

# Daniel Yiu Wah Lo

Climate and Space Sciences and Engineering, University of Michigan, USA

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## Education

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<i>Doctor of Philosophy, Planetary Sciences</i>	2021
Lunar and Planetary Laboratory, The University of Arizona, USA Minor: Optical Sciences	
<i>Master of Science, Planetary Sciences</i>	2017
Lunar and Planetary Laboratory, The University of Arizona, USA	
<i>Bachelor of Science with Honors, Double major in Physics and Planetary Science</i>	2014
California Institute of Technology, USA Minor: Philosophy	

## Honors and Awards

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<i>American Geophysical Union Outstanding Student Presentation Award</i>	2020
<i>The University of Arizona College of Science Galileo Circle Scholarship</i>	2019
<i>NASA Group Achievement Award – MAVEN Mission Team</i>	2018
<i>The University of Arizona Graduate and Professional Student Council Travel Grant</i>	2018
<i>Lunar and Planetary Institute Career Development Award</i>	2018
<i>NASA Group Achievement Award – MAVEN Science Team</i>	2016
<i>NASA Robert Hutchings Goddard Exceptional Achievement for Science – MAVEN Science Team</i>	2016
<i>The University of Arizona Lunar and Planetary Laboratory Lieutenant Colonel Kenneth Rondo Carson and Virginia Bryan Carson Graduate Fellowship</i>	2014
<i>California Institute of Technology Fritz Burns Prize in Geology</i>	2013
<i>Singapore Science and Engineering Fair Silver Award</i>	2004

## Publications

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h-index: 20 (as of 26 June 2023)

### Mars Science Laboratory

Lo D. Y., et al. *Evaluating atmospheric and surface drivers for the O<sub>2</sub> variations observed by MSL SAM at Gale crater*. Under review.

### Mars Atmospheric Chemistry and Escape

26. Thomas T. B., Hu R., & **Lo D. Y.** (2023). *Constraints on the size and composition of the ancient Martian atmosphere from coupled CO<sub>2</sub>-N<sub>2</sub>-Ar isotopic evolution models*. The Planetary Science Journal 4(3), 41. doi: [10.3847/PSJ/acb924](https://doi.org/10.3847/PSJ/acb924)
25. **Lo D. Y.**, Yelle R. V., Lillis R. J., & Deighan J. I. (2021). *Carbon photochemical escape rates from the modern Mars atmosphere*. Icarus 360, 114371. doi: [10.1016/j.icarus.2021.114371](https://doi.org/10.1016/j.icarus.2021.114371)
24. **Lo D. Y.**, Yelle R. V., & Lillis R. J. (2020). *Carbon photochemistry at Mars: Updates with recent data*. Icarus 352, 114001. doi: [10.1016/j.icarus.2020.114001](https://doi.org/10.1016/j.icarus.2020.114001)
23. Chaffin M. S., et al. (2021). *Martian water loss to space enhanced by regional dust storms*. Nature Astronomy. doi: [10.1038/s41550-021-01425-w](https://doi.org/10.1038/s41550-021-01425-w)
22. Stone, S. W., Yelle, R. V., Benna, M., **Lo, D. Y.**, et al. (2020). *Hydrogen escape from Mars is driven by seasonal and dust storm transport of water*. Science 370(6518), 824–831. doi: [10.1126/science.aba5229](https://doi.org/10.1126/science.aba5229)
21. Ajello J. M., et al. (2019). *UV study of the Fourth Positive Band system of CO and O I 135.6 nm from electron impact on CO and CO<sub>2</sub>*. Journal of Geophysical Research: Space Physics, 124. doi:[10.1029/2018ja026308](https://doi.org/10.1029/2018ja026308)
20. Jakosky B. M., 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](https://doi.org/10.1016/j.icarus.2018.05.030)

### Mars Atmospheric Tides

19. England S. L., Liu G., Withers P., Yiğit E., **Lo D. Y.**, et al. (2016). *Simultaneous observations of atmospheric tides from combined in situ and remote observations at Mars from the MAVEN spacecraft*. Journal of Geophysical Research: Planets, 121, 594–607. doi:[10.1002/2016JE004997](https://doi.org/10.1002/2016JE004997)
18. **Lo D. Y.**, et al. (2015). *Nonmigrating tides in the Martian atmosphere as observed by MAVEN IUVS*. Geophysical Research Letters, 42 (21), 9057–9063. doi:[10.1002/2015GL066268](https://doi.org/10.1002/2015GL066268)

### MAVEN

17. Evans J. S., et al. Soto E., Jain S. K., Deighan J. I., Stevens M. H., Chaffin S. M., **Lo D. Y.**, et al. (2023). *Dayside temperature maps of the upper mesosphere and lower thermosphere of Mars retrieved from MAVEN IUVS observations of O I 297.2 nm emission*. Journal of Geophysical Research: Planets, 128 (2), e2022JE007325. doi: [10.1029/2022JE007325](https://doi.org/10.1029/2022JE007325)
16. **Lo D. Y.**, et al. (2022). *MAVEN/IUVS observations of C I 156.1 nm and 165.7 nm dayglow: Direct detection of carbon and implications on photochemical escape*. Icarus 371, 114664. doi: [10.1016/j.icarus.2021.114664](https://doi.org/10.1016/j.icarus.2021.114664)
15. Schneider N. M., et al. (2018). *Global aurora on Mars during the September 2017 space weather event*. Geophysical Research Letters, 7391–7398. doi:[10.1029/2018GL077772](https://doi.org/10.1029/2018GL077772)

14. Jain S. K., et al. (2018). *Martian thermospheric response to an X8.2 solar flare on September 10, 2017 as seen by MAVEN/IUVS*. *Geophysical Research Letters*, 45, 7312–7319. doi:[10.1029/2018GL077731](https://doi.org/10.1029/2018GL077731)
13. Deighan J. I., et al. (2018). *Discovery of a proton aurora at Mars*. *Nature Astronomy*, 2, 802–807. doi:[10.1038/s41550-018-0538-5](https://doi.org/10.1038/s41550-018-0538-5)
12. Stiepen A., et al. (2017). *Nitric oxide nightglow and Martian mesospheric circulation from MAVEN/IUVS observations and LMD-MGCM predictions*. *Journal of Geophysical Research: Space Physics*, 122 (5), 5782–5797. doi:[10.1002/2016JA023523](https://doi.org/10.1002/2016JA023523)
11. Stevens M. H., et al. (2017). *Martian mesospheric cloud observations by IUVS on MAVEN: Thermal tides coupled to the upper atmosphere*. *Geophysical Research Letters*, 44 (10), 4709–4715. doi:[10.1002/2017GL072717](https://doi.org/10.1002/2017GL072717)
10. Medvedev A. S., et al. (2016). *Comparison of the Martian thermospheric density and temperature from IUVS/MAVEN data and general circulation modeling*. *Geophysical Research Letters*, 43 (7), 3095–3104. doi:[10.1002/2016GL068388](https://doi.org/10.1002/2016GL068388)
9. Jakosky B. M., et al. (2015). *MAVEN observations of the response of Mars to an interplanetary coronal mass ejection*. *Science*, 350 (6261), aad0210. doi:[10.1126/science.aad0210](https://doi.org/10.1126/science.aad0210)
8. Schneider N. M., et al. (2015). *Discovery of diffuse aurora on Mars*. *Science*, 350 (6261), aad0313. doi:[10.1126/science.aad0313](https://doi.org/10.1126/science.aad0313)
7. Bougher S. W., et al. (2015). *Early MAVEN Deep Dip campaign reveals thermosphere and ionosphere variability*. *Science*, 350 (6261), aad0459. doi:[10.1126/science.aad0459](https://doi.org/10.1126/science.aad0459)
6. Thiemann E. M. B., et al. (2015). *Neutral density response to solar flares at Mars*. *Geophysical Research Letters*, 42 (21), 8986–8992. doi:[10.1002/2015GL066334](https://doi.org/10.1002/2015GL066334)
5. Jain S. K., et al. (2015). *The structure and variability of Mars upper atmosphere as seen in MAVEN/IUVS dayglow observations*. *Geophysical Research Letters*, 42 (21), 9023–9030. doi:[10.1002/2015GL065419](https://doi.org/10.1002/2015GL065419)
4. Evans J. S., et al. (2015). *Retrieval of CO<sub>2</sub> and N<sub>2</sub> in the Martian thermosphere using dayglow observations by IUVS on MAVEN*. *Geophysical Research Letters*, 42 (21), 9040–9049. doi:[10.1002/2015GL065489](https://doi.org/10.1002/2015GL065489)
3. Stevens M. H., et al. (2015). *New observations of molecular nitrogen in the Martian upper atmosphere by IUVS on MAVEN*. *Geophysical Research Letters*, 42 (21), 9050–9056. doi:[10.1002/2015GL065319](https://doi.org/10.1002/2015GL065319)

#### Waterfall Plunge Pools

2. Scheingross J. S., Lo D. Y., & Lamb M. P. (2017). *Self-formed waterfall plunge pools in homogeneous rock*. *Geophysical Research Letters*, 44 (1), 200–208. doi:[10.1002/2016GL071730](https://doi.org/10.1002/2016GL071730)

1. Scheingross J. S., Brun F., **Lo D. Y.**, Omerdin K., & Lamb M. P. (2014). *Experimental evidence for fluvial bedrock incision by suspended and bedload sediment*. *Geology*, 42 (6), 523–526. doi:[10.1130/G35432.1](https://doi.org/10.1130/G35432.1)

## **Presentations**

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*Evaluating atmospheric and surface drivers for atmospheric O<sub>2</sub> variations at Gale crater as observed by MSL SAM*. Lunar Planetary Science Conference 2023.

*Evaluating atmospheric and surface drivers for O<sub>2</sub> variations at Gale crater as observed by MSL SAM*. American Geophysical Union Fall Meeting 2022.

*What can drive the atmospheric O<sub>2</sub> variations observed by MSL SAM?* Asia Oceania Geosciences Society 19<sup>th</sup> Annual Meeting 2022.

*Carbon at Mars: Inventory and loss*. (Invited). April 2022. Jet Propulsion Laboratory Mars Forum.

*What can drive the atmospheric O<sub>2</sub> variations observed by MSL SAM?* Lunar Planetary Science Conference 2022.

*Carbon photochemical escape from the Martian atmosphere: Updates and future directions*. (Invited). American Geophysical Union Fall Meeting 2021.

*Direct detection of atomic carbon and implications on photochemical escape from MAVEN/IUVS observations of C I 156.1 nm and 165.7 nm dayglow*. American Geophysical Union Fall Meeting 2021.

*Carbon photochemical escape rates from the modern Mars atmosphere*. American Geophysical Union Fall Meeting 2020.

*Carbon photochemical escape rates from the modern Mars atmosphere*. American Geophysical Union Fall Meeting 2019.

*An ultraviolet perspective of the dynamic atmosphere of Mars: Highlights from four years of observations from the MAVEN Imaging UltraViolet Spectrograph*. Asia Oceania Geosciences Society 16<sup>th</sup> Annual Meeting 2019.

*Modern carbon photochemical escape rates at Mars based on MAVEN Observations*. Asia Oceania Geosciences Society 16<sup>th</sup> Annual Meeting 2019.

*Carbon photochemistry and densities in the Martian atmosphere under MAVEN Deep Dip 2 conditions*. American Geophysical Union Fall Meeting 2018.

*Carbon production and densities in the Martian atmosphere under MAVEN Deep Dip 2 conditions*. Lunar Planetary Science Conference 2018.

*MAVEN IUVS observations of C I Emissions at 156.1 nm and 165.7 nm*. Mars Aeronomy Conference 2017.

*Twilight limb observations of the Martian north polar hood by MAVEN IUVS*. Division of Planetary Science/European Planetary Science Conference 2016.

*Twilight limb observations of clouds in the Martian atmosphere by MAVEN IUVS.* Lunar Planetary Science Conference 2016.

*Tides in the Martian atmosphere as observed by MAVEN IUVS.* American Geophysical Union Fall Meeting 2015.

## Research Experience

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*Mars Science Laboratory / Curiosity* 2021–  
Science team collaborator

*Mars Atmosphere and Volatile Evolution (MAVEN)* 2014–  
Science team member

*Research Fellow, Climate and Space Science and Engineering, University of Michigan, USA* 2021–  
Advisor: Sushil K. Atreya, University of Michigan, USA

*Graduate Research Associate, Lunar and Planetary Laboratory, The University of Arizona, USA* 2017–2021  
Advisor: Roger V. Yelle, The University of Arizona, USA

*Graduate Research Assistant, Lunar and Planetary Laboratory, The University of Arizona, USA* 2014–2017  
Advisor: Roger V. Yelle, The University of Arizona, USA

*Summer Undergraduate Research Fellowship* 2013  
Homer J. Stewart Summer Undergraduate Research Fellow  
*Electron response of STEREO High Energy Telescope through GEANT4 modeling*  
Mentors: Edward C. Stone and Mark E. Wiedenbeck, California Institute of Technology, USA

*Summer Undergraduate Research Fellowship* 2012  
*Waterfall plunge pools evolution under constant forcing: A study using low temperature polyurethane foam*  
Mentor: Michael P. Lamb, California Institute of Technology, USA

*Summer Undergraduate Research Fellowship* 2011  
Homer J. Stewart Summer Undergraduate Research Fellow  
*Atmospheric features at the Jupiter North Pole from Cassini images*  
Mentor: Andrew P. Ingersoll, California Institute of Technology, USA

*Science Research Programme* 2006  
*Degradation of ascorbic acid*  
Mentor: Leong Lai Peng, National University of Singapore, Singapore

*Science Mentorship Programme* 2004  
*Polynomials over  $\mathbb{Z}_p^n$*   
Mentor: Lang Mong Lung, National University of Singapore, Singapore  
Obtained Distinction in Poster Category at national Youth Science Conference

## Teaching Experience

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### *Lunar and Planetary Laboratory, The University of Arizona, USA*

- Member of Curriculum Development Committee 2016–2017
- Teaching assistant for ASTR/PTYS 170B2 (The Universe and Humanity: Origin and Destiny),  
conducted by Renu Maholtra 2017
- Teaching assistant for ASTR/PTYS 170B2 (The Universe and Humanity: Origin and Destiny),  
conducted by Kat Volk 2015

### *National University of Singapore, Singapore*

- Coach for the Singapore national team to the International Young Physicists' Tournament. The team  
eventually obtained the top position in the competition. 2010

### *Raffles Institution, Singapore*

- Trainer for the Singapore Junior Physics Olympiad 2010
- Coach for the Singapore Young Physicists' Tournament. All four teams eventually obtained the top  
positions in the competition, leading to subsequent employment in a similar job as the coach for  
the national team. 2009–2010

## **Planetary Exploration Mission Experience**

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- Mars Science Laboratory / Curiosity* 2021–  
Science team collaborator
- Mars Atmosphere and Volatile Evolution (MAVEN)* 2014–  
Science team member
- RASC-AL Exploration Robo-Ops (Team Second)* 2012
- Project Manager in a team for a competition organized by the US National Institute of Aerospace for  
graduate and undergraduate students to design and build a remotely controlled planetary rover that  
can perform a series of competitive tasks.
- Caltech Space Challenge (Team First)* 2011
- Science instrumentation team member for a competition involving graduate and undergraduate  
students from various universities internationally to design a manned sample return mission from a  
Near Earth Asteroid.
- Xichang Astronautics Winter Camp* 2006
- A week of activities for high school students that provided an introduction to the Chinese space  
program

## **Academic Service**

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### *Journal Peer Reviews*

- 2023: Nature Astronomy (1), Journal for Geophysical Research (1)
- 2022: Geophysical Research Letters (1)

2021: Journal for Geophysical Research (2)

2019: Journal for Geophysical Research (1)

*ICPAE webinar series*

2022

Member of 3-person team for organizing monthly webinars showcasing research on planetary and exoplanetary atmospheres from scientists across the world

*NASA Review Panel*

Executive secretary (2019)

*Mars Students Lunch at Lunar and Planetary Science Conference*

2017–2019

Sole organizer for social lunch event bringing together students studying Mars from across the world attending the Lunar and Planetary Science Conference

*The University of Arizona Lunar and Planetary Laboratory Career Development Seminars Committee*

2015–2018

Organized seminars involving people inside and outside the department to furnish students with career-relevant skills and expose them to non-traditional career paths

*The University of Arizona Lunar and Planetary Laboratory Curriculum Development Committee*

2015–2018

Concurrent role in Career Development Seminars Committee revealed the importance and interest in formal training in career-relevant skills

Motivated and helped inform the design for PTYS 595B (Career Development) courses

## **Science Outreach**

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*Cassini Scientist for a Day (Singapore Edition)*

2013

US Coordinator

*Students for the Exploration and Development of Space (SEDS)*

2010-2013

President (2012–2013) for the Caltech chapter

## **Professional Affiliations**

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*American Geophysical Union; American Astronomical Society; International Commission on Planetary Atmospheres and Evolution*

## **Skills**

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*Scientific: hypothesis testing, physical modeling, big data analysis*

*Computer Languages: Python, MATLAB, IDL, Java, Fortran, C++, JavaScript, HTML, CSS, LaTeX, SQL*

*Software: Adobe Illustrator, Adobe Photoshop, Adobe Lightroom, Adobe InDesign, Adobe Premiere Pro, Adobe Audition, Adobe DreamWeaver, Adobe Acrobat, Wolfram Mathematica, JMars, ArcGIS, ENVI, IGOR Pro, Github, Apache Subversion (SVN), SolidWorks, Avid Sibelius, Microsoft Office*