

# MAREK SLIPSKI

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## EDUCATION

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### University of Colorado Boulder

*PhD in Geophysics*

Advisor: Bruce Jaksoky

Department of Astrophysical and Planetary Sciences

Sep 2012 – Jan 2019

### University of Rochester

*Bachelor of Science in Physics and Astronomy*

Department of Physics and Astronomy

Sep 2007 – Dec 2011

## EXPERIENCE

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### Research Scientist

*Jet Propulsion Laboratory*

Feb 2023 – present

- Performing mission operations and science planning tasks for the Mars Climate Sounder (MCS) instrument on the Mars Reconnaissance Orbiter.
- Determining compositions of observed martian clouds using a simple radiative transfer model.
- Constructing radiance maps of Mars for input to straylight models of the Narrow Angle Camera in support of Mars Sample Return.
- Managing the Cloudspotting on Mars citizen science project.

### NASA Postdoctoral Program Fellow/JPL Postdoctoral Fellow

*Jet Propulsion Laboratory*

September 2019 – Feb 2023

*Advisor: Armin Kleinböhl*

- Created a cloud detection algorithm to identify mesospheric clouds in MCS observations spanning more than 15 years.
- Identified the relationship between high altitude clouds and temperature variance, revealing the spatial and seasonal dependence of clouds on wave activity.
- Managed Cloudspotting on Mars citizen team: led meetings with science collaborators, worked closely with volunteer beta testers to improve user experience, and trained citizen scientists to analyze data.
- Characterized the radiometric environment at Mars in support of straylight analysis of the Mars Sample Return Earth Return Orbiter camera for detection of the Orbiting Sample in collaboration with joint ESA-NASA Cloud Tiger Team.
- Developed an interactive dashboard in python and a citizen science tool on Zooniverse for labeling features in MCS data archive for further scientific investigation.
- Served on Mars 2020 *Council of Atmospheres* in support of EDL during the approach period.

### Researcher

*NASA Frontier Development Lab*

June 2020 – August 2020

*Advisor: Clem Tillier*

- Developed, tested, and evaluated a machine learning model to predict severe weather events with a 15-minute lead time using Geostationary Lightning Mapper (GLM) observations.
- Monitored data pipeline that processed over 3 million GLM L2 files into physical parameters and then into severe weather event predictions using the Google Cloud Computing Platform.

### Mission Concept Design Participant

*JPL NRS Mission Incubation Program*

2021-2022

- Developed the scientific motivation and architecture of a mission to investigate wildfire evolution and predict future burn areas with a 12 hour lead time.

- Collaboratively designed New-Frontiers-class Uranus orbiter and probe mission concept (Role: Ground Systems).

**Research Scientist**

Feb 2019 – May 2019

*Laboratory for Atmospheric and Space Physics, University of Colorado Boulder* Advisor: Bruce Jakosky

- Investigated variability of Mars' homopause/turbopause and exobase altitudes during the 2018 planet-encircling dust event neutral densities from MAVEN's NGIMS instrument and temperatures from MRO's MCS.

**Graduate Research Assistant**

Jan 2013 – Feb 2019

*Laboratory for Atmospheric and Space Physics, University of Colorado Boulder* Advisor: Bruce Jakosky

- Characterized Mars's thermospheric structure with measurements from MAVEN's Neutral Gas and Ion Mass Spectrometer (NGIMS) and showed that Mars's homopause altitude varies by tens of kilometers.
- Determined that two-thirds of Mars's atmospheric argon has been lost to space using measurements from NGIMS and MSL's Sample Analysis at Mars instrument.
- Created an atmospheric evolution model of argon isotope ratios to assess integrated atmospheric escape on Mars.

**NASA Undergraduate Student Research Assistant**

Jan 2010 – May 2010

*NASA MSFC, NASA Undergraduate Student Research Program* Advisor: James Adams

- Began development of a model to predict worst-case solar proton environments for spacecraft missions by analyzing spectral energy distributions of solar particle events.

**RESEARCH GRANTS FUNDED**

<b>Science PI</b> (\$519k)	PI: Armin Kleinböhl
NASA Mars Data Analysis Program	2022-2025
<i>"Distribution and Composition of Mars Mesospheric Clouds from Mars Climate Sounder Observations"</i>	
<b>Science PI</b> (\$85k)	PI: Armin Kleinböhl
NASA Citizen Science Seed Funding Program	2021-2022
<i>"Mars Mesospheric Cloud Citizen Science"</i>	
<b>Co-I</b> (Unfunded)	PI: Mark Wronkiewicz
JPL R&TD Spontaneous Concept	2022
<i>"Characterizing Small Martian Dust Storms with Data Science for Mission Planning and Climate Modeling"</i>	
<b>Collaborator</b> (Unfunded)	PI: Matteo Crismani
NASA Citizen Science Seed Funding Program	2022-2023
<i>"Martian Cloud Watching"</i>	

**HONORS, AWARDS, AND PROGRAMS**

Participant in JPL NRSF Mission Incubation Program	2022
Participant in NASA JPL Planetary Science Summer School	2016
Participant in NAI Summer School in Astrobiology	2014
Recipient of NASA MEPAG Student Travel Grant	2014
University of Rochester Cum Laude with Highest Distinction	2011
Participant in NASA Undergraduate Student Research Program	2010
Sigma Pi Sigma Inductee, National Physics Honors Society	2010
Participant in University of Rochester Summer REU program	2009, 2010, 2011
Recipient Iota Book Award, Iota Chapter of Phi Beta Kappa	2008
University of Rochester Dean's List	2007 – 2011
Wilder Trustee Scholarship	2007 – 2011

## SELECTED PUBLICATIONS

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- Slipski, M.**, Kleinböhl, A., Tirsch, D., Kminek, G., et al. (submitted). “The radiometric environment for Mars limb observations by the Mars Sample Return Earth Orbiter.” *Advances in Space Research*.
- Slipski, M.**, Kleinböhl, A., Kass, D. M. (2022). Role of thermal tides and gravity waves in Mars equatorial mesospheric cloud formation revealed by Mars Climate Sounder observations. *Geophysical Research Letters*, 49, e2022GL100607.
- Tirsch, D., **Slipski, M.**, Kleinböhl, A., Kminek, G., and Cloud Tiger Team. (2022). MSR/ERO Cloud Tiger Team Report. *ESA-NASA Technical Report*.
- Slipski, M.**, Venzor-Cardenas, I., Molina, M. J., Ahmed, N Cheung, M., Tillier, C., Edgington, S., Renard, G. (2020). Predicting Severe Thunderstorms with Machine Learning and Geostationary Lightning Mapper. *Frontier Development Lab Technical Memorandum*.
- Slipski, M.**, Jakosky, B., Benna, M., Elrod, M., Mahaffy, P., Kass, D., Stone, S., Yelle, R. (2018). Variability of Martian Turbopause Altitudes. *Journal of Geophysical Research - Planets*, 123, 2939-2957.
- Jakosky, B. M., Brain, D., Chaffin, M., Curry, S., Deighan, J., Grebowsky, J., ... **Slipski, M.**, ... & Zurek, R. (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.
- Elder, C., Bramson, A., Blum, L., Chilton, H., Chopra, A., Chu, C., Das, A., Davis, A., Delgado, A., Fulton, J., Jozwiak, L., Khayat, A., Landis, M., Molaro, J., **Slipski, M.**, Valencia, S., Watkins, J., Young, C., Budney, C., Mitchell K. (2017). OCEANUS: A high science return Uranus orbiter with a low-cost instrument suite. *Acta Astronautica*.
- Jakosky, B. M., **Slipski, M.**, Benna, M., Mahaffy, P., Elrod, M., Yelle, R., Stone, S., Alsaeed, N. (2017). Mars atmospheric history derived from upper-atmosphere measurements of  $^{38}\text{Ar}/^{36}\text{Ar}$ . *Science*, 355(6332), 1408-1410.
- Slipski, M.**, and Jakosky, B. M. (2016). Argon isotopes as tracers for martian atmospheric loss. *Icarus*, 272, 212-227.

## TEACHING EXPERIENCE

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| <b>Planets and Their Atmospheres</b><br><i>Teaching Assistant to Jean-Michel Desert</i><br><i>Guest Lecture: Climate and Evolution of Atmospheres</i><br>University of Colorado Boulder | Spring 2015 |
| <b>Introduction to Geology</b><br><i>Guest Lecture: Climates of the Terrestrial Planets</i><br>Front Range Community College  | Spring 2015 |
| <b>Introduction to Astronomy</b><br><i>Laboratory Teaching Assistant to Seth Hornstein</i><br>University of Colorado Boulder  | Fall 2012   |
| <b>Elementary Astrophysics</b><br><i>Undergraduate Teaching Assistant to Dan Watson</i><br>University of Rochester  | Spring 2011 |
| <b>The Solar System and Its Origins</b><br><i>Undergraduate Teaching Assistant to Dan Watson</i><br>University of Rochester   | Fall 2010   |

## PRESS COVERAGE

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- Interviewed for *New Scientist* story on Cloudspotting on Mars, “Join the hunt for clouds high up in the Martian atmosphere” (2022).
- Guest on *Planetary Radio* podcast: “Citizen Science: Join the search for Martian clouds.” (2022).
- Interviewed for *WIRED* story about *Cloudspotting on Mars*, “NASA Is Crowdsourcing Cloud Research—on Mars.” (2022).
- *Cloudspotting on Mars* project featured in *NPR Morning Edition*, *Space.com*, *LAist*, *Gizmodo*, *KPCC*, *CNET*, *FOX Weather*, *EarthSky*, *Cloud Appreciation Society* (2022).
- NASA feature about *Cloudspotting on Mars*, “Help NASA Scientists Find Clouds on Mars.” (2022).
- Live guest on SETI Live episode “Frontier Development Lab: Lightning and Extreme Weather.” (2020).
- NASA Science nugget on *Variability of Martian Turbopause Altitudes*: “‘Breathing’ in Mars Upper Atmosphere.” (2019).
- Interviewed by *LA Times* for story about *Mars atmospheric history derived from upper-atmosphere measurements of  $^{38}\text{Ar}/^{36}\text{Ar}$* , “How did Mars lose so much of its atmosphere? MAVEN has an answer.” (2017).
- Interviewed by *Daily Camera* for story about *Mars atmospheric history derived from upper-atmosphere measurements of  $^{38}\text{Ar}/^{36}\text{Ar}$* , “CU-led MAVEN mission to Mars quantifies atmospheric loss.” (2017).

## ACADEMIC SERVICE

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**Referee** for *GRL*, *Icarus*, *JGR-Planets*, *The Astrophysical Journal*, *The Planetary Science Journal*, *JGR-Atmospheres*, *MDPI*, *AGU Outstanding Paper Awards*

**Proposal Reviewer** for NASA

**Judge** for Fall AGU Student Posters

Served as **Executive Secretary** for NASA Review Panel

AbGradCon Local Organizing Committee Member

2016

“Life” Synthesis Team member for the 8th International Conference on Mars

2014

Graduate student concerns committee representative

2013

## PUBLIC OUTREACH

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Cloudspotting on Mars Webinar Series, Virtual

2022-present

Public lecture on Planetary Atmospheres, Rotary Club, *Longmont, CO*

2015

Organized public lectures on astronomy, Rotary Club, *Longmont, CO*

2015 & 2016

Co-organized MAVEN demonstrations, CU Boulder Astronomy Day, *Boulder, CO*

2014 & 2015

Public lecture on MAVEN mission, Boardman High School, *Boardman, OH*

2013

Observing night lead, Sommers-Bausch Observatory, *Boulder, CO*

2012 – 2016

Science Fair Judge, *Kansas City, MO*

2012

Observing night lead, Mees Observatory, *Bristol Hills, NY*

2009 – 2011

## TECHNICAL STRENGTHS

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**Programming**

Python, IDL, Linux/Unix, awk, Jupyter, Colab, pair coding

**Analysis Tools**

pandas, numpy, xarray, scipy, sklearn, skimage, pymc3, dask, Excel

**Visualization**

matplotlib, panel, bokeh, dash, plotly, Vega-Lite, streamlit

**Writing & Presentation**

LaTeX, Word, Powerpoint, Prezi, Google Workspace

**Management/DevOps**

git, pytest, CircleCI, Make, Docker, Trello, Google Drive

**Cloud & Computing**

High Performance Computing, Amazon Web Services, Google Cloud Platform

## MENTORING EXPERIENCE

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*AGU Planetary Sciences Mentoring Program* mentor to Kanpatom Kasonsuwan and Priya Patel Winter 2022  
Co-mentor to Steven Dillmann, *JPL Visiting Student Research Program* Summer 2022  
Co-mentor to Alex Scatena, *Fairview High School student* Summer 2018  
Co-mentor to Hind Saeed, *LASP REU student* Summer 2017  
Co-mentor to Noora Alsaeed, *LASP REU student* Summers 2015 & 2016  
Physics tutor, *University of Rochester* 2009 – 2011

## SELECTED TALKS AND PRESENTATIONS

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*Conference Talk* Dec 2022  
**Slipski, M.**, Kleinböhl, A., Dillmann, S., Reimuller, J. D., Wronkiewicz, M., Doran, G. B. Cloudspotting on Mars: Mapping Mesospheric Clouds through Citizen Science *American Geophysical Union, Fall Meeting*, abstract #P33D-08.

*Conference Talk* July 2022  
**Slipski, M.**, Kleinböhl, A., Kass, Tirsch, D., and the Cloud Tiger Team. The radiometric environment for Mars limb observations by the Mars Sample Return Earth Return Orbiter. *COSPAR 2022*.

*Poster* June 2022  
**Slipski, M.**, Kleinböhl, A., Kass, D. M. “Aphelion Equatorial Mesospheric Clouds Observed by MCS.” *Seventh International Workshop on the Mars Atmosphere: Modelling and Observations*.

*Conference Talk* Dec 2021  
**Slipski, M.**, Kleinböhl, A., Kass, D. M. Aphelion Equatorial Mesospheric Clouds Observed by MCS: Local time variability and evidence for wave-induced cold pockets. *American Geophysical Union, Fall Meeting*, abstract #P31B-04.

*Conference Talk* Dec 2020  
**Slipski, M.**, and Kleinböhl, A. “Identification of Mars Mesospheric Clouds in Mars Climate Sounder Data Using a Machine-learning Algorithm.” *American Geophysical Union, Fall Meeting*, abstract #P008-04.

*Conference Talk* July 2019  
**Slipski, M.**, Jakosky, B., Kleinböhl, A. “Turbopause levels and mesospheric cloud formation.” *Ninth International Conference on Mars*, abstract 6313.

*Poster* Mar 2018  
**Slipski, M.**, Jakosky, B., Benna, M., Mahaffy, P., Elrod, M., Gonzalez-Galindo, F. “Variability and Control of the Homopause Level.” *MAVEN Project Science Group Meeting*.

*Conference Poster* Oct 2017  
**Slipski, M.**, Jakosky, B., Benna, M., Mahaffy, P., Elrod, M. K. (2017) “Atmospheric Argon Isotope Evolution Informed by MAVEN Results.” *Fourth International Conference on Early Mars*, LPI Contribution No. 2014, id. 3027.

*Conference Poster* May 2017  
**Slipski, M.**, Jakosky, B., Benna, M., Mahaffy, P., Elrod, M., Yelle R., Stone S., Alsaeed N., Vals M. (2017) “Homopause Variability as Observed by MAVEN.” *International Conference on Mars Aeronomy*.