

Tim Cassidy, PhD

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Profile

My work is to organize data in a useful way, interpret it with a physical model, and then clearly communicate results.

Self-directed and technical skills:

- ❖ Numerical modeling of physical processes
- ❖ Facility with Python, IDL, Fortran
- ❖ UV and visible spectroscopic data analysis
- ❖ Plasma spectrometer data analysis
- ❖ Radiation shielding design (including radiation transport analysis)

Collaborative and team-oriented skills:

- ❖ Experience designing and developing scientific instruments with proposal teams
- ❖ Held talks on project and scientific findings at national and international conferences
- ❖ Frequent peer reviewer for scientific publications and NASA data analysis program proposals
- ❖ Student mentoring*
- ❖ Education and public outreach

Education

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| Ph.D. Engineering, Physics University of Virginia | 2008 |
| B.A. Physics, Reed College | 2003 |

Employment & Research Projects

Research Scientist II, LABORATORY FOR ATMOSPHERIC AND SPACE PHYSICS, 2011-present

Key NASA Research Projects and Impact:

Co-Investigator, SOLAR SYSTEM WORKINGS PROGRAM, 2019-present

- Project to model Mercury exosphere observations. Programming for this was done in Python.
- Resulted in the discovery of large impact events on the planet (Cassidy et al., in prep.; Jasiniski et al., in press).

Co-Investigator, SOLAR SYSTEM WORKINGS PROGRAM, 2017-present

- Investigation into a new phenomenon observed at Jupiter's moon Io. Modeling effort found that this is explained by volcanic dust accelerated by Jupiter's magnetosphere (Grava et al., in preparation).

Principal Investigator, JPL SUBCONTRACT, 2017-2019

* I mentored 7 students while at the University of Colorado. This included people of diverse backgrounds that are typically underrepresented, including veterans and people of color.

- Contributed to the development of a Jupiter radiation model for spacecraft mission development (Project described by Jun et al., 2019).

Co-Investigator, DISCOVERY DATA ANALYSIS PROGRAM, 2016-present

- Multi-instrument MESSENGER data analysis effort to better understand space weather at Mercury.
- Discovered novel mode of space weathering (Merkel et al., in preparation).

Co-investigator and science team affiliate, EUROPA CLIPPER, 2015-present

- Worked on the development of the Surface Dust Analyzer (SUDA), with a focus on understanding and mitigating radiation and plasma-induced background currents
- I was a member of the short-lived Radiation Working Group.

Principal Investigator, PLANETARY MISSION DATA ANALYSIS PROGRAM, 2014-2019

- Archived ground-based observations of Mercury to NASA's Planetary Data System.
- Reduction of raw data that utilized an integral field unit attached to a high-resolution spectrograph.

Science team member, MESSENGER MISSION TO MERCURY, 2011-2017

- Primarily worked with data from the Ultraviolet and Visible Spectrometer instrument.
- Innovative analysis of a large data set combined with physical modeling (Cassidy et al., 2015, 2016).
- Received a Group Achievement Award.
- Education and public outreach: I contributed a video showing observations of Mercury's sodium "tail." † A still from an earlier version was a NASA Astronomy Picture Of the Day (APOD).
- Contributed to an archive of MESSENGER data on the NASA Planetary Data System.

Caltech Postdoctoral Scholar, JPL

2009-2011

- Photometry of the moons of Saturn and Jupiter (Hendrix et al., 2011, 2012).
- Used data from the Cassini Ultraviolet and Visible Spectrometer, the Galileo Ultraviolet Spectrometer, and the Galileo Near Infrared Mapping Spectrometer.
- Developed a highly cited model of the cloud of neutrals surrounding Saturn (Cassidy and Johnson, 2010; Hartogh et al., 2013).

Co-Investigator, JUPITER DATA ANALYSIS, 2011-2015

- Developed a model of charged-particle bombardment of Jupiter's moons (Cassidy et al., 2013).

Postdoctoral Scholar, Astronomy Department, University of Virginia,

2008-2009

† An updated version of this data visualization is available here:

https://www.dropbox.com/s/3d8d8z431xsbtcd/Na%20nightside%20linear_2.mp4?dl=0

- Conducted research into exoplanet moon stability (Cassidy et al., 2009).
- Began work on the Cassini mission, which was continued at JPL.

Publications

Author or coauthor of over 70 journal articles and book chapters, including the following. Full bibliography available upon request.

- Cassidy**, T.A., Mendez, R., Arras, P., Johnson, R.E., Skrutskie, M.F., 2009. Massive Satellites of Close-In Gas Giant Exoplanets. *The Astrophysical Journal* 704, 1341–1348. doi:10.1088/0004-637X/704/2/1341
- Cassidy**, T.A., Johnson, R.E., 2010. Collisional spreading of Enceladus’ neutral cloud. *Icarus* 209, 696–703. doi:10.1016/j.icarus.2010.04.010
- Cassidy**, T.A., Merkel, A.W., Burger, M.H., Sarantos, M., Killen, R.M., McClintock, W.E. and Vervack Jr., R.J., 2015. Mercury’s seasonal sodium exosphere: MESSENGER orbital observations. *Icarus*, 248, 547–559. doi: 10.1016/j.icarus.2014.10.037.
- Cassidy**, T.A., McClintock, W.E., Killen, R.M., Sarantos, M., Merkel, A. W., Vervack, R.J. and Burger, M. H., 2016. A cold-pole enhancement in Mercury’s sodium exosphere. *Geophys. Res. Lett.*, 2016GL071071. doi: 10.1002/2016GL071071.
- Cassidy**, T.A., Paranicas, C.P., Shirley, J.H., Dalton, J.B., III, Teolis, B.D., Johnson, R.E., Kamp, L., Hendrix, A.R., 2013. Magnetospheric ion sputtering and water ice grain size at Europa. *Planetary and Space Science* 77, 64–73. doi:10.1016/j.pss.2012.07.008
- Cassidy**, T.A., Schmidt, C.A., Merkel, A., W., et al. Large impactors seen in Mercury’s exosphere. In preparation.
- Grava, C., Cassidy, T.A., et al., In Preparation. Io’s dust jet.
- Hartogh, P., E. Lellouch, R. Moreno, D. Bockele-Morvan, N. Biver, T.A. Cassidy, M. Rengel, C. Jarchow, T. Cavalié, J. Crovisier, F. P. Helmich, and M. Kidger 2011. Direct detection of the Enceladus water torus with Herschel. *Astronomy and Astrophysics* 532.
- Hendrix, A.R., Cassidy, T.A., Buratti, B.J., Paranicas, C., Hansen, C.J., Teolis, B., Roussos, E., Todd Bradley, E., Kollmann, P., Johnson, R.E., 2012. Mimas’ far-UV albedo: Spatial variations. *Icarus* 220, 922–931. doi:10.1016/j.icarus.2012.06.012
- Hendrix, A.R., Cassidy, T.A., Johnson, R.E., Paranicas, C., Carlson, R.W., 2011. Europa’s disk-resolved ultraviolet spectra: Relationships with plasma flux and surface terrains. *Icarus* 212, 736–743. doi:10.1016/j.icarus.2011.01.023
- Jasinski, J., Regoli, L.H., Cassidy, T.A. et al. Mercury’s sodium exosphere observed at high altitudes in the solar wind as pickup ions. *Nature Communications*, in press.
- Jun, I., Garrett, H.B., T.A. Cassidy, K. Wousik, L. Dougherty, 2019. Updating the Jovian Electron Plasma Environment (2019). *IEEE Transactions on Plasma Science* 47, 3915-3922.
- Merkel, A.W., Cassidy, T.A., In Preparation. Evidence of heavy ion sputtering at Mercury.