

Melodie Kao

UC Santa Cruz, Astronomy & Astrophysics
1156 High St, MS: UCO / LICK
Santa Cruz, CA 95064

melodie.kao@ucsc.edu
www.melodiekao.com

Education

02/2011	SB, Physics	MIT, Concentration: Architecture
06/2013	MS, Astrophysics	Caltech
06/2017	PhD, Astrophysics	Caltech, Advisor: Gregg Hallinan

Appointments

09/2022 - 12/2022	Invited Programme Visitor	INI: Frontiers in Dynamo Theory
09/2021 - Present	Heising-Simons 51 Pegasi b Fellow	UCSC, Mentor: Jonathan Fortney
09/2021 - Present	Guide & Scholarship Co-Director	Andrew Skurka Adventures
08/2018 - 08/2021	NASA Hubble Fellow	ASU, Mentor: Evgenya Shkolnik
10/2017 - 08/2018	Postdoctoral Researcher	ASU, Mentor: Evgenya Shkolnik

Funding & Honors (~\$1.95M)

2023	\$175k	NASA Advanced Innovative Concepts <i>M. Knapp, L. Paritsky, M. Kao, E. Kononov</i>
2022	\$2000	American Alpine Club Catalyst Grant
2022	£3000	Isaac Newton Institute (INI) Simons Fellowship
2021	\$375k	51 Pegasi b Postdoctoral Fellowship
2021	\$300k	NSF Postdoctoral Fellowship (declined)
2021	\$300k	ASU Exploration Postdoctoral Fellowship (declined)
2019	\$171k	HST General Observer Grant <i>J. Vos, J. S. Pineda, M. Kao</i>
2018	\$309k	NASA Hubble Postdoctoral Fellowship
2018	\$300k	ASU Exploration Postdoctoral Fellowship (declined)
2017	\$18.2k	NRAO Grote Reber Doctoral Fellowship
2008	\$3000	MIT Program on Human Rights and Justice Grant

Selected Awarded Telescope Proposals

VLA 2022B	12 hr	Co-I, equal effort (PI J. S. Pineda)
VLA 2020B	109 hr	PI
VLBA+VLA 2020A	13.5 hr	PI
VLA 2019B	17.2 hr	PI
HST Cycle 27	16 orbits	Co-I, equal effort (PI J. Vos, Co-I J. S. Pineda)
HSA 2019A	28 hr	PI, coordinated VLA + VLBA + GBT + Effelsberg
VLA 2019A	17 hr	PI
VLA 2018B	10.2 hr	PI
VLA 2018B	27 hr	Co-I (PI J. S. Pineda)
VLA 2018A	76 hr	PI
VLA 2017B	44 hr	PI
VLA 2016A	66 hr	PI

Mission Development

2023 Awarded: NASA Innovative Advanced Concepts (NIAC)
2022 NASA PI Launchpad, LOC
2019 NASA PI Launchpad

Selected Talks

TBD	Invited	American Alpine Club Annual Gala
10/2023	Invited	MIT Haystack Observatory Colloquium
06/2023	Invited Review	Exoclimes
04/2023	Invited	UCLA Space Physics Seminar
02/2023	Invited	Heising-Simons Foundation
11/2022	Invited	UC Santa Cruz Colloquium
10/2022	Invited	Lowell Observatory Colloquium
09/2022	Invited	MIT Haystack Observatory
06/2022	Invited Review	Cool Stars 21: Manifestations of Star-Planet Interactions
06/2022	Invited	Lorentz Workshop: Life Around a Radio Star
11/2021	Invited	CU Boulder APS Colloquium
11/2021	Invited	Berkeley Center for Integrative Planetary Science Seminar
01/2022	Invited	McGill Space Institute Seminar
04/2021	Invited	MIT Exoplanet Seminar
04/2021	Invited	SOFIA Colloquium
04/2021	Invited	CU Boulder Seminar
02/2021	Invited	Royal Observatory of Edinburgh Colloquium
12/2020	Invited	NYU Seminar
11/2020	Invited	Arizona State University Colloquium
02/2020	Invited	Haverford College Physics & Astronomy Colloquium
12/2019	Invited	American Geophysical Union Fall Meeting
10/2019	Invited	St. Mary's College of Maryland Colloquium
10/2019	Invited	Boston University, Space Physics Seminar
08/2019	Contributed	Extreme Solar Systems (plenary)
04/2019	Invited	American Museum of Natural History Seminar
03/2019	Invited	NRAO Charlottesville Colloquium
03/2018	Invited	Radio Exploration of Planetary Habitability
10/2016	Invited	Harvard CfA Stars and Planets Seminar
10/2016	Invited	MIT Exoplanet Seminar

Interiority Workshops

(materials available at: www.melodiekao.com/toolkit)

TBD	Invited	MIT Haystack Observatory
2023	Invited	MAVEN Early Career Scientists
2023	Invited	UCSC Conference for Undergraduate Women in Physics
2022	Invited	UCSC Astronomy & Astrophysics Welcome Week
2021	Invited	CU Boulder
2021	Invited	Dartmouth College
2019	Invited	Princeton
2019	Invited	CUNY
2019	Invited	STScI
2019	Invited	NRAO Charlottesville
2019	Invited	NRAO Socorro
2019	Invited	Haverford College (Distinguished Visitor)
2019	Invited	St. Mary's College of Maryland
2019	Volunteer	Caltech

Selected Advising & Mentoring

2023	Research advisor, undergraduate	Chu-Lan McKinlay	UCSC
2023	Research advisor, undergraduate	Ashlynn Briney	UCSC
2023	Research advisor, undergraduate	Jessamyn Wright	UCSC
2018 - 2019	Research advisor, 2nd-year project	Tyler Richey-Yowell	ASU
2019	Committee member, senior thesis	Shivam Sadachar	ASU
2019	Academic mentor, undergraduate	Jarrold McWilliams	SMCM
2019	Academic mentor, undergraduate	Alana Thompson	SMCM
2019	Peer mentor, graduate	Anna Ho	Caltech
2019	Peer mentor, graduate	Joshua Lieber	Caltech
2019	Peer mentor, graduate	Marta Bryan	Caltech
2019	Peer mentor, graduate	Io Kleiser	Caltech
2019	Peer mentor, graduate	Masha Klescheva	Caltech

Selected Teaching & Outreach

Winter, Spring 2023	Introduction to Research in Physics and Astrophysics (UCSC) <i>Research Mentor (Prof. Ruth Murray-Clay)</i> 2-quarter research project for 3 early undergraduate students
2021 - Present	Professional Backpacking Guide (Andrew Skurka Adventures) <i>Guide & Night Sky Interpreter</i> <i>First guide of color</i> Multi-day, skills-based backpacking trips for off-trail travel
2019 - 2020	Wilderness Astronomy (ASU) <i>Co-Instructor & Co-Developer (w/ Dr. Parke Loyd)</i> Lecture, flipped classroom, experiential formats Semester-long course with 7-day backpacking capstone for non-majors
2014 - 2016	Tango Initiative Immersion Program (Caltech) <i>Program director & head TA</i> Experiential format, group and 1-on-1 classes Year-long integration: boundary-setting, dance, music, emotional fluency
Fall 2012	Undergraduate Relativistic Physics <i>Graduate TA (Prof. Sterl Phinney)</i> Lecture format
Winter 2013	Basic Astronomy & the Galaxy (Caltech) <i>Head TA (Prof. John Johnson)</i> Flipped classroom format Recorded online lectures and led in-class blackboard session
Fall 2007	Freshman Advising Seminar: Blacksmithing (MIT) <i>Undergraduate Co-Advisor (Prof. Samuel Allen)</i> Weekly blacksmithing and academic advising class
Summer 2007	MIT Women's Technology Program in Math, EE, & CS (MIT) <i>Teaching Assistant & Residential Assistant</i> Laboratory, lecture, motor-building workshop Month-long immersion program for 40 high school girls

Selected Teaching & Mentoring Development

- 2022 **Cultivating Emotional Balance Teacher Training¹**
42-hour multicultural curriculum for burnout prevention
Efficacy research-validated in UCSF medical residency program
- 2022 **Visceral Change Workshop²**
Multicultural and equity-based organizational management
- 2021 **Natural Next Questions: Life & Icy Moons (ASU)**
Semester-long class: cultivating skillful question-asking
- 2020 **Followership CONNECT**
3-month seminar: followership skills for effective leadership and teams
- 2018 - 2019 **ASU Exploration Learning Workshops I & II**
Inquiry-based learning techniques
- 2019 **AAS Teaching for Equity Workshop**
Applying equity-focused sociology and psychology research to STEM
- 2019 **AAS Teaching Science Thought & Practices Weekend Intensive**
18-hour laboratory pedagogy practicum, longitudinally validated by CUNY
- 2018 **Brilliance Coaching³ Academy**
Scholarship winner
3-month seminar and 450+ hours of practicum training
- 2015 **Principles of University Teaching & Learning in STEM (Caltech)**
Quarter-long course: literature review and discussion of pedagogy research
- 2015 - 2016 **UCLA Mindful Awareness Research Center**
6-week classes: practicums and literature reviews of mindfulness research

Selected Service

- Ongoing National Radio Astronomy Observatory User Committee
- Ongoing Science Review Panelist (NASA, NRAO, STScI, NSF)
- Ongoing Reviewer (ApJ, ApJL, PASP, A&A, Nature Astronomy, MNRAS)
- Ongoing Co-founder, cross-institutional Magnetism & Equity (MagE) Journal Club
- 2022 UC Santa Cruz Colloquium Committee
- 2020 Co-lead, Hubble Fellowship Equitable Application Evaluation Processes
- 2018 Astro 2020 Decadal Survey Early Career Focus Session
- 2017 AAS Congressional Visits Day

¹ <https://cultivating-emotional-balance.org/teacher-training/>

² <https://www.visceralchange.org/sherard-robbins>

³ see the white paper by Dr. Lucianne Walkowicz (Adler Planetarium), who received coaching as a TED Fellow, to learn more about the efficacy of coaching techniques: <https://arxiv.org/abs/1805.09963>

Significant Author Publications

(^graduate student paper)

1. **M. Kao**, A. Mioduszewski, J. Villadsen, E. Shkolnik. “Resolved Imaging of an Extrasolar Radiation Belt around an Ultracool Dwarf.” Submitted to Nature.
2. **M. Kao** & E. Shkolnik. “The Occurrence Rate of Quiescent Radio Emission for Ultracool Dwarfs using a Semi-Analytical Bayesian Framework.” Submitted, in revision.⁴
3. **M. Kao** & J.S. Pineda. “Binarity Enhances the Occurrence Rate of Quiescent Radio Emission in Ultracool Dwarfs.” Submitted, in revision.⁴
4. **M. Kao** & E. Shkolnik. “The Role of Age in Brown Dwarf Magnetism: A Survey of Radio Emission in Young Brown Dwarfs.” In draft.
5. **M. Kao** & J.S. Pineda. “Radio Emission from Binary Ultracool Dwarf Systems.” *ApJ*, 232, 21. 2022.
6. ^T. Richey-Yowell, **M. Kao**, et al. “On the Correlation between L Dwarf Optical and Infrared Variability and Radio Aurorae.” *ApJ*, 903, 74. 2020
7. **M. Kao**, et al. “Constraints on Magnetospheric Radio Emission from Y Dwarfs.” *MNRAS*, 487, 1994. 2019.
8. **M. Kao**, et al. “The Strongest Magnetic Fields on the Coolest Brown Dwarfs.” *ApJS*, 237. 2018.
9. **M. Kao**, et al. “Auroral Radio Emission from Late L and T Dwarfs: A New Constraint on Dynamo Theory in the Substellar Regime.” *ApJ*, 818, 24. 2016.
10. K. Cooksey, **M. Kao**, et al. “Precious Metals in SDSS Quasar Spectra I: Tracking the Evolution of Strong, $1.5 < z < 4.5$ C IV Absorbers with Thousands of Systems.” *ApJ*, 763, 37. 2013.

Co-Author or Collaborator Publications

1. J. S. Pineda, G. Hallinan & **M. Kao**. “A Panchromatic View of Brown Dwarf Aurorae.” *ApJ*, 846, 75. 2017.
3. J. S. Pineda, et al. “A Survey for Auroral H α Emission from Late L and T Dwarfs.” *ApJ*, 826, 73. Jul 2016.
4. G. Hallinan, et al. “Magnetospherically Driven Optical and Radio Aurorae at the End of the Stellar Main Sequence.” *Nature*, 523, 568. 2015.
5. H. Knutson, et al. “Friends of Hot Jupiters. I. A Radial Velocity Search for Massive, Long-period Companions to Close-in Gas Giant Planets.” *ApJ*, 785, 126. 2014.
6. E. Seyffert, et al. “Precious Metals in SDSS Quasar Spectra II: Tracking the Evolution of Strong $0.4 < z < 2.3$ Mg II Absorbers with Thousands of Systems.” *ApJ*, 779, 161. 2013.
7. N.K. Lewis, et al. “Orbital Phase Variations of the Eccentric Giant Planet Hat-P-2b.” *ApJ*, 766, 95. 2013.
8. R. Simcoe, et al. “Extremely Metal-Poor Gas at a Redshift of 7.” *Nature*, 492, 79. 2012.

White Papers

1. **M. Kao**, J.S. Pineda, et al. “Magnetism in the Brown Dwarf Regime.” *BAAS Astro2020 Decadal Survey*, 51, 484. 2019.
2. Osten, R. et al. “Advancing Understanding of Star-Planet Ecosystems in the Next Decade: The Radio Wavelength Perspective.” *BAAS Astro2020 Decadal Survey*, 51, 434. Mar 2019.

⁴ Drafts: https://www.dropbox.com/sh/wqopex7qwczwlsq/AACuLP3UNACLSqc_rDtKQMeda?dl=0