

Dr. Edward M. Molter

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Postdoctoral Scholar, Earth and Planetary Science Department, UC Berkeley
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EDUCATION

Ph.D. Astrophysics, University of California, Berkeley **August 2022**
Thesis: “Cloud Formation and Circulation in Planetary Tropospheres from Remote-Sensing Data”
Advisers: Dr. William Collins, Dr. Imke de Pater

M.A. Astrophysics, University of California, Berkeley **December 2018**

B.A. Physics, Summa Cum Laude, Macalester College **May 2015**
Thesis: “Constraining the Properties of the Metal-Poor ISM with Interferometric CO Observations of Low Metallicity Dwarf Galaxies”
Adviser: Dr. John Cannon

RESEARCH INTERESTS

Planetary atmospheres; planetary rings; radiative transfer; atmospheric dynamics; extreme weather; climate change; photochemistry; interferometry

RESEARCH POSITIONS

CIPS Postdoctoral Fellow, Dept. of Earth and Planetary Science, UC Berkeley **Sep 2022 - present**

Graduate Student Researcher, Lawrence Berkeley National Lab **Aug 2019 - Aug 2022**
Adviser: Dr. William Collins

Graduate Student Researcher, UC Berkeley **Jan 2017 - Aug 2019**
Adviser: Dr. Imke de Pater

Visiting Scholar, Keck Observatory **Summer 2017**
Adviser: Dr. Carlos Alvarez

Research Assistant, NASA Goddard Space Flight Center **Aug 2015 - July 2016**
Adviser: Dr. Conor Nixon

Undergraduate Research Assistant, Macalester College **Sep 2014 - May 2015**
Adviser: Dr. John Cannon

NSF REU Research Student, US Geological Survey/Northern Arizona U. **Summer 2014**
Adviser: Dr. Colin Dundas

Visiting Research Student, Université Libre de Bruxelles **Fall 2013**
Adviser: Dr. Nicolas Chamel

Undergraduate Research Assistant, Macalester College **Summer 2013**
Adviser: Dr. John Cannon

REFERREED JOURNAL ARTICLES

**Student Advised* <https://orcid.org/0000-0003-3799-9033>

18. Zhang, L., Risser, M., **Molter, E. M.**, Wehner, M. F., O’Brien, T. A., “Removing the influence of daily weather systems on detected changes in precipitation extremes”, *Weather & Climate Extremes*, in prep

17. * Chavez, E., Redwing, E., de Pater, I., **Molter, E. M.**, Tollefson, J., Wong, M. H., Alvarez, C., Campbell, R., de Kleer, K., Hueso, R., “Long-Term Near-Infrared Observations of Neptunes Atmosphere”, in review

16. **Molter, E. M.**, Collins, W. D., Risser, M. D., “Quantitative Precipitation Estimation of Extremes in CONUS with Radar Data”, *Geophysical Research Letters*, accepted (2021) <https://doi.org/10.1029/2021GL094697>

15. Villanueva, G., Cordiner, M., Irwin, P., de Pater, I., Butler, B., Gurwell, M., Milam, S., Nixon, C., Luszcz-Cook, S., Wilson, C., Kofman, V., Liuzzi, G., Faggi, S., Fauchez, T., Lippi, M., Cosentino, R., Thelen, A., Moullet, A., Hartogh, P., **Molter, E.**, Charnley, S., Arney, G., Mandell, A., Biver, N., Vandaale, A., de Kleer, K., Kopparapu, R., “No evidence of phosphine in the atmosphere of Venus from independent analyses”, *Nature Astronomy* 5, 631-635 (2021) <https://doi.org/10.1038/s41550-021-01422-z>
14. * Zorzi, A., **Molter, E. M.**, de Pater, I., Luszcz-Cook, S. H., Tollefson, J., Wong, M. H., “Evolution of Neptune’s Troposphere in 1994-2018 based on HST Observations”, *Astronomy & Astrophysics*, in review
13. Tollefson, J., de Pater, I., **Molter, E. M.**, Sault, R. J., Butler, B. J., Luszcz-Cook, S., DeBoer, D., “Neptune’s Spatial Brightness Temperature Variations from the VLA and ALMA”, *Planetary Science Journal* 2, 3 (2021) <https://doi.org/10.3847/PSJ/abf837>
12. **Molter, E. M.**, de Pater, I., Luszcz-Cook, S., Tollefson, J., Sault, R. J., Butler, B., de Boer, D., “Tropospheric Composition and Circulation of Uranus with ALMA and the VLA”, *Planetary Science Journal*, 2, 1 (2021) <https://doi.org/10.3847/PSJ/abc48a>
11. Nixon, C. A., Thelen, A. E., Cordiner, M. A., Kisiel, Z., Charnley, S. B., **Molter, E. M.**, Serigano, J., Irwin, P. G. J., Teanby, N., Kuan, Y., “Detection of Cyclopropenylidene on Titan with ALMA”, *Astronomical Journal*, 160, 5 (2020) <https://doi.org/10.3847/1538-3881/abb679>
10. **Molter, E. M.**, de Pater, I., Roman, M. T., Fletcher, L. N., “Thermal Emission from the Uranian Ring System”, *Astronomical Journal*, 158, 47 (2019) <https://doi.org/10.3847/1538-3881/ab258c>
9. de Kleer, K., de Pater, I., **Molter, E. M.**, Banks, E., Davies, A. G., Alvarez, C., Campbell, R., Aycock, J., Pelletier, J., Stickel, T., Kacprzak, G. G., Nielsen, N. M., Stern, D., Tollefson, J., “Io’s Volcanic Activity from Time Domain Adaptive Optics Observations: 2013-2018”, *Astronomical Journal*, 158, 29 (2019) <https://doi.org/10.3847/1538-3881/ab2380>
8. **Molter, E. M.**, de Pater, I., Luszcz-Cook, S., Hueso, R., Tollefson, J., Alvarez, C., Sánchez-Lavega, A., Wong, M. H., Hsu, A. I., Sromovsky, L. A., Fry, P. M., Delcroix, M., Campbell, R., de Kleer, K., Gates, E., Lynam, P. D., et al., “Analysis of Neptune’s 2017 Bright Equatorial Storm”, *Icarus*, 321, 324 (2019) <https://doi.org/10.1016/j.icarus.2018.11.018>
7. Thelen, A. E., Nixon, C. A., Chanover, N. J., Cordiner, M. A., **Molter, E. M.**, Teanby, N. A., Irwin, P. G. J., Serigano, J., Charnley, S. B., “Abundance Measurements of Titan’s Stratospheric HCN, HC₃N, C₃H₄, and CH₃CN from ALMA observations”, *Icarus*, 319, 417 (2019) <https://doi.org/10.1016/j.icarus.2018.09.023>
6. Cordiner, M. A., Nixon, C. A., Charnley, S. B., Teanby, N. A., **Molter, E. M.**, Kisiel, Z., Vuitton, V., “Interferometric Imaging of Titan’s HC₃N, H¹³CCCN, and HCCC¹⁵N”, *Astrophysical Journal Letters*, 859, L15 (2018) <https://doi.org/10.3847/2041-8213/aac38d>
5. Thelen, A. E., Nixon, C. A., Chanover, N. J., **Molter, E. M.**, Cordiner, M. A., Achterberg, R. K., Serigano, J., Irwin, P. G. J., Teanby, N., Charnley, S. B., “Spatial variations in Titan’s atmospheric temperature: ALMA and Cassini comparisons from 2012 to 2015”, *Icarus*, 307, 380 (2018) <https://doi.org/10.1016/j.icarus.2017.10.042>
4. Lai, J. C.-Y., Cordiner, M. A., Nixon, C. A., Achterberg, R. K., **Molter, E. M.**, Teanby, N. A., Palmer, M. Y., Charnley, S. B., Lindberg, J. E., Kisiel, Z., Mumma, M. J., Irwin, P. G. J., “Mapping Vinyl Cyanide and Other Nitriles in Titan’s Atmosphere Using ALMA”, *Astronomical Journal*, 154, 206 (2017) <https://doi.org/10.3847/1538-3881/aa8eef>
3. **Molter, E. M.**, Nixon, C. A., Cordiner, M. A., Serigano, J., Irwin, P. G. J., Teanby, N. A., Charnley, S. B., Lindberg, J. E., “ALMA Observations of HCN and its Isotopologues on Titan”, *Astronomical Journal*, 152, 2 (2016) <https://doi.org/10.3847/0004-6256/152/2/42>
2. Warren, S. R., **Molter, E. M.**, Cannon, J. M., Bolatto, A. D., Adams, E. A. K., Bernstein-Cooper, E. Z., Giovanelli, R., Haynes, M. P., Herrera-Camus, R., Jameson, K., McQuinn, K. B. W., Rhode, K.

L., Salzer, J. J., Skillman, E. D., “CARMA CO Observations of Three Extremely Metal-Poor, Star-Forming Galaxies”, *Astrophysical Journal*, 814, 30 (2015) <https://doi.org/10.1088/0004-637X/814/1/30>

1. Chamel, N., **Molter, E.**, Fantina, A. F., Arteaga, D. P., “Maximum strength of the magnetic field in the core of the most massive white dwarfs,” *Physical Review Letters D*, 90, 043002 (2014) <https://doi.org/10.1103/PhysRevD.90.043002>

TELESCOPE TIME AWARDED

Atacama Large (sub-)Millimeter Array (ALMA)

2. Primary Investigator, *Thermal Properties of the Uranian Rings*, 8.5 hours
1. Primary Investigator, *Opacity Variability in Uranus’s Troposphere*, 3.7 hours
Funding awarded (\$17,500) via NRAO Student Observing Support Award

James Webb Space Telescope (JWST)

1. co-Investigator, *ERS observations of the Jovian System as a demonstration of JWST’s capabilities for Solar System science*, Instruments: Multiple; PIs: T. Fouchet and I. de Pater, 28.9 hours

W. M. Keck Observatory

3. co-Investigator, *The Twilight Zone: Cadenced Twilight Observations of Solar System Bodies*, long-term program. Instruments: NIRC2, Osiris; PIs: I. de Pater, K. de Kleer, A. Davies, 2018-present. >80 activations, 0.5 hours each
2. co-Investigator, *Spatial Distribution of H₂S on Neptune and Uranus*, Instrument: OSIRIS; PI: I. de Pater, 1.0 nights
1. co-Investigator, *Uranus from Equinox to Mid-Spring: Tropospheric Temperatures, Seasonal Changes, and Emerging Rings*, Instrument: Subaru COMICS; PI: J. Sinclair, 1.0 nights

Very Large Array (VLA)

1. co-Investigator, *Seasonal Variations in the Microwave Emission of Uranus*, PI: Alex Akins, 18.0 hours

Very Large Telescope (VLT)

2. co-Investigator, *Uranus from Equinox to Mid-Spring: Temperature Structure, Photochemistry, Seasonal Changes, and Emerging Rings*, Instrument: VISIR; PI: M. Roman, 14.5 hours
1. co-Investigator, *Resolve Loki Patera on Jupiter’s Satellite Io with Matisse*, Instrument: MATISSE; PI: I. de Pater, 3 hours

Paranal Observatory

1. co-Investigator, *Preparatory observations for GTO program on Matisse of Io’s Loki Patera*, Instrument: NACO; PI: I. de Pater, XX activations, 0.5 hours each

Lick Observatory

1. Primary & co-Investigator, *Origin & Evolution of Storms, Clouds, and Hazes on Uranus and Neptune*, long-term program. Instrument: ShARCS; PIs: E. Molter, J. Tollefson, E. Redwing. >80 activations, 1 hour each

TEACHING, OUTREACH, & MENTORSHIP

Mentor , Berkeley Undergraduate Research Apprentice Program	Spring 2022
Volunteer Organizer , Berkeley Climate & Impacts Research Hub	Fall 2020 - Present
Graduate Student Instructor , UC Berkeley	
C162 Planetary Astrophysics	Fall 2018
C12 The Planets	Spring 2017
C10 Introduction to General Astronomy	Fall 2016
Volunteer Panelist , Branson School Science Symposium	2018, 2019
Volunteer Instructor , Splash @ Berkeley	2018
Peer Mentor , Berkeley Astronomy Dept.	Fall 2018 - Present
Orientation Leader , Macalester College Dept of Student Affairs	Fall 2012
Program Staff (full-time) , Camp Becket/Chimney Corners YMCA, Becket, MA	Summer 2012

PROFESSIONAL DEVELOPMENT	Graduate Climate Conference (GCC) , Virtual	October 2021
	Unlearning Racism in the Geosciences (URGE) Berkeley Chapter, Virtual	Fall 2020
	JPL Center for Climate Sciences Summer School , Virtual	August 2020
	Physics in Machine Learning Workshop , Berkeley, California	May 2019
	Very Large Array (VLA) Synthesis Imaging Workshop , Socorro, New Mexico	May 2018
	Very Large Array (VLA) Data Reduction Workshop , Socorro, New Mexico	October 2017
	JWST Early Release Science Proposal Writing Workshop , Leiden, Netherlands	May 2017
	Titan Aeronomy and Climate Workshop , Reims, France	June 2016
	Combined Array for Research in Millimeter Astronomy (CARMA) Summer School , Big Pine, CA	August 2014
	Undergraduate ALFALFA Team Workshop , Arecibo, Puerto Rico	January 2014

CONFERENCE PRESENTATIONS

14. “A Storm-Resolving Data Set for Analysis of Precipitation at its Native Scale, Diagnosis of Cloud-Resolving Models, and Development of Next-Generation Parameterizations”, AGU Fall Meeting, A45Q-2082 (2021)
13. “Quantitative Precipitation Estimation of Extremes over the Continental United States with Radar Data”, AMS Annual Meeting, 2A.1 (2021) [[click for video recording](#)]
12. **(Invited)** “Thermal Measurements of the Ring System of Uranus”, AGU Fall Meeting, P017-03 (2020)
11. “Quantitative Precipitation Estimation of Extremes over the Continental United States with Radar Data”, AGU Fall Meeting, A042-0014 (2020)
10. “Uranus’s Tropospheric Circulation and Composition with ALMA and the VLA”, EPSC/DPS Meeting 13, 726-1 (2019)
9. “Uranian Atmosphere and Rings Probed with ALMA Observations”, AAS/DPS Meeting, 50, 104.07 (2018)
8. “Mapping circulation and chemistry in Uranus’s deep atmosphere with radio observations”, Astrophysical Frontiers in the Next Decade and Beyond Meeting (2018)
7. “Discovery of a Bright Equatorial Storm on Neptune”, AGU Fall Meeting, P31D-2856 (2017)
6. “Isotopic Ratios in Nitrile Species on Titan using ALMA”, Titan Aeronomy & Climate Workshop, #37 (2016)
5. “Observations of HCN and its Isotopologues on Titan using ALMA”, AAS, 227, #141.19 (2016)
4. “Vertical Profiles and Isotopic Ratios in HCN and its Isotopologues from ALMA Observations of Titan”, AAS/DPS, 47, #310.15 (2015)
3. “Testing for the Influence of Insolation on Formation and Growth of Hollows on Mercury,” LPSC, 46, #1489 (2015)
2. “CO Observations of DDO 68: An Extreme Outlier on the Mass-Metallicity Relation”, AAS, 225, #248.18 (2015)
1. “The Low CO Luminosity of Three Extremely Metal-Poor Star-Forming Galaxies”, AAS, 223, #246.52 (2014)

PUBLICITY

Press Release , UC Berkeley, “Berkeley Astronomers to Put New Space Telescope Through its Paces”	January 2022
Interview , Futurism, “Here’s What Uranus Scientists Think About Your Disgusting Jokes”	November 2021
Press Release , NASA, “NASA Scientists Discover ‘Weird’ Molecule in Titan’s Atmosphere”	October 2020
Press Release , UC Berkeley, “Astronomers see ‘warm’ glow of Uranus’s rings”	June 2019
Nature Research Highlight , “Epic storm roils a tranquil region of Neptune”	December 2018
Press Release , UC Berkeley/Keck Observatory, “New Storm Makes Surprise	August 2018

Appearance on Neptune”

**SELECTED
GRADUATE
COURSEWORK**

I have taken advantage of the rich academic program at UC Berkeley by enrolling in classes throughout my graduate career, going well beyond the coursework requirements:

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| 11. Effective Mentoring in Higher Education | Spring 2022 |
| 10. Python Computing for Data Science | Spring 2022 |
| 9. Unlearning Racism in the Geosciences (URGE) | Spring 2021 |
| 8. Global Circulation of Planetary Atmospheres | Fall 2020 |
| 7. Computational Fluid Dynamics | Fall 2020 |
| 6. Atmospheric Physics and Dynamics (audit) | Fall 2019 |
| 5. Astrophysical Fluid Dynamics | Spring 2018 |
| 4. Radiation and its Interactions with Climate | Fall 2017 |
| 3. Solar System Astrophysics | Fall 2017 |
| 2. Astrophysical Techniques | Spring 2017 |
| 1. Radiative Processes in Astronomy | Fall 2016 |