

Emily M. Silich

Department of Astronomy, California Institute of Technology

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Education

California Institute of Technology (Caltech)

Astrophysics, PhD (expected 2026) Astrophysics, MS (2023)

NSF Graduate Research Fellow

2023 - 2026

SAO Predoctoral Fellow

2024 - 2025

Wallace L. W. Sargent Graduate Fellow

2021 - 2022

University of Iowa

Astronomy, BS Physics, BS Mathematics, minor

2017 - 2021

with University Honors, High Distinction, Honors in Astronomy, Phi Beta Kappa

Research

Interests:

Galaxy clusters (584), Intracluster medium (858), X-ray astronomy (1810), Hydrodynamical simulations (767), Sunyaev-Zeldovich effect (1654), Circumgalactic medium (1897)

Experience:

Graduate Research Assistant

2021 - *pres.*

Division of Physics, Mathematics and Astronomy, Caltech

Predoctoral Fellow

2024 - 2025

Center for Astrophysics | Harvard & Smithsonian

Undergraduate Research Assistant

2017 - 2021

Department of Physics & Astronomy, University of Iowa

Research Intern

Summer 2020

X-ray Astrophysics Laboratory, NASA Goddard Space Flight Center

Student Researcher

Winter 2019

Canada-Norway Student Sounding Rocket Program (CaNoRock)

Peer-reviewed publications

1. **E.M. Silich**, J. Sayers, P.F. Hopkins, et al., “*Exploring a cosmic ray inverse-Compton origin to the SZ-to-X-ray pressure deficit in the cool core cluster ZwCl 3146*”, 2025, submitted to The Astrophysical Journal.
2. **E.M. Silich**, J. ZuHone, E. Bellomi, et al., “*X-ray emission signatures of galactic feedback in the hot circumgalactic medium: predictions from cosmological hydrodynamical simulations*”, 2025, accepted for publication in The Astrophysical Journal.
3. **E.M. Silich**, E. Bellomi, J. Sayers, et al., “*ICM-SHOX. Paper II: Galaxy cluster sample overview*”, 2024, Proc. of the mm Universe 2023 conference, EPJ Web of conferences, EDP Sciences.

4. **E.M. Silich**, E. Bellomi, J. Sayers, et al., “*ICM-SHOX. Paper I: Methodology overview and discovery of a gas–dark matter velocity decoupling in the MACS J0018.5+1626 merger*”, 2024, The Astrophysical Journal, 968, 74.
5. **E.M. Silich**, K. Jahoda, L. Angelini, et al., “*A Search for the 3.5 keV Line from the Milky Way’s Dark Matter Halo with HaloSat*”, 2021, The Astrophysical Journal, 916, 2.
6. **E.M. Silich**, P. Kaaret, A. Zajczyk, et al., “*Global X-Ray Properties of the Vela and Puppis A Supernova Remnants*”, 2020, The Astronomical Journal, 160, 1.
7. P.F. Hopkins, E. Quataert, S.B. Ponnada, & **E.M. Silich**, “*Cosmic Rays Masquerading as Hot CGM Gas: An Inverse-Compton Origin for Diffuse X-ray Emission in the Circumgalactic Medium*”, 2025, The Open Journal of Astrophysics, 8, 78.
8. A. Zajczyk, P. Kaaret, D. LaRocca, et al. (including **E.M. Silich**), “*On-ground calibration of the HaloSat science instrument*”, 2020, J. Astron. Telesc. Instrum. Syst. 6(4), 044005.
9. P. Kaaret, A. Zajczyk, D.M. LaRocca, et al. (including **E.M. Silich**), “*HaloSat - A CubeSat to Study the Hot Galactic Halo*”, 2019, The Astrophysical Journal, 884, 2.
10. P.F. Hopkins, E. Quataert, **E.M. Silich**, et al., “*Cosmic Rays Masquerading as Cool Cores: An Inverse-Compton Origin for Cool Core Cluster Emission*”, 2025, submitted to The Open Journal of Astrophysics.
11. S.B. Ponnada, P.F. Hopkins, Y.S. Lu, et al. (including **E.M. Silich**), “*Strong Evidence for Cosmic Ray-Supported $\sim L_*$ Galaxy Halos via X-ray & tSZ Constraints*”, 2025, submitted to The Astrophysical Journal Letters.
12. B.J. Vaughan, J. Sayers, L. Spencer, et al. (including **E.M. Silich**), “*Measuring the Temperature of Extremely Hot Shock-Heated Gas in the Major Merger MACS J0717.5+3745 With Relativistic Corrections to the Sunyaev-Zel’dovich Effect*”, 2025, submitted to The Astrophysical Journal.

Press Releases

1. “*Dark Matter Flies Ahead of Normal Matter in Mega Galaxy Cluster Collision*”, Caltech PR, July 2024. [Read here](#).

Teaching

Ay 105: Optical Astronomy Instrumentation Lab	Graduate TA, Spring 2023
Ay 122c: High Energy Astronomical Measurements	Graduate TA, Winter 2023
Ay 127: Astrophysical Cosmology	Graduate TA, Fall 2022
PHYS 1611: Introductory Physics I	Undergraduate TA, Spring 2020
PHYS 1512: College Physics II	Undergraduate TA, Spring 2020

Fellowships & Awards (selected)

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| 1. Smithsonian Astrophysical Observatory (SAO) Predoctoral Fellow | 2024 - 2025 |
| 2. Garmire Scholar, France A Cordova Graduate Student Fund (Caltech) | 2023 |
| 3. NSF Graduate Research Fellowship (GRFP) | 2023 - 2026 |
| 4. Wallace L. W. Sargent Graduate Fellowship (Caltech) | 2021 - 2022 |

5. Chambliss Astronomy Achievement Student Awards - Honorable Mention	2021
6. University of Iowa Dare to Discover	2021
7. Barry Goldwater Scholar	2020
8. James A. Van Allen Award (UI)	2020
9. John Mather Nobel Scholar (NASA/GSFC)	2020
10. Western Dubuque High School Young Accomplished Alumni	2020
11. APS Division of Astrophysics (DAP) Travel Grant	2020
12. Manuel Paul & Abraham Chinitz Liberal Arts & Sciences Scholarship (UI)	2019 - 2021
13. Myrtle K. Maier Scholarship (UI)	2019 - 2020
14. ICRU Academic Year Research Fellowship	2019 - 2020
15. NASA Iowa Space Grant Consortium Research Fellowship	2018 - 2020
16. Rhodes Dunlap Award for Excellence in the First/Second Year (UI)	2018 - 2020
17. ICRU Academic Year Research Fellowship	2018 - 2019
18. Charles A. Wert Summer Research Fund (UI)	2019
19. UI Department of Physics & Astronomy Poster Prize	2018, 2019
20. ICRU Summer Research Fellowship	2018
+4 others	

Academic Presentations (selected)

Talks:

1. *Extragalactic Journal Club*, Michigan State University & University of Michigan, Virtual. October 2025.
2. *mm Universe*, Kavli Institute for Cosmological Physics, University of Chicago. Chicago, IL. June 2025.
3. *Observational Cosmology Seminar*, Caltech. Pasadena, CA. November 2024, October 2023, & February 2023.
4. *Astronomy Lunch Seminar*. University of Massachusetts. Amherst, MA. October 2024.
5. *Galaxy Clusters & Radio Relics II*. Center for Astrophysics | Harvard & Smithsonian. Cambridge, MA. September 2024.
6. *Multiphase Madness: Resolving the CGM in Theory and Observations*. Center for Astrophysics | Harvard & Smithsonian. Cambridge, MA. August 2024.
7. *γ th ICM Theory & Computation Workshop*. Ann Arbor, MI. June 2024.
8. *Galaxy Cluster Discussion Group Meeting*, Center for Astrophysics | Harvard & Smithsonian. Cambridge, MA. February 2024 & November 2022.
9. *High Energy Astrophysics Seminar*, Center for Astrophysics | Harvard & Smithsonian. Cambridge, MA. February 2024.
10. *Merging Cluster Workshop*, Yonsei University. Seoul, KR. December 2023.
11. *Observing the Universe at Millimetre Wavelengths (mm Universe)*, Laboratory of Subatomic Physics & Cosmology (LPSC). Grenoble, FR. June 2023.
12. *240th American Astronomical Society (AAS) Meeting*, Pasadena, CA. June 2022.

13. *Department of Physics & Astronomy Colloquium*, University of Iowa. Virtual. April 2021 & October 2020.
 14. *Conference for Undergraduate Women in Physical Sciences*, University of Nebraska. Lincoln, NE. November 2019.
 15. *Astrophysics & Space Physics Seminar*, University of Iowa. Iowa City, IA. October 2019.
- +5 others

Posters:

1. *STScI Galaxy Clusters 2022: Challenging Our Cosmological Perspectives*, Virtual. April 2022.
 2. *237th American Astronomical Society (AAS) Meeting*, Virtual. January 2021.
 3. *American Physical Society (APS) April Meeting*, Virtual. April 2020.
 4. *APS CUWiP*, University of Minnesota. Minneapolis, MN. January 2020.
 5. *Conference for Undergraduate Women in Physical Sciences*, University of Nebraska. Lincoln, NE. October 2018.
- +3 others

Observing

Awarded PI telescope proposals:

1. “*Revealing the nature of the putative equatorial shock in the MACS J0018.5+1626 galaxy cluster merger with ALMA*”, 31 hrs, *ALMA* Cycle 12, ranked Priority C.
2. “*Separating dark matter and hot gas velocities in a unique merging cluster: first comparison of X-rays and the kSZ effect*”, 300 ks, *XRISM* AO-1, ranked Priority C.

Observing time:

1. Keck Observatory, *DEIMOS*: 7.5 nights
2. Keck Observatory, *LRIS*: 4 nights

Mentoring

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| 3 high school students from Gabrielino High School | Summer 2025 |
| <i>Visualization of galaxy cluster merger simulations with volume rendering techniques</i> | |
| 3 high school students from Gabrielino High School | Summer 2024 |
| <i>Visualization of galaxy cluster merger simulations with volume rendering techniques</i> | |
| 2 high school students from Gabrielino High School | Summer 2023 |
| <i>Data reduction of cluster-member optical spectroscopy from Keck/DEIMOS</i> | |

Public Outreach

Lectures & speaking engagements:

1. Astronomy on Tap – Death Valley, “*Galaxy Clusters Collide: The Most Energetic Events since the Big Bang*”, DVNP, CA. February 2025.

2. Caltech Stargazing Lectures, “*Galaxy Clusters Collide: The Most Energetic Events since the Big Bang*”, Pasadena, CA. August 2023. Watch [here](#).
3. Death Valley Dark Sky Festival, “*Ask an Astrophysicist*” Q&A panelist, DVNP, CA. March 2023.

Science writing (and “Science writing”):

1. Altadena Poetry Review (digital anthology), “*Asymmetry*”. 2025. Read [here](#).
2. Telegraph Herald, “*Cuts in federal funding for science would have long-term impacts*”. 2025.
3. Altadena Poetry Review (print anthology), “*Illustrations of Astrograd School*”. 2024. Nominated for the Pushcart Prize in Poetry.
4. Altadena Poetry Review (print anthology), “*An Experiment in Poetic Physics*”. 2024.
5. Astrobites, “*A Search for Dark Matter with HaloSat*”, 2021. Read [here](#)

Volunteering:

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| 1. Astronomy on Tap – Los Angeles | Telescope operator, 2022 - <i>pres.</i> |
| 2. Caltech Stargazing Lectures & Public Observing | Telescope operator, 2022 - <i>pres.</i> |
| 3. Gabrielino High School physics classrooms | Lab assistant & speaker, 2021 - <i>pres.</i> |
| 4. Death Valley Dark Sky Festival | Telescope operator, 2022 - <i>pres.</i> |
| 5. Scouting America Troop 0175 (Epworth, IA) | Guest speaker, 2025 |
| 6. Girl Scouts Troop 6371 (Monrovia, CA) | Guest speaker, 2023 |
| 7. Iowa Center for Research by Undergraduates | Research ambassador, 2020 - 2021 |
| 8. Society of Physics Students, UIowa | Vice president & secretary, 2017 - 2021 |
| 9. Van Allen Observatory Public Observing | Telescope operator, 2017 - 2021 |
| 10. Drexler Middle School FIRST Lego League | Team mentor, 2018 |