

Paul O. Hayne

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Summary My research focuses on the surfaces and atmospheres of icy planets and moons. I develop computational models, missions, and instrumentation to better understand these planetary bodies. Teaching, mentoring, and public engagement are also fundamental to my work.

Positions Held
University of Colorado, Boulder
Assistant Professor, January 2018 – present
Astrophysical & Planetary Sciences Department,
and Laboratory for Atmospheric & Space Physics

NASA – Jet Propulsion Laboratory, California Institute of Technology
Research Scientist, 2012 – 2017

California Institute of Technology
Postdoctoral Scholar, 2011 – 2012 (Advisor: Oded Aharonson)

Education
University of California, Los Angeles
Ph.D., Geophysics & Space Physics, 2010 (Advisor: David A. Paige)

Stanford University
M.S., Geophysics, 2005 (Advisors: Norman H. Sleep & Jack J. Lissauer)
B.S., Geophysics, 2003

Mission Involvement
Multi-Asteroid eXplorer (MAX) mission, United Arab Emirates Space Agency
Project Scientist (2021–present)

NASA Lunar Compact Infrared Imaging System (L-CIRiS)
Principal Investigator (2019–present), CLPS-19C lunar south polar mission

NASA Lunar-Vulkan Imaging and Spectroscopy Explorer mission (Lunar-VISE)
Co-Investigator and *Instrument Lead* (2019–present)
Lunar-VISE Compact Infrared Imaging System (LV-CIRiS)

NASA Janus
Co-Investigator and *Instrument Lead* (2019–present)
Thermal IR Camera

NASA Europa Clipper
Co-Investigator (2017–present) and *Investigation Scientist* (2015–2018)
Europa Thermal Emission Imaging System (E-THEMIS)

NASA Mars Reconnaissance Orbiter
Co-Investigator (2017–present)
Mars Climate Sounder

Mission Involvement (cont.)

NASA Lunar Flashlight
Co-Investigator (2012–present)

NASA Lunar Reconnaissance Orbiter
Co-Investigator (2011–present)
 Diviner Lunar Radiometer Experiment

Science Team Affiliate: NASA OSIRIS-REx (2018–2020),
NASA Dawn (2016–2019), and **NASA/ESA Cassini-Huygens** (2006–2014)

Visiting Appointments

Lawrence Livermore National Laboratory
Visiting Scientist (2017)
 Planetary Defense Program / Weapons and Complex Integration (WCI)

Weizmann Institute of Science, Israel
Visiting Scientist (2015, 2016)
 The Helen Kimmel Center for Planetary Science

Leadership & Service

CU Research & Innovation Office
RIO Faculty Fellow (2022–2023)

CU Outreach Grant
Faculty Award Co-Recipient, “Engaging Underserved Students with CU’s Cutting-edge Space Research” (2021–2022)

Keck Institute for Space Studies, California Institute of Technology
Study Co-Lead
 2017–2018: [Unlocking the Climate Record Stored within Mars’ Polar Layered Deposits](#)
 2013–2014: [New Approaches to Lunar Ice Detection and Mapping](#)

American Astronomical Society, Division for Planetary Sciences
Member of the Federal Relations Subcommittee (2017–present)
Local Organizing Committee, Annual Meeting (2016)
Panelist, Annual Meeting (2015)

American Geophysical Union
Session Organizer (Mars Atmosphere), Annual Meeting (2014–2022)

Early-Career Planetary Explorers
Formerly: Young Scientists for Planetary Exploration
Co-founder (2012) and *Co-leader* (2012–2020)
 World-wide advocacy organization for early-career planetary scientists

Ad Astra Academy
Co-founder and Co-leader, Ad Astra - Brazil (2015–present)
 Science and exploration program for school-aged students in developing countries

NASA Science Mission Directorate
Appointed Member, Mars Exploration Program:
 Ice and Climate Evolution Science Assessment Group (2018–2019)
Review Panel Member (2012–present)

Leadership
& Service
(cont.)

National Research Council – Space Studies Board
Raconteur, Planetary Science Decadal Survey (2009–2010)

Earth & Space Sciences Student Organization, UCLA
President (2007–2008)

Stanford Astronomical Society
President (2002–2004)

Referee for major scientific journals:

Journal of Geophysical Research, Geophysical Research Letters, Icarus, Astrophysical Journal, Planetary & Space Science, Advances in Space Research, Space Science Reviews, Geology, Science Advances, Nature Astronomy, Nature

Honors
& Awards

2022 *RIO Faculty Fellow*, CU Research & Innovation Office
2013 *NASA Group Achievement Award*, Diviner Lunar Radiometer science team
2011 *NASA Group Achievement Award*, Mars Climate Sounder science team
2010 *Best Student Paper Award*, NASA Lunar Science Forum
2010 *NASA Group Achievement Award*, Diviner Lunar Radiometer operations team
2010 *NASA Group Achievement Award*, Diviner Lunar Radiometer science team
2008 *Simon Latimer Award for Service*, UCLA
2006 *Graduate Fellowship*, Institute of Geophysics and Planetary Physics
2006 *Chancellor’s Prize*, UCLA
2003 *Graduate Fellowship*, Dept. of Geophysics, Stanford University
2001 *Summer Research Fellowship*, Dept. of Physics, Stanford University

Departmental
Service

Committee Membership (APS Department):

2022/2023 Chair: Graduate Admissions Committee
2022/2023 APS Friday Lunch Seminar Committee
2022/2023 Outreach & Development Committee
2021/2022 Graduate Admissions Committee
2021/2022 Outreach & Development Committee
2020/2021 Fall Semester/COVID Planning Committee
2020/2021 Grad Welcome and Social Committee
2019/2020 Social Committee (Chair)
2019/2020 Colloquium Committee
2019/2020 Undergraduate Curriculum and Concerns Comm.
2019/2020 Graduate Admissions Committee
2018/2019 Social Committee (Acting Chair)
2018/2019 Colloquium Committee

Undergraduate Mentoring:

2018–present APS Department Undergraduate Student Mentor
2018–present APS Department Graduate Student Mentor

Additional Service:

2018-2019 Co-organizer: “Planet Lunch” CU Boulder
2018-2020 Organizer: Natural Sciences New Faculty Coffee CU Boulder

Exam
Committees
&
Defenses

Graduate Comprehensive Examinations:

2022	Harry Brodsky	CU / GEOL	
2022	Patrick Behr	CU / APS	
2022	Dahlia Baker	CU / AES	
2021	Kya Sorli*	CU / APS	*Primary Advisor
2020	E. Fernando Cruz	CU / APS	Non-advocate Chair
2020	Rachel Hoover	CU / GEOL	
2019	Eryn Cangi	CU / APS	
2019	Noora Alsaeed	CU / APS	Non-advocate Chair
2019	Raven Larson*	CU / APS	*Primary Advisor
2019	Andrew Wilcoski*	CU / APS	*Primary Advisor
2019	Perianne Johnson	CU / APS	Non-advocate Chair
2019	William Waalkes	CU / APS	
2018	Momchil Molnar	CU / APS	
2018	Arika Egan	CU / APS	

Ph.D. Dissertation Defenses:

2022	Dr. Noora Alsaeed*	CU / APS	*Primary Advisor
2022	Dr. Andrew Wilcoski*	CU / APS	*Primary Advisor
2022	Dr. Chase Chivers	Georgia Tech / EAS	
2022	Dr. Christopher Kremer	Brown U. / DEEPS	
2019	Dr. Marek Slipski	CU / APS	

Undergraduate Honors Thesis Defenses:

2019	Carlos Eytan Gary Bicas*	CU / APS	*Primary Advisor
2018	Amanda Alexander	CU / GEOL	

Teaching

University of Colorado Boulder

ASTR 1030: Accel. Introductory Astronomy (Fall, 2018)

Professor for undergraduate majors course (115 students)

ASTR 3400: Research Methods (Spring, 2023)

Professor for undergraduate majors course (30 students)

ASTR 3720: Planets and their Atmospheres (Spring, 2018)

Professor for upper-division undergraduate course (84 students)

ASTR 3750: Planets, Moons, and Rings (Fall, 2020; Fall, 2021; Fall, 2022)

Professor for undergraduate majors course (~100 students)

ASTR 5800: Planetary Surfaces & Interiors (Fall, 2019; Fall, 2021)

Professor for graduate course (~15 students)

ASTR 5835: Seminar in Planetary Science (Spring, 2023)

Co-Instructor for graduate seminar (~25 students)

California Institute of Technology

Ge 151: Planetary Surfaces (2011)

Co-Instructor & Guest Lecturer for graduate course (~6 students)

University of California, Los Angeles

ESS 10: Exploring Mars (2008)

Teaching Assistant and Guest Lecturer for undergraduate course (60 students)

Teaching
(cont.)

Stanford University

Geophysics 150: Physics of the Earth (2004, 2005)
Teaching Assistant for graduate course (~6 students)
Physics 50: Observational Astronomy (2002, 2003)
Teaching Assistant for undergraduate course (~20 students)

Mentoring

Laboratory for Atmospheric and Space Physics

Postdocs

2022–present: Dr. Patrick O’Brien
2019–2020: Dr. Margaret Landis (now: LASP Research Scientist)

Graduate Students

2022–present: Robert Stevens (APS Dept., U. Colorado)
2020–present: Kya Sorli (APS Dept., U. Colorado)
2020–2022: Noora Alsaeed, *Ph.D.* — *Dec. ‘22* (APS Dept., U. Colorado)
2018–2022: Andrew Wilcoski, *Ph.D.* — *Dec. ‘22* (APS Dept., U. Colorado)
2019–2020: Raven Larson, *M.S.* — *May ‘20* (APS Dept., U. Colorado)

Undergraduate Students

2022–present: Isabella Wise (APS Dept., CU Boulder)
2022–present: Sam Aberbook (Physics Dept., CU Boulder)
2018–2021: Tara Tomlinson (CU Boulder, B.S. → Dartmouth College, Ph.D.)
2019–2020: Shaelyn Raposa (CU Boulder, B.S. → N. Ariz. U., Ph.D.)
2018–2019: Carlos Eytan Gary Bicas (CU Boulder, B.S. → Stony Brook U., Ph.D.)
2018–2019: Tyler Horvath (CU Boulder, B.S. → UCLA, Ph.D.)

Caltech Summer Undergraduate Research Fellows (SURF)

2017: James Haber (Cornell University, B.S. → Purdue U., Ph.D.)
2015: Léa Bonnefoy (Cornell University, B.S. → U. Arizona, Ph.D.)
2014: Clifford Watkins (Carleton College, B.S. → U. Hawaii, Ph.D.)
2011: Michael Lauria (Caltech, B.S.)

Maximizing Student Potential (MSP)

2015–2018: José Martínez Camacho (Citrus College → SMU, Ph.D.)

Caltech Postdoctoral Fellows at JPL

2017–2018: Dr. Quentin Vinckier (now: JPL Technologist)
2016–2018: Dr. Catherine M. Elder (now: JPL Scientist)

Selected
External
Grants
&
Contracts

2022–2027 *Lunar Vulkan Imaging and Spectroscopy Explorer (Lunar-VISE)*
PI: K. Donaldson Hanna (Co-I/Instrument Lead: P. Hayne)
NASA Payloads and Research Investigations on the Surface of the Moon (PRISM)
\$35M (\$2.2M for P. Hayne)

2019–2024 *Lunar Compact Infrared Imaging System (L-CIRiS)*
PI: P. Hayne
NASA Lunar Science and Instrument Technology Payloads / \$3.5M

2019–2026 *Janus Mission*
PI: D. Scheeres (Co-I/Instrument Lead: P. Hayne)
NASA SIMPLEx Program / ~ \$300k for P. Hayne

2015–2026 *Europa Thermal Emission Imaging System*
PI: P. Christensen (Co-I: P. Hayne)
NASA Europa Clipper Mission / ~\$200k allocation for P. Hayne

External
Grants (cont.)

- 2016–2024 *Lunar Reconnaissance Orbiter Extended Missions 3–5*
 PI: D. Paige (Co-I: P. Hayne)
 NASA Discovery Program / ~\$2M allocation for P. Hayne
- 2016–2024 *Mars Reconnaissance Orbiter Extended Missions 4–6*
 PI: J. T. Schofield (Co-I: P. Hayne)
 NASA Mars Program / ~\$1.5M allocation for P. Hayne
- 2013–2023 *Lunar Flashlight Science Investigation*
 PI: B. Cohen (Co-I: P. Hayne)
 PI: P. Hayne (Science PI: C. Elder)
 NASA Advanced Exploration Systems / ~\$900k allocation for P. Hayne
- 2018–2021 *Boulders on Bennu: Modeling Thermal Emission from Boulders for Yarkovsky Effect and Thermal Inertia Investigations*
 NASA OSIRIS-REx Participating Scientist Program / \$346k
- 2017–2018 *Unlocking the Climate Record Stored within Mars’ Polar Layered Deposits*
 PI: P. Hayne
 W. M. Keck Institute for Space Studies / \$50k
- 2015–2018 *Inter-seasonal and Inter-annual Surface Dust Fluxes on Mars*
 PI: P. Hayne (Science PI: S. Piqueux)
 NASA Mars Data Analysis Program / \$331k
- 2013–2017 *Volatile Regolith Thermal Investigation Consortium for Exploration and Science (VORTICES)*
 PI: A. Rivkin (Co-I: P. Hayne)
 NASA Solar System Exploration Research Virtual Institute / ~\$120k
- 2014–2016 *Thermal Infrared Observations of the Moon during Lunar Eclipse*
 PI: P. Lucey (Co-I: P. Hayne)
 NASA Planetary Astronomy / \$143k allocation for P. Hayne
- 2013–2014 *New Approaches to Lunar Ice Detection and Mapping*
 PI: P. Hayne
 W. M. Keck Institute for Space Studies / \$50k

Invited
Lectures

- 2021 Purdue University
 2020 Planetary Science Decadal Survey
 2020 Observatoire de la Côte d’Azur
 2020 NASA Lunar Surface Science Workshop
 2019 University of California, Los Angeles
 2018 Applied Physics Laboratory, Johns Hopkins University
 2017 Lawrence Livermore National Laboratory
 2017 University of Colorado, Boulder
 2016 Lunar & Planetary Institute
 2016 Weizmann Institute of Science (Israel)
 2015 International Space Exploration Coordination Group,
 2015 NASA Exploration Science Forum
 2015 University of California - Santa Cruz
 2014 SETI Institute
 2013 Lunar & Planetary Institute
 2012 California Institute of Technology
 2012 NASA – Jet Propulsion Laboratory

Professional Affiliations American Astronomical Society - Division for Planetary Sciences
American Geophysical Union
European Geosciences Union
Asia Oceania Geosciences Society

Skills & Training **Remote sensing & spacecraft instrumentation,
Modeling and numerical simulation**

Computer programming languages

Proficient/expert: C/C++, Python, MATLAB, IDL

Familiar: Fortran 90/95, shell scripting, etc.

Mission formulation experience

Team-X, NASA Jet Propulsion Laboratory

Team-A, NASA Jet Propulsion Laboratory

Capture Lead Training, NASA Jet Propulsion Laboratory

Co-I and Deputy PI on mission proposals to NASA's *Discovery* and *New Frontiers* programs

PI on multiple instrument proposals to NASA mission programs

Additional training

NASA Astrobiology Winter School and Field Course (2011)

International Astrobiology Summer School (2008)

PADI Open Water Diver scuba certification (50+ dives)

Eagle Scout (1998), BSA Troop 676, Issaquah, WA

Publications: Refereed Journal Articles

Number of peer-reviewed publications: 73 (as of December, 2022)

First-author: 10 / Student first-author: 11 / Postdoc first-author: 6

h-index: 28 (ADS), 30 (Google Scholar)

Total citations: 2,491 (ADS), 3,876 (Google Scholar)

(*) indicates (U,G) student or (P) postdoc supervised or co-supervised by Hayne

2022

1. *(G) **Alsaeed, N. R.** & **Hayne, P. O.** (2022), Transport of water into the polar regions of Mars through scavenging by CO₂ snowfall, *J. Geophys. Res.*, e2022JE007386. doi: [10.1029/2022JE007386](https://doi.org/10.1029/2022JE007386)
2. Bapst, J., Piqueux, S., Edwards, C. S., Wolfe, C., **Hayne, P. O.**, Kass, D. M., & Kleinböhl, A. (2022), Surface dust redistribution on Mars from interannual differences in temperature and albedo, *J. Geophys. Res.*, e2022JE007365. doi: [10.1029/2022JE007365](https://doi.org/10.1029/2022JE007365)
3. Magaña, L. O., Retherford, K. D., Byron, B. D., Hendrix, A. R., Grava, C., Mandt, K. E., Raut, U., Czajka, E., **Hayne, P. O.**, Hurley, D. M., Gladstone, G. R., Poston, M. J., Greathouse, T. K., Pryor, W., Cahill, J. T., & Stickle, A. (2022), LRO-LAMP survey of lunar south pole cold traps: implication for the presence of condensed H₂O, *J. Geophys. Res.*, e2022JE007301. doi: [10.1029/2022JE007301](https://doi.org/10.1029/2022JE007301)
4. *(U) **Horvath, T.**, **Hayne, P. O.**, & Paige, D. A. (2022), Thermal and illumination environments of lunar pits and caves: models and observations from the Diviner Lunar Radiometer Experiment, *Geophys. Res. Lett.*, e2022GL099710. doi: [10.1029/2022GL099710](https://doi.org/10.1029/2022GL099710)

2022

(cont.)

5. *(U) Tomlinson, T. C. & Hayne, P. O. (2022), Composition and possible origins of dark crater ejecta on Europa, *Icarus*, 115037. doi: [10.1016/j.icarus.2022.115037](https://doi.org/10.1016/j.icarus.2022.115037)
6. *(U) Innanen, A. C., Landis, M. E., Hayne, P. O., & Moores, J. E. (2022), Possible atmospheric water vapor contribution from Martian Swiss cheese terrain, *Planet. Sci. J.*, 3. doi: [10.3847/PSJ/ac979e](https://doi.org/10.3847/PSJ/ac979e)
7. *(G) Wilcoski, A. X. & Hayne, P. O., & Landis, M. E. (2022), Polar ice accumulation from volcanically induced transient atmospheres on the Moon, *The Planetary Science Journal*, 3(5), 99. doi: [10.3847/PSJ/ac649c](https://doi.org/10.3847/PSJ/ac649c)
8. Williams, J. P., Pathare, A. V., Costello, E. S., Gallinger, C. L., Hayne, P. O., et al. (2022), The effects of terrain properties upon the small crater population distribution at Giordano Bruno: implications for lunar chronology, *Journal of Geophysical Research*, e2021JE007131. doi: [10.1029/2021JE007131](https://doi.org/10.1029/2021JE007131)
9. *(P) Landis, M. E., Hayne, P. O., Williams, J. P., Greenhagen, B. T., & Paige, D. A. (2022), Spatial distribution and thermal diversity of surface volatile cold traps at the lunar poles, *The Planetary Science Journal* 3 (2), 39. doi: [10.3847/PSJ/ac4585](https://doi.org/10.3847/PSJ/ac4585)
10. *(P) Landis, M. E., Castillo-Rogez, J. C., Hayne, P. O., et al. (2022), The case for a Themis asteroid family spacecraft mission, *Planetary and Space Science* 212, 105413. doi: [10.1016/j.pss.2021.105413](https://doi.org/10.1016/j.pss.2021.105413)
11. Williams, J. P., Greenhagen, B. T., ..., Hayne, P. O., & Sullivan, M. T. (2022), Temperatures of the Lacus Mortis region of the Moon, *Earth and Space Science*, 9(2). doi: [10.1029/2021EA001966](https://doi.org/10.1029/2021EA001966)
12. Byron, B. D., Elder, C. M., Williams, J-P., Ghent, R. R., Gallinger, C. L., Hayne, P. O., & Paige, D. A. (2022), Thermophysical properties of lunar irregular mare patches from LRO Diviner Radiometer data, *J. Geophys. Res.*, e2022JE007214. doi: [10.1029/2022JE007214](https://doi.org/10.1029/2022JE007214)
13. Lucey, P. G., Petro, N., ..., Hayne, P. O., et al. (2022), Volatile interactions with the lunar surface, *Geochemistry*, 125858. doi: [10.1016/j.chemer.2021.125858](https://doi.org/10.1016/j.chemer.2021.125858)

2021

14. *(G) Burnett, E. R. & Hayne, P. O. (2021), Europa's hemispheric color dichotomy as a constraint on non-synchronous rotation, *Icarus*, 364. doi: [10.1016/j.icarus.2021.114438](https://doi.org/10.1016/j.icarus.2021.114438)
15. Hayne, P. O., Aharonson, O., & Schörghofer, N. (2021), Micro cold traps on the Moon, *Nature Astron.*, 1-7. doi: [10.1038/s41550-020-1198-9](https://doi.org/10.1038/s41550-020-1198-9)
16. Lucey, P. G., Hayne, P. O., Costello, E. S., Green, R., Hibbitts, C. A., Goldberg, A., ... & Honniball, C. (2021), The spectral radiance of indirectly illuminated surfaces in regions of permanent shadow on the Moon, *Acta Astronautica*, 180, 25-34. doi: [10.1016/j.actaastro.2020.11.032](https://doi.org/10.1016/j.actaastro.2020.11.032)
17. Wu, Y., ..., & Hayne, P. O. (2021), Chang'E-4 rover spectra revealing micro-scale surface thermophysical properties of the Moon, *Geophys. Res. Lett.*, 48, 4. e2020GL089226.
18. Ahrens, C. J., Paige, D. A., Eubanks, T. M., Blase, W. P., Mesick, K. E., Zimmerman, W., Petro, N., Hayne, P. O., & Price, S. (2021), Small penetrator instrument concept for the advancement of lunar surface science, *Planet. Sci. J.*, 2(1), p. 38.
19. Avdellidou, C., Munaibari, E., *(G) Larson, R., ... Hayne, P. O., et al. (2021), Impacts on the Moon: analysis methods and size distribution of impactors, *Planet. & Space Sci.*, 200.

2020

20. *(G) Wilcoski, A. X. & Hayne, P. O. (2020), Surface roughness evolution and implications for the age of the North Polar Residual Cap of Mars, *J. Geophys. Res.*, 125(12), e2020JE006570.
21. *(U) Gary-Bicas, C. E., Hayne, P. O., *(U) Horvath, T., Heavens, N. G., Kass, D. M., Kleinböhl, A., Piqueux, S., Shirley, J., & McCleese, D. J. (2020), Asymmetries in snowfall, emissivity and albedo of Mars' seasonal polar caps: Mars Climate Sounder observations. *J. Geophys. Res.*, 125(5), e2019JE006150.
22. Feng, J., Siegler, M. A., & Hayne, P. O. (2020), New constraints on thermal and dielectric properties of lunar regolith from LRO Diviner and CE-2 Microwave Radiometer, *J. Geophys. Res.*, 125(1), e2019JE006130.
23. Siegler, M. A., Feng, J., Lucey, P. G., Ghent, R. R., Hayne, P. O., & White, M. N. (2020), Lunar titanium and frequency dependent microwave loss tangent as constrained by the Chang'E-2 MRM and LRO Diviner Lunar Radiometers, *J. Geophys. Res.*, e2020JE006405.
24. Cohen, B. A., Hayne, P. O., Greenhagen, B., Paige, D. A., Seybold, C., & Baker, J. (2020), Lunar Flashlight: illuminating the lunar south pole, *IEEE Aerospace and Electronic Systems*, 35(3), 46-52.
25. Smith, I. B., Hayne, P. O., Byrne, S., Becerra, P., Kahre, M., Calvin, W., ... & Horgan, B. (2020), The Holy Grail: A road map for unlocking the climate record stored within Mars' polar layered deposits, *Planet. Space Sci.*, 184, 104841.
26. Lyra, W., ... Hayne, P. O., & Marlow, J. (2020), Ad Astra Academy: Using Space Exploration to Promote Student Learning and Motivation in the City of God, Rio De Janeiro, Brazil, *Comm. Astron. with the Public*, 27, 5-13.

2019

27. Buhler, P. B., Ingersoll, A. P., Piqueux, S., Ehlmann, B. E., Hayne, P. O. (2019), Coevolution of Mars's atmosphere and massive south polar CO₂ ice deposit. *Nature Astron.*, 4(4), 364-371. doi: [10.1038/s41550-019-0976-8](https://doi.org/10.1038/s41550-019-0976-8)
28. *(P) Hofgartner, J. D., Buratti, B. J., Hayne, P. O., Young, L. A. (2019), Ongoing resurfacing of KBO Eris by volatile transport in local, collisional, sublimation atmosphere regime. *Icarus*, 334, 52-61. doi: [10.1016/j.icarus.2018.10.028](https://doi.org/10.1016/j.icarus.2018.10.028)
29. Piqueux, S., ..., Hayne, P. O. (2019), Widespread shallow water ice on Mars at high latitudes and midlatitudes. *Geophys. Res. Lett.*, 46, 14,290-14,298. doi: [10.1029/2019GL083947](https://doi.org/10.1029/2019GL083947)
30. Farrell, W. M., Hurley, D. M., Poston, M. J., Hayne, P. O., Szalay, J. R., & McLain, J. L. (2019), The young age of the LAMP-observed frost in lunar polar cold traps. *Geophys. Res. Lett.*, in press. doi: [10.1029/2019GL083158](https://doi.org/10.1029/2019GL083158)
31. Sefton-Nash, E., Williams, J. P., Greenhagen, B. T., Warren, T. J., Bandfield, J. L., Aye, K. M., Leader, F., Siegler, M. A., Hayne, P. O., & Paige, D. A. (2019), Evidence for ultra-cold traps and surface water ice in the lunar south polar crater Amundsen. *Icarus*, 332, 1-13. doi: [10.1016/j.icarus.2019.06.002](https://doi.org/10.1016/j.icarus.2019.06.002)
32. Hendrix, A. R., Hurley, D. M., Farrell, W. M., Greenhagen, B. T., Hayne, P. O., Retherford, K. D., ... & Liu, Y. (2019), Diurnally migrating lunar water: evidence from ultraviolet data, *Geophys. Res. Lett.*, 46(5), 2417-2424. doi: [10.1029/2018GL081821](https://doi.org/10.1029/2018GL081821)

2019

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33. Jordan, A. P., Stubbs, T. J., Shusterman, M. L., Izenberg, N. R., Wilson, J. K., **Hayne, P. O.**, ... & Spence, H. E. (2019), How dielectric breakdown may contribute to the global weathering of regolith on the moon, *Icarus*, *319*, 785-794. doi: [10.1016/j.icarus.2018.10.025](https://doi.org/10.1016/j.icarus.2018.10.025)
34. Bapst, J., Byrne, S., Bandfield, J. L., & **Hayne, P. O.** (2019), Thermophysical properties of the north polar residual cap using MGS TES, *J. Geophys. Res.*, in press. doi: [10.1029/2018JE005786](https://doi.org/10.1029/2018JE005786)
35. *(P) **Vinckier, Q.**, Hardy, L., Gibson, M., Smith, C., Putman, P., **Hayne, P. O.**, & Sellar, R. G. (2019), Design and characterization of the multi-band SWIR receiver for the Lunar Flashlight CubeSat Mission, *Remote Sensing*, *11*(4), 440. doi: [10.3390/rs11040440](https://doi.org/10.3390/rs11040440)
36. Landis, M. E., Byrne, S., Combe, J. P., Marchi, S., Castillo-Rogez, J., Sizemore, H. G., Schörghofer, N., Prettyman, T. H., **Hayne, P. O.**, Raymond, C. A., & Russell, C. T. (2019), Water vapor contribution to Ceres' exosphere from observed surface ice and postulated ice-exposing impacts, *J. Geophys. Res.*, *124*(1), 61-75.

2018

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