

# ALEXANDRA G. CRAMER

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## EDUCATION

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<b>PhD candidate, Astronomy</b> Boston University	2021 – present [anticipated: 2024]
<b>Master of Arts, Astronomy</b> Boston University	2021
<b>Bachelor of Science, Physics Honors, <i>magna cum laude</i></b> Minor, Mathematics College of William and Mary	2018

## RESEARCH INTERESTS

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Thermosphere, ionosphere, near-space environment (Mars, Earth); atmospheric changes with solar irradiance variability, solar flares; space weather; star-planet interactions; data analysis, observation-simulation comparisons; applications to: atmospheric evolution, past atmospheric conditions, mitigation of space weather risks to human activity/technology; planetary habitability

## RESEARCH POSITIONS

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### Boston University, Astronomy Department

2018 – present	Graduate Research Fellow; conducting analysis of solar flare effects on the upper atmosphere of Mars with MAVEN spacecraft observations and time-dependent simulations from a Mars global atmospheric circulation model (M-GITM) <i>Advisor: Paul Withers</i>
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### NASA Goddard Space Flight Center

Summer 2017	Intern; identified times from 2014-17 when the Heliospheric Current Sheet crossed Mars using MAVEN magnetometer data and CCMC iSWA model outputs <i>Mentors: Jacob Gruesbeck, Jared Espley</i>
Summer 2016	DREAM2 Intern; produced data pipeline for identifying lunar ion flux during micro-meteoroid events and solar wind conditions using LADEE UVS spectra <i>Mentor: Menelaos Sarantos</i>

### College of William & Mary, Physics Department

2017 – 2018	Senior honors thesis; selected and applied parameters for isolating Timelike Compton Scattering reaction in Jefferson Lab's GlueX Experiment <i>Mentor: Justin Stevens</i>
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- 2015 – 2016 Undergraduate researcher; conducted observations of Moon and Jupiter in plausibility study for researching gas giant atmospheres and meteor impacts  
*Mentors: Wouter Deconinck, Kunio Sayanagi*
- Summer 2015 Undergraduate researcher; conducted interferometry lab experiment to maximize VO<sub>2</sub> reflectivity through its temperature dependent insulator-to-metal transition  
*Mentors: Irina Novikova, Ellie Radue*

### **Pulsar Search Collaboratory**

- 2012 – 2014 Analyzed 200+ datasets for pulsar detection from Green Bank Telescope surveys

## **HONORS AND AWARDS** -----

- 2022-24 Future Investigators in NASA Earth and Space Science and Technology (FINESST) fellowship
- 2022 MASGC (Massachusetts Space Grant Consortium) funding award, Summer semester
- 2021 MASGC funding award, Fall semester  
MASGC funding award, Summer semester  
MASGC funding award, Spring semester
- 2020 MASGC funding award, Summer semester
- 2019 Mars Student Travel Grant (for Ninth International Conference on Mars)
- 2018 Boston University Dean's Fellowship, Fall semester
- 2017-18 Jefferson Science Associates MFURA (Research Assistantship), Academic Year
- 2014-18 William & Mary Dean's List (GPA > 3.6), six semesters
- 2014 NWFCU Ben DeFelice Scholarship

## **REFEREED PUBLICATIONS** -----

**Cramer, A. G., & Withers, P.** (2023). Effects of the 10 September 2017 solar flare on the density and composition of the ionosphere of Mars: Significance of thermospheric changes. *Journal of Geophysical Research: Space Physics*, 128, e2022JA030961. <https://doi.org/10.1029/2022JA030961>

**Cramer, A. G., Withers, P., Elrod, M. K., Benna, M., & Mahaffy, P. R.** (2020). Effects of the 10 September 2017 solar flare on the density and composition of the thermosphere of Mars. *Journal of Geophysical Research: Space Physics*, 125, e2020JA028518. <https://doi.org/10.1029/2020JA028518>

Swiggum, J. K., **et al.** (2015, June). PSR J1930-1852: A Pulsar in the Widest Known Orbit around Another Neutron Star., 805 (2), 156. doi:10.1088/0004-637X/805/2/156

## **CONFERENCE ABSTRACTS, UNREFEREED WORKS** -----

Cramer, A., Withers, P., Elrod, M., & Pawlowski, D. (2022, December). Ion Densities at Mars During a Solar Flare: A Comparison of MAVEN NGIMS Observations with MGITM Model Outputs. In AAS/Division for Planetary Sciences meeting abstracts (Vol. 54, p. 213.07). *Poster*

Cramer, A., Withers, P., & Elrod, M. (2021, December). Solar Flare Effects on Upper Ionosphere Processes at Mars. In AGU Fall Meeting abstracts (Vol. 2021, p. P45F-2503). *Poster*

Cramer, A. G., Withers, P., & Elrod, M. K. (2020, December). MAVEN Observations of Solar Flare Effects in the Upper Atmosphere of Mars. In AGU Fall Meeting abstracts (Vol. 2020, p. P033-0011). *Poster*

Cramer, A. G., Withers, P., & Elrod, M. K. (2019, December). Investigating Solar Flare-Induced Oxygen Production in the Martian Thermosphere. In AGU Fall Meeting abstracts (Vol. 2019, p. P41B-3445). *Poster*

Cramer, A. G., Withers, P., & Elrod, M. K. (2019, July). Effects of the September 2017 Solar Flare on Neutral Species Abundances in the Martian Thermosphere. In LPI Editorial Board (Ed.), Ninth International Conference on Mars (Vol. 2089, p. 6300). *Poster*

Cramer, Alexandra, "Timelike Compton Scattering in the GlueX Experiment at Jefferson Lab" (2018). *Undergraduate Honors Theses*. Paper 1235. <https://scholarworks.wm.edu/honorstheses/1235>

## PRESENTATIONS

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BU Graduate Student Research Seminar – six talks (2019 – present)

*Upper Atmospheric Changes Over Time During a Solar Flare Event*  
MAVEN and MUAN Joint Meeting – talk (Sep 2023)

*9/10/2017 Solar Flare: Thermal Expansion Effects Over Time in the Simulated Upper Atmosphere of Mars*  
MAVEN Project Science Group Meeting – poster & talk (May 2023)

*Solar Flare Effects on Ion Densities at Mars: Comparing MGITM Simulation Outputs with NGIMS Observations*  
MAVEN Project Science Group Meeting – poster & talk (Oct 2022)

*Timing of Solar Flare Effects on the Topside Ionosphere*  
MAVEN Science Team Meeting (May 2022)

*Response of Upper Atmosphere Ions to the September 10, 2017 Solar Flare*  
MAVEN Project Science Group Meeting – talk (Oct 2021)

*Effects of the 10 September 2017 Solar Flare on the Density and Composition of the Upper Atmosphere of Mars*  
MAVEN Project Science Group Meeting – talk (Oct 2020)

*Timelike Compton Scattering in the GlueX Detector at Jefferson Lab*  
W&M Undergraduate Research Symposium, APS GW CUWiP, W&M Physics Class of 1968 Alumni Visit – posters (Spring 2018)  
W&M Physics Honors Defense – talk (May 2018)

*Effects of the Heliospheric Current Sheet on Mars' Induced Magnetosphere*  
MAVEN Magnetometer Group Journal Club – talk (Aug 2017)  
GSFC 2017 Summer Intern Poster Session – poster (Aug 2017)

*Investigations of the Lunar Atmosphere Using LADEE Data*  
DREAM2 Summer Interns Presentations – talk (Aug 2016)  
GSFC Summer Intern Poster Session – poster (Aug 2016)

## SKILLS

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- **Programming:** Python (current projects), MATLAB (3+ years), C++, IDL, R, ROOT
- **Software:** Microsoft Office, LaTeX
- **General:** Data analysis, statistics, basic telescope operations (8" Meade, 14" Cassegrain-Schmidt, 72" Cassegrain), Spanish (5 years)

## TEACHING, OUTREACH & AFFILIATIONS -----

Oct 2023	BU Annular Solar Eclipse Outreach Event – volunteer
2022 – present	Public Open Night at BU Coit Observatory – volunteer
2022, 2023	Co-created logo designs: BU Astronomy Department; MAVEN Early Career Group
Summer 2022	Physics Pedagogy Journal Club member
Spring 2022	Boston University Teaching Fellow: AS107: Life Beyond Earth
Oct 2021	The Art of Planetary Science (TAPS) 2021: Space Travel, Fine Arts entry
2021 – present	AAS Division of Planetary Sciences (DPS) member
2020 – present	American Geophysical Union (AGU) member
2019 – present	Smithsonian Transcription Center: Project PHaEDRA – volunteer
2018 – present	BU Inclusive Astronomy/Women As Leaders In Astronomy member
Oct 2017	W&M “Physics of Space” Physics Fest – volunteer
2012 -- 2014	High school math tutor: Geometry, Algebra II