

# MAREK SLIPSKI

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## EDUCATION

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- University of Colorado Boulder** Sep 2012 – Jan 2019  
*PhD in Geophysics*  
Advisor: Bruce Jaksoky  
Department of Astrophysical and Planetary Sciences
- University of Rochester** Sep 2007 – Dec 2011  
*Bachelor of Science in Physics and Astronomy*  
Department of Physics and Astronomy

## EXPERIENCE

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- NASA Postdoctoral Program Fellow/JPL Postdoc** September 2019 – Present  
*Jet Propulsion Laboratory* Advisor: Armin Kleinböhl
- Created a cloud detection algorithm to identify mesospheric clouds in Mars Climate Sounder (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 science project 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** June 2020 – August 2020  
*NASA Frontier Development Lab* 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.
- 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 Jaksoky
- 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**  
*NASA MSFC, NASA Undergraduate Student Research Program*

Jan 2010 – May 2010  
*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.

**Undergraduate Research Assistant**  
*University of Rochester, REU Student*

Sep 2008 – Dec 2011  
*Advisor: Eric Mamajek*

- Searched for nearby candidate dwarf stars based on photometry and astrometry in the All-Sky Compiled Catalogue.
- Derived ages for exoplanet host stars using chromospheric activity measurements and empirical activity-rotation-age calibrations.

## RESEARCH GRANTS FUNDED

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

## HONORS, AWARDS, AND PROGRAMS

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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

## ACADEMIC SERVICE

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<b>Referee</b> for <i>GRL, Icarus, JGR-Planets, The Astrophysical Journal, The Planetary Science Journal, JGR-Atmospheres, MDPI, AGU Outstanding Paper Awards</i>	
<b>Proposal Reviewer</b> for NASA	
<b>Judge</b> for Fall AGU Student Posters	
Served as <b>Executive Secretary</b> 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

## PRESS COVERAGE

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- 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).

## PUBLICATIONS

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**Slipski, M.**, Kleinböhl, A., Tirsch, D., Kminek, G., and Cloud Tiger Team (in preparation) . The radiometric environment for Mars limb observations by the Mars Sample Return Earth Orbiter. *Advances in Space Research*.

Kleinböhl, A., Willacy, K., **Slipski, M.**, Poncin, L. (in preparation). Hydrogen escape on Mars dominated by water vapor decomposition above the hygropause. *Science*.

**Slipski, M.**, Kleinböhl, A., Kass, D. M. (under review). Role of thermal tides and gravity waves in Mars equatorial mesospheric cloud formation revealed by Mars Climate Sounder observations. *Geophysical Research Letters*.

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.

## TECHNICAL STRENGTHS

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<b>Programming</b>	Python, IDL, Linux/Unix, awk, Jupyter, Colab, pair coding
<b>Analysis Tools</b>	pandas, numpy, xarray, scipy, sklearn, skimage, pymc3, dask, Excel
<b>Visualization</b>	matplotlib, panel, bokeh, dash, plotly, Vega-Lite, streamlit
<b>Writing &amp; Presentation</b>	LaTeX, Word, Powerpoint, Prezi, Google Workspace
<b>Management/DevOps</b>	git, pytest, CircleCI, Make, Docker, Trello, Google Drive
<b>Cloud &amp; Computing</b>	High Performance Computing, Amazon Web Services, Google Cloud Platform

## MENTORING EXPERIENCE

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Co-mentor to Steven Dillmann, <i>JPL Visiting Student Research Program</i>	Summer 2022
Co-mentor to Alex Scatena, <i>Fairview High School student</i>	Summer 2018
Co-mentor to Hind Saeed, <i>LASP REU student</i>	Summer 2017
Co-mentor to Noora Alsaed, <i>LASP REU student</i>	Summers 2015 & 2016
Physics tutor, <i>University of Rochester</i>	2009 – 2011

## TEACHING EXPERIENCE

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

## PUBLIC OUTREACH

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Cloudspotting on Mars Webinar Series, Virtual	2022-present
Public lecture on Planetary Atmospheres, Rotary Club, <i>Longmont, CO</i>	2015
Organized public lectures on astronomy, Rotary Club, <i>Longmont, CO</i>	2015 & 2016
Co-organized MAVEN demonstrations, CU Boulder Astronomy Day, <i>Boulder, CO</i>	2014 & 2015
Public lecture on MAVEN mission, Boardman High School, <i>Boardman, OH</i>	2013
Observing night lead, Sommers-Bausch Observatory, <i>Boulder, CO</i>	2012 – 2016
Science Fair Judge, <i>Kansas City, MO</i>	2012
Observing night lead, Mees Observatory, <i>Bristol Hills, NY</i>	2009 – 2011

## TALKS AND PRESENTATIONS

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<i>Conference Talk</i>	July 2022
<b>Sliwski, M.</b> , 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. <i>COSPAR 2022</i>	

- 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* May 2022  
**Slipski, M.**, Kleinböhl, A., Reimuller, J., Aye, K-M. “Cloudspotting on Mars: A NASA Citizen Science Project on Zooniverse.” *C\*Sci 2022*.
- 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.
- Conference Talk* Dec 2018  
**Slipski, M.**, Jakosky, B., Benna, M., Elrod, M., Mahaffy, P., Kass, D., Stone, S., Yelle, R. “Variability of Mars’ Turbopause Altitudes.” *American Geophysical Union, Fall Meeting*, abstract #P32B-02.
- Poster* Sep 2018  
**Slipski, M.**, Jakosky, B., Benna, M., Elrod, M., Mahaffy, P., Kass, D., Stone, S., Yelle, R., Scatena, A. “Variability of Homopause and Turbopause Altitudes and Implications for Ar loss.” *MAVEN Project Science Group Meeting*.
- 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 Talk* Oct 2017  
**Slipski, M.**, Jakosky, B., Benna, M., Mahaffy, P., Elrod, M., Kass, D., Gonzalez-Galindo, F. “Variability of Martian Turbopause Altitudes.” *American Astronomical Society, DPS meeting #49, #510.08*.
- Poster* Oct 2017  
**Slipski, M.**, Jakosky, B., Benna, M., Mahaffy, P., Elrod, M., Gonzalez-Galindo, F. “Variability of Mars’ homopause and ‘wave-turbopause.’” *MAVEN Project Science Group Meeting*.
- Conference Poster* Oct 2017  
**Slipski, M.**, Jakosky, B., Benna, M., Mahaffy, P., Elrod, M. K. “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. “Homopause Variability as Observed by MAVEN.” *International Conference on Mars Aeronomy*.
- Conference Talk* Jan 2017  
**Slipski, M.**, Jakosky, B., Benna, M., Mahaffy, P., Elrod, M., Yelle, R., Stone, S., Alsaeed, N. “Total Atmospheric Loss from Upper-Atmospheric Structure of  $^{36}\text{Ar}/^{38}\text{Ar}$  Observed by MAVEN.” *The Sixth International Workshop on the Mars Atmosphere*, p.3316.
- Talk* Nov 2016  
**Slipski M.** “Variability of the homopause.” *MAVEN Project Science Group Meeting*.

*Conference Talk* Mar 2016  
**Slipski, M.**, Jakosky, B., Alsaeed, N., Mahaffy, P., Benna, M., Elrod, M. “Characterizing Mars’ Atmospheric Loss Through Argon Isotopic Fractionation Observed with MAVEN.” *47th Lunar and Planetary Science Conference*, LPI Contribution No. 1903, p.2422.

*Talk* Oct 2015  
**Slipski, M.** “Exobase and Homopause altitudes.” *MAVEN Project Science Group Meeting*.

*Conference Poster* July 2014  
**Slipski, M.**, Jakosky, B. “Evolution of Argon Isotopes in the Martian Atmosphere.” *Eighth International Conference on Mars*, LPI Contribution No. 1791, p.1021.

*Talk* Jan 2014  
**Slipski, M.** “Argon Isotopic Evolution in the Martian Atmosphere.” *MAVEN Project Science Group Meeting*.

*Conference Poster* Dec 2013  
**Slipski, M.**, Jakosky, B. “Effects of outgassing, sputtering, and erosion on the evolution of argon isotopes in the Martian atmosphere.” *American Geophysical Union, Fall Meeting*, abstract #P21B-1717.

*Conference Poster* Jan 2010  
**Slipski, M.**, Mamajek, E. “Improved Ages Estimates for Extrasolar Planet Host Stars” *American Astronomical Society, AAS Meeting #215*, 423.01.

(Talks and posters contributed to available upon request)