts*, 2019, SM33D-3230, San Francisco, CA.

**Madanian, H**, JS Halekas, “Quasi-perpendicular shock reformation at Mars observed in MAVEN data”, *MAVEN Plasma Science Group Team Meeting*, 2019, Boulder, CO.

**Madanian, H**, JS Halekas, J Espley, J McFadden, “Solar Wind Magnetic Holes Upstream of the Martian Bow Shock”, *MAVEN Plasma Science Group Team Meeting*, 2019, College Park, MD.

- 2018 **Madanian, H**, GK Stephens, JW Manweiler, DG Mitchell, JD Patterson, LJ Lanzerotti, “Investigation of high charge state ion dynamics in the inner magnetosphere: An empirical approach”, *AGU Fall Meeting Abstracts*, 2018, SM23C-7.

**Madanian, H**, JD Patterson, G Stephens, DG Mitchell, JW Manweiler, LJ Lanzerotti, “Prediction of entry paths of solar wind ions into the inner magnetosphere using a toy model”, *AGU Triennial Earth Sun-Summit (TESS)*, 2018, Norfolk, VA.

**Madanian, H**, TW Broiles, JL Burch, et al., “Evolution of Electron Pitch Angle Distributions in the Plasma Environment of Comet 67P”, *Rosetta Plasma Consortium Team Meeting*, 2018, Kiruna, Sweden.

- 2017 **Madanian, H**, JD Patterson, JW Manweiler, AR Soto-chavez, AJ Gerrard, LJ Lanzerotti, “Time-lag and Correlation between ACE and RBSPICE Injection Event Observations during Storm Times”, *AGU Fall Meeting Abstracts*, 2017, SM11B-2315.

**Madanian, H**, T. E. Cravens, J. Burch, R. Goldstein, M. Rubin, Z. Nemeth, C. Goetz, C. Koenders, K.-H. Glassmeier, K. Altwegg, “Plasma Environment around Comet 67P/CG at Perihelion Observed by the Rosetta RPC-IES Sensors”, *19th EGU General Assembly*, 2017, EGU2017-10156.

- 2016 **Madanian, H.**, T. E. Cravens, J. L Burch, R. Goldstein, K.-H. Glassmeier, C. Goetz, C. Koenders, Z. Nemeth, M. Rubin, K. Altwegg, “Plasma Environment Around Comet 67P/Churyumov-Gerasimenko at Perihelion”, *AGU Fall Meeting Abstracts*, 2016, P43D-5.

**Madanian, H.**, “RPC-IES science team, RPC-MAG science team, Observation and simulation of plasma features around comet 67P/CG at high activity”, *Rosetta Science Working Team #47/Co-Investigator Meeting*, 2016, New York City, NY.

**Madanian, H.**, TE Cravens, JH Waite, R Perryman, “Update on Titan ionospheric chemistry: HCN reactions and solar cycle”, *CAPS-INMS joint team meeting*, 2016, San Antonio, TX.

**Madanian, H.**, T. E. Cravens, M. S. Richard, J. H. Waite, N. J. T. Edberg, J. H. Westlake, J.-E. Wahlund, “Observations of Titan's Ionospheric Densities over the 10 Year Time Period of the Cassini Mission”, *MidAmerican Regional Astrophysics Conference - Regional meeting of the American Astronomical Society*, Kansas City, MO, 2016.

- 2015 **Madanian, H.**, TE Cravens, MS Richard, NJT Edberg, JH Westlake, JE Wahlund, JH Waite Jr, R Perryman, “Variations in Titan's Ionospheric Densities over the 10 Year Time Period of the Cassini Mission”, *AGU Fall Meeting Abstracts*, 2015, San Francisco, CA.

**Madanian, H.**, TE Cravens, SA Ledvina, and MS Richard, “Transport and Solar Cycle Activity Effects in Titan's Ionosphere”, *Magnetosphere of Outer Planets (MOP) Meeting*, 2015, Atlanta, GA.

**Madanian, H.**, TE Cravens, SA Ledvina, and MS Richard, “The role of transport in the ionosphere of Titan”, *46th Lunar and Planetary Science Conference*, 2015, Woodland, TX.

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### 6.3. Contributed Talks and Presentations

- 2021 LB Wilson, AL Brosius, DJ Gershman, S Schwartz, **H Madanian**, IJ Cohen, DL Turner, K Goodrich, “Particle acceleration by nonlinear, magnetosonic-whistler precursors”, *American Geophysical Union Fall Meeting*, 2021, New Orleans, LA.

LB Wilson, A Brosius, D Gershman, S Schwartz, **H Madanian**, I Cohen, D Turner, K Goodrich. “MMS Observations of nonlinear whistler precursor particle acceleration”, *Bulletin of the American Physical Society*, 2021, CM10.1, Pittsburgh, PA.

T Karlsson, H Trollvik, M Volwerk, L Hadid, MW Morooka, AP Dimmock, LS Griton, Y Khotyaintsev, **H Madanian**, M Maksimovic, S Raptis, G Marc, K Steinvall, “First Solar Orbiter Solar Wind Magnetic Hole Observations”, *American Geophysical Union Fall Meeting*, 2021, New Orleans, LA.

- 2020 Mazelle, C, K Meziane, N Romanelli, DL Mitchell, S Ruhunisiri, **H Madanian**, A Rahmati, SJ Schwartz, JR Espley, JS Halekas, E Penou, “Influence of foreshock electrons impact ionization on the amplitude of pickup protons generated waves at Mars”, *EGU General Assembly Conference Abstracts*, 2020, 10596.

Starkey, MJ, SA Fuselier, MI Desai, RG Gomez, **H Madanian**, J Mukherjee, I Cohen, SJ Schwartz, CT Russell, “The effect of Mach number on accelerated He<sup>+</sup> pickup ions downstream of quasi-perpendicular shocks”, *AGU Fall Meeting Abstracts*, 2020, SH042-9.

- 2019 Eriksson, AI, N Edberg, F Johansson, J Deca, A Divin, M Galand, C Goetz, P Henri, K Llera, **H Madanian**, H Nilsson, E Odelstad, M Rubin, GS Wieser, M Volwerk, “The Dynamic Plasma of Comet 67P”, *EPSC-DPS Joint Meeting*, 2019, EPSC-DPS2019-1713

- 2018 Patterson, JD, JW Manweiler, **H Madanian**, “Modeling the radial variations of energetic O and He ions through scattering and neutral charge-exchange in the inner heliosphere”, *AGU Fall Meeting Abstracts*, 2018, SH43F-3740.
- 2017 Manweiler, JW, **H Madanian**, AJ Gerrard, JD Patterson, DG Mitchell, LJ Lanzerotti, “Flow of Energy through the Inner Magnetosphere during the March 17, 2015, solar storm as observed by the Van Allen Probes Radiation Belt Storm Probes Ion Composition Experiment”, *AGU Fall Meeting Abstracts*, 2017, SM43C-2733.
- Patterson, JD, **H Madanian**, JW Manweiler, LJ Lanzerotti, “Solar Energetic Particle Composition over Two Solar Cycles as Observed by the Ulysses/HISCALE and ACE/EPAM Pulse Height Analyzers”, *AGU Fall Meeting Abstracts*, 2017, SH31B-2730.
- Sulaiman, AH, N Omid, WS Kurth, **H Madanian**, T Cravens, N Sergis, "A Single Deformed Bow Shock for Titan-Saturn System", *AGU Fall Meeting Abstracts*, 2017, SH51A-2473.
- Németh, Z, M Dósa, C Goetz, **H Madanian**, A Opitz, K Richter, K Szegő, A Timár, “Estimating the solar wind pressure at comet 67P from Rosetta magnetic field measurements”, *European Planetary Science Congress*, 2017, EPSC2017-612.
- 2016 Nemeth, Z, J Burch, C Goetz, KH Glassmeier, R Goldstein, C Koenders, **H Madanian**, K Mandt, P Mokashi, I Richter, K Szego, A Timar, “Finding diamagnetic cavity crossing events at comet67P/Churyumov-Gerasimenko using multiple instruments of the Rosetta Plasma Consortium”, *EGU General Assembly*, 2016, Vienna, Austria.
- 2015 Cravens, TE, A Rahmati, S Sakai, **H Madanian**, DE Larson, RJ Lillis, JS Halekas, R Goldstein, JL Burch, GB Clark, and BM Jakosky, “Pickup ions in the plasma environments of Mars, Comets, and Enceladus”, *AGU Fall Meeting Abstracts*, 2015, SM42B-05, San Francisco, CA.
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