

My research motivation is to improve our understanding of water and atmospheric escape at Mars by studying a key region of the atmosphere that holds clues to the planet's present and past. My educational goals are to develop pedagogies for students with an emphasis on those from under-represented minority groups.

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### Education

Ph.D. Astronomy, Boston University	2013
M.A. Astronomy, Boston University	2009
B.S. Physics (Mathematics minor), <i>Summa Cum Laude</i> , University of Massachusetts, Boston	2006
B.E. Computer and Communications Engineering, American University of Beirut, Lebanon	1998

### Research Experience

Boston University, Boston, MA Research Scientist	2015 – Present
Boston University, Boston, MA Postdoctoral researcher with Professor John Clarke	2013 – 2015
Boston University, Boston, MA Research Assistant for Professors Michael Mendillo and Paul Withers Research Assistant to Professor Meers Oppenheim	2007 – 2013 Fall 2006

### First-Author Publications

**Mayyasi, M.**, and 18 coauthors (2018), Significant Space Weather Impact on the Escape of Hydrogen from Mars, *Geophys. Res. Lett.*, doi:10.1029/2018GL077727.

**Mayyasi, M.**, P. Withers, K. Fallows (2018), A Sporadic Topside Layer in the Ionosphere of Mars from Analysis of MGS Radio Occultation Data, *J. Geophys. Res. Space Physics*, doi:10.1002/2017JA024938, in press.

**Mayyasi, M.**, Clarke, J., Bhattacharyya, D., Deighan, J., Jain, S., Chaffin, M., ... Jakosky, B. (2017). The variability of atmospheric deuterium brightness at Mars: Evidence for seasonal dependence, *J. Geophys. Res. Space Physics*, 122, doi:10.1002/2017JA024666

**Mayyasi, M.** et al. (2017) IUVS echelle-mode observations of interplanetary hydrogen: Standard for calibration and reference for cavity variations between Earth and Mars during MAVEN cruise, *J. Geophys. Res. Space Physics*, 122, doi:10.1002/2016JA023466.

**Mayyasi, M.** and M. Mendillo (2015), Why the Viking descent probes found only one ionospheric layer at Mars, *Geophys. Res. Lett.*, 42, 7359–7365, doi:10.1002/2015GL065575

**Matta, M.**, M. Mendillo, P. Withers and D. Morgan (2015), Interpreting Mars Ionospheric Anomalies over Crustal Magnetic Field Regions using a 2-D Ionospheric Model, *J. of Geophys. Res.*, 120, doi: 10.1002/2014JA020721.

**Matta, M.**, M. Galand, L. Moore, M. Mendillo and P. Withers (2014), Numerical Simulations of Ion and Electron Temperatures in the Ionosphere of Mars: Multiple Ions and Diurnal Variations, *Icarus*, 227, p. 78 – 88, doi:10.1016/j.icarus.2013.09.006.

**Matta, M.**, P. Withers, M. Mendillo (2013), The Composition of Mars' Topside Ionosphere: Effects of Hydrogen, *J. Geophys. Res.*, 118, p. 2681–2693, doi: 10.1002/jgra.50104.

**M. Matta**, S. Smith, J. Wilson, J. Baumgardner, M. Mendillo (2009), The sodium tail of the Moon, *Icarus*, 204 (2), p. 409-417.

### Co-Author Publications

- Mendillo, M., P. Erickson, S.-R. Zhang, **M. Mayyasi**, C. Narvaez, E. Thiemann, P. Chamberlin, L. Andersson, and W. Peterson (2018), Flares at Earth and Mars: An Ionospheric Escape Mechanism?, *Space Weather*, doi:10.1029/2018SW001872
- J. Deighan, S. Jain, M. Chaffin, X. Fang, J. Halekas, J. Clarke, N. Schneider, I. Stewart, J.-Y. Chaufray, S. Evans, M. Stevens, **M. Mayyasi**, A. Stiepen, M. Crismani, W. McClintock, G. Holsclaw, D. Lo, F. Motmessin, F. Lefevre and B. Jakosky (2018), Discovery of a Proton Aurora at Mars, *Nature Astro.*, *in press*, ID#NATASTRON-17121040B.
- M. Chaffin, J. Y. Chaufray, J. Deighan, **M. Mayyasi**, E. Thiemann, S. Jain, M. Crismani, A. Stiepen, F. Montmessin, F. Eparvier, J. Clarke, W. McClintock, I. Stewart, G. Holsclaw, N. Schneider, B. Jakosky (2018), Mars H Escape Rates Derived from MAVEN/IUVS Lyman Alpha Brightness Measurements and their Dependence on Model Assumptions, *J. Geophys. Res. Planets*, doi: 10.1029/2018JE005574.
- Mendillo, M. C. Narvaez, J., Trovato, P. Withers, **M. Mayyasi**, D. Morgan, A. Kopf, D. Gurnett, F. Nemeč, and B. Campbell (2018), Mars Initial Reference Ionosphere (MIRI) Model: Upgrades and Validations using MAVEN, MEX, and MRO Data Sets, *J. Geophys. Res. Space Physics*, doi: 10.1029/2018JA025263.
- Peterson, W., C. Fowler, L. Andersson, E. Thiemann, S. Jain, **M. Mayyasi**, T. Esman, R. Yelle, M. Behra and J. Espley (2018), Martian electron temperatures in the sub solar region: MAVEN observations compared to a one-dimensional model, *J. Geophys. Res.*, doi:10.1029/2018JA025406.
- B. Jakosky et al. (2018), Loss of the Martian atmosphere to space: Present-day loss rates determined from MAVEN observations and integrated loss through time, *Icarus*, 315, 146 – 157, doi:10.1016/j.icarus.2018.05.030
- D. Bhattacharyya, J. Clarke, J.- Y. Chaufray, **M. Mayyasi**, J. L. Bertaux, M. Chaffin, N. Schneider, G. Villanueva (2017), Seasonal Changes in Hydrogen Escape from Mars through Analysis of HST Observations of the Martian Exosphere Near Perihelion *J. of Geophys. Res.*, doi:10.1002/2017JA024572
- Mendillo, M., C. Narvaez, M. Vogt, **M. Mayyasi**, J. Forbes, M. Galand, E. Thiemann, M. Benna, F. Eparvier, P. Chamberlin, P. Mahaffy, L. Andersson (2017), Sources of Ionospheric Variability at Mars, *J. Geophys. Res. Space Physics*, doi:10.1002/2017JA024366.
- Clarke, J., **M. Mayyasi**, and 13 coauthors (2017), Variability of D and H in the Martian upper atmosphere observed with the MAVEN IUVS echelle channel, *J. Geophys. Res. Space Physics*, 122, doi:10.1002/2016JA023479
- Mendillo, M., C. Narvaez, M. Vogt, **M. Mayyasi**, and 13 co-authors (2017), MAVEN and the total electron content of the martian ionosphere, *J. Geophys. Res. Space Physics*, 122, doi:10.1002/2016JA023474.
- D. Bhattacharyya, J. T. Clarke, J.-L. Bertaux, J.-Y. Chaufray, **M. Mayyasi** (2016), Analysis and modeling of remote observations of the Martian hydrogen exosphere, *Icarus*, 281, pp. 264 – 280, doi:10.1016/j.icarus.2016.08.034.
- P. Withers, **M. Matta** and 18 co-authors, (2016), The morphology of the topside ionosphere of Mars under different solar wind conditions: Results of a multi-instrument observing campaign by Mars Express in 2010, *PSS*, v. 120, p. 24 – 34.

- D., Bhattacharyya, J. Clarke, J.-L. Bertaux, J.-Y. Chaufray and **M. Mayyasi** (2015), A Strong Seasonal Dependence in the Martian Hydrogen Exosphere, *Geophys. Res. Lett.*, 42, 8678–8685, doi:10.1002/2015GL065804.
- M. Mendillo, C. Narvaez, **M. Matta**, M. Vogt, P. Mahaffy, M. Benna, and B. Jakosky (2015), MAVEN and Mars Initial Reference Ionosphere (MIRI) Model, *Geophys. Res. Lett.*, 42, 9080–9086, doi:10.1002/2015GL065732
- Withers, P., M. Vogt, **M. Mayyasi**, and 8 coauthors (2015), Comparison of model predictions for the composition of the ionosphere of Mars to MAVEN NGIMS data, *Geophys. Res. Lett.*, 42, 8966–8976, doi:10.1002/2015GL065205
- B. Jakosky and 93 coauthors, including **M. Mayyasi** (2015), MAVEN Observations of the Response of Mars to an Interplanetary Coronal Mass Ejection, *Science*, 10.1126/science.aad0210
- S. Bougher and 93 coauthors, including **M. Mayyasi** (2015), Early MAVEN Deep Dip Campaigns: First Results and Implications, *Science*, 10.1126/science.aad0459.
- K. Fallows, P. Withers, and **M. Matta** (2015), Numerical simulations of the influence of solar zenith angle on properties of the M1 layer of the Mars ionosphere, *J. Geophys. Res. Space Physics*, 120, 6707–6721, doi:10.1002/2014JA020947.
- K. Fallows, P. Withers and **M. Matta** (2015), An observational study of the influence of solar zenith angle on properties of the M1 layer of the Mars ionosphere, *J. of Geophys. Res.*, doi: 10.1002/2014JA020750.
- Withers, P., K. Fallows, and **M. Matta** (2014), Predictions of electron temperatures in the Mars ionosphere and their effects on electron densities, *Geophys. Res. Lett.*, 41, 2681–2686, doi:10.1002/2014GL059683.
- Mendillo, M., C. Navarez, P. Withers, **M. Matta**, W. Kofman and J. Mouginot (2013), Variability in Ionospheric Total Electron Content at Mars, *Planet. Sp. Science*, 86, p. 117 – 129, doi:10.1016/j.pss.2013.08.010.
- Withers, P., K. Fallows, Z. Girazian, **M. Matta**, B. Häusler, D. Hinson, L. Tyler, D. Morgan, M. Pätzold, K. Peter, S. Tellmann, J. Peralta, and O. Witasse (2012), A clear view of the multifaceted dayside ionosphere of Mars, *Geophys. Res. Lett.*, 39, L18202, doi:10.1029/2012GL053193.
- Lollo A., P. Withers, K. Fallows, Z. Girazian, **M. Matta**, P.C. Chamberlin (2012), Numerical simulations of the ionosphere of Mars during a solar flare, *J. Geophys. Res.*, 117 (A5), A05314, doi: 10.1029/2011JA017399.
- Mendillo, M., A. Lollo, P. Withers, **M. Matta**, M. Pätzold, and S. Tellmann (2011), Modeling Mars' Ionosphere with Constraints from Same-Day Observations by Mars Global Surveyor and Mars Express, *J. Geophys. Res.*, 116 (A11), doi:10.1029/2011JA016865.

#### Awards

Winner of the International Deuterium Day Contest	2016
Fred L. Scarf Award for outstanding doctoral research, AGU	2015
MSGC Award to train at NASTAR for suborbital flight in Southampton, PA	2010
UMass student Travel Grant	2006
UMass Arthur Martin Award for Academic Excellence	2006

#### Invited Talks/Colloquia

LoCSST, UMass Lowell	2018
BU Center for Space Physics Seminar	2018

CFA Stars and Planets Seminar	2017
SPA Invited Lecture at American Geophysical Union Meeting, San Francisco	2015
Physics Department, UMass Boston	2013
LPL, University of Arizona	2013

### **Teaching Experience, Public Outreach & Mentoring**

Lead organizer for Space Science for Kids event at Center for Space Physics	2018
Scientist of the Day at Boston Tech Academy, middle school class, Dorchester, MA	2017
Science Judge for Montessori middle and high school	2016 – Present
Mentoring Undergraduate Astronomy Class (AS202) Lecture	2016
Veterans Off-Grid Initiative (on navigating the night sky)	2016 – Present
Boston University, Boston, MA	
Undergraduate work-study supervision and training	2014 – Present
MOOC series contribution for BU Astronomy Course	2014
Grade school rocket science presentation	2013
Work-study undergraduate training	2011 – 2013
Science Day for predominantly minority high school students	2012
Venus Transit Public Education and Outreach	2012
Research Internship in Science and Engineering (6 week program)	2012
Tutor to Astronomy 101 student	2011
Science Day for predominantly minority high school students	2011
Graduate Women in Science and Engineering Panel	2011
Tutor to Astronomy 102 student	2010
Teaching Assistant with Professor Elizabeth Blanton	2007
New York Academy of Sciences NeXXt Scholar’s Program Mentor	2012 – 2014
New York Academy of Sciences Master Mentor	2015

### **In the News**

Feature in Nature <sup>1</sup> for first authored publication	2009
Suborbital Space Training with NASTAR	2010
Cover story of New York Academy of Science Magazine <sup>2</sup>	2013
GRL 2015 publication featured in Science News Online <sup>3</sup>	2015
Articles in BUToday newsletter <sup>4,5</sup>	2015, 2016

### **Handy Skills**

Spectral reduction, pipeline development, and image analysis (MAVEN, HST STIS), ionospheric data analysis (radio occultation, topside sounder, in situ spectrometer), ionospheric/atmospheric chemistry and numerical modeling (collisional fluid), ionospheric physics (dynamics, energetics,

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<sup>1</sup> Matta et al., 2009 paper featured in: nature physics, volume 5, August 2009: [www.nature.com/naturephysics](http://www.nature.com/naturephysics), Lunar science: In the Moon’s wake, p.535 by David Gevaux, doi:10.1038/nphys1346

<sup>2</sup> <http://www.nyas.org/Publications/Detail.aspx?cid=e88c65db-db90-43ad-b951-9026e8b2dfdb>

<sup>3</sup> <https://www.sciencenews.org/article/mars%E2%80%99-ionosphere-mystery-explained>

<sup>4</sup> <https://www.bu.edu/today/2015/mission-to-mars/>

<sup>5</sup> <http://www.bu.edu/today/2016/where-did-mars-water-go/>

field interactions), automation tools for large datasets, all-sky camera image processing and analysis. Multilingual.

### **Active Memberships**

American Geophysical Union	since 2010
Mars Upper Atmospheres Network	since 2009
American Astronomical Society – Division of Planetary Science	since 2008

### **Service**

Local organizer of Center for Space Physics 30 <sup>th</sup> Anniversary (includes public outreach)	2018
Executive secretary, panelist, and external reviewer for multiple NASA Panels	2013 – Present
Swedish National Space Board external reviewer	2016
Peer Reviewer (AGU Journals, APJ, Icarus, Advances in Space Research)	2012 – Present
DPS Professional Development Subcommittee, dependent care liaison	2008 – 2015

**References available upon request.**