Melodie Kao

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Research Interests

Brown dwarf & planetary magnetism, magnetic dynamos, exo-aurorae, magnetospheric imaging

Education

Jun 2017	PhD, Astrophysics *Caltech*
Jun 2013	MS, Astrophysics *Caltech*
Feb 2011	SB Physics, Minor Focus in Architecture *MIT*

Appointments

Sep 2020 – Dec 2020	Programme Visitor, Invited *Isaac Newton Institute for Mathematical Sciences* — Frontiers in Dynamo Theory: Earth to Stars
Aug 2018 – Aug 2021	NASA Hubble Postdoctoral Fellow *ASU* Mentor: Professor Evgenya Shkolnik
Oct 2017 – Aug 2018	Postdoctoral Researcher *ASU* Mentor: Professor Evgenya Shkolnik
Jan 2017 – Jun 2017	NRAO Grote Reber Doctoral Fellow *NRAO Socorro* Mentor: Dr. Dale Frail
Apr 2013 – Aug 2017	Graduate Student *Caltech* PhD advisor: Professor Gregg Hallinan
Sep 2011 – Mar 2013	Graduate Student *Caltech* Research advisors: Professor Heather Knutson, Professor John Johnson
Mar 2011 – Aug 2011	Post-Baccalaureate Research Assistant *MIT* Advisor: Professor Robert Simcoe

Funding & Honors

2019	$171k	Hubble Space Telescope General Observer Grant
2018	$369k	NASA Hubble Postdoctoral Fellowship
2018	$286k	ASU Exploration Postdoctoral Fellowship (declined)
2017		Caltech Leadership Award
2017	$18.2k	NRAO Grote Reber Doctoral Fellowship
2011		NSF Graduate Research Fellowship Honorable Mention
2008	$3000	MIT Program on Human Rights and Justice Grant
2008	$1500	MIT Sigma Phi Epsilon Balanced Man Scholarship

Academic Service

Ongoing	Science Review Panelist (Very Large Array, Very Long Baseline Array, Greenbank Observatory)
2019	Astro 2020 Decadal Survey White Paper, co-lead
2019	Co-founder of the cross-institutional Magnetism and Equity (MagE) Journal Club
2018	Astro 2020 Decadal Survey Early Career Focus Session
Ongoing	Reviewer (NASA, PASP, A&A, Nature Astronomy)
2017	AAS Congressional Visits Day
2014	Caltech Graduate Student Recruitment Co-Organizer

First Author and Significant Author Publications

1. T. Richey-Yowell, **M. Kao**, et al. "Assessing Infrared Variability as a Tracer of L Dwarf Radio Aurorae." In prep, to be submitted Dec 2019. Graduate student paper, primary research advisor.

2. **M. Kao** & E. Shkolnik. "Radio Occurrence Rate of Young and Old Brown Dwarfs." In prep, to be submitted Dec 2019.

3. ***M. Kao**, J.S. Pineda, et al. "Magnetism in the Brown Dwarf Regime." *BAAS Astro2020 Decadal Survey*, science white papers, 51, 484. Mar 2019. Non-refereed, https://ui.adsabs.harvard.edu/abs/2019BAAS...51c.484K/

4. **M. Kao**, et al. "Constraints on Auroral Radio Emission from Y Dwarfs." *MNRAS*, 487, 1994. Aug 2019.

5. **M. Kao**, et al. "The Strongest Magnetic Fields on the Coolest Brown Dwarfs." *ApJS*, 237. Jul 2018.

6. **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. Feb 2016.

7. 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. Jan 2013.

Co-Author Publications

1. *Osten, R. et al., incl. **M. Kao**. "Advancing Understanding of Star-Planet Ecosystems in the Next Decade: The Radio Wavelength Perspective." *BAAS Astro2020 Decadal Survey*, science white papers, 51, 434. Mar 2019. https://ui.adsabs.harvard.edu/abs/2019BAAS...51c.434O/

2. J.S. Pineda, G. Hallinan, & **M. Kao**. "A Panchromatic View of Brown Dwarf Aurorae." *ApJ*, 846, 75. Sep 2017.

3. J.S. Pineda, et al., incl. **M. Kao**. "A Survey for Auroral Hα Emission from Late L and T Dwarfs." *ApJ*, 826, 73. Jul 2016.

4. G. Hallinan, et al., incl. **M. Kao**. "Magnetospherically Driven Optical and Radio Aurorae at the End of the Stellar Main Sequence." *Nature*, 523, 568. Jul 2015.

5. H. Knutson, et al., incl. **M. Kao**. "Friends of Hot Jupiters. I. A Radial Velocity Search for Massive, Long-period Companions to Close-in Gas Giant Planets." *ApJ*, 785, 126. Apr 2014.

6. E. Seyffert, et al., incl. **M. Kao**. "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. Dec 2013.

7. N.K. Lewis, et al., incl. **M. Kao**. "Orbital Phase Variations of the Eccentric Giant Planet Hat-P-2b." *ApJ*, 766, 95. Apr 2013.

8. R. Simcoe, et al., incl. **M. Kao**. "Extremely Metal-Poor Gas at a Redshift of 7." *Nature*, 492, 79. Dec 2012.

* denotes Astro2020 Decadal White Paper, non-refereed

Awarded Telescope Proposals

VLBA+VLA 2020A	13.5 hr	Principal Investigator
VLA 2019B	17.2 hr	Principal Investigator
VLA 2019B	20 hr	Co-Investigator (PI J. Sebastian Pineda)
HST Cycle 27	16 orbits	Co-Investigator, equal effort (PI Johanna Vos , Co-I . Sebastian Pineda)
HSA 2019A	28 hr	Principal Investigator (coordinated VLA + VLBA + GBT + Effelsberg)
VLA 2019A	17 hr	Principal Investigator
VLA 2018B	10.2 hr	Principal Investigator
VLA 2018B	27 hr	Co-Investigator (PI J. Sebastian Pineda)
VLA 2018A	76 hr	Principal Investigator
VLA 2017B	44 hr	Principal Investigator
VLA 2016A	66 hr	Principal Investigator
VLA 2015A	43 hr	Co-Investigator (PI Gregg Hallinan)

Invited Talks

Apr 2020	NYU Seminar
Feb 2020	Haverford College, Physics & Astronomy Colloquium
Dec 2019	American Geophysical Union (AGU) Fall Meeting
Oct 2019	St. Mary's College of Maryland Natural Science & Mathematics Colloquium
Oct 2019	Boston University, Space Physics Seminar
May 2019	Lowell Observatory Colloquium
Apr 2019	AMNH Seminar
Mar 2019	NRAO Charlottesville Colloquium
Mar 2018	Very Long Baseline Interferometry Futures Meeting
Mar 2017	NRAO Wednesday Seminar
Oct 2016	Harvard CfA Stars and Planets Seminar
Oct 2016	MIT Exoplanet Seminar

Contributed Talks

Oct 2019	Hubble Symposium
Aug 2019	Extreme Solar Systems, Plenary
Jun 2019	Radio/mm Frontiers in the Next Decade (ngVLA)
Mar 2019	Hubble Symposium
Jan 2019	National Science Radio Meeting
Jan 2019	AAS 233rd Meeting
Jun 2018	Emerging Researchers in Exoplanet Science IV
Nov 2017	Radio Stars from kHz to THz
May 2017	Radio Exploration of Planetary Habitability
Jan 2017	American Astronomical Society 229th Meeting
Jun 2015	Magnetospheres of Outer Planets
Jun 2014	18th Cool Stars Workshop

Research Advising & Mentoring

Jun 2019 – Present	*Graduate school mentor* for Joshua Lieber (Caltech)
Oct 2018 – Present	*Research advisor* for Tyler Richey-Yowell (ASU, 2nd-year project)
Jan 2018 – May 2018	*Peer mentor* for graduate student Masha Klescheva (Caltech)
Oct 2013 – Oct 2015	*Peer mentor* for graduate student Marta Bryan (Caltech)
Oct 2012 – Oct 2013	*Peer mentor* for graduate student Io Kleiser (Caltech)
Oct 2011 – Jun 2012	*Graduate mentor* for undergraduate student Monica He (Caltech)
Oct 2011 – Jun 2012	*Graduate mentor* for undergraduate student Jennifer Greco (Caltech)
Jul 2007	*Residential assistant* for 40 female high school students in MIT Women's Technology Program
Aug 2007 – Dec 2007	*Undergraduate co-advisor* for 4 freshmen in the MIT Freshman Advising Seminar Program

Professional Development

Nov 2019	NASA Principle Investigator Launchpad
Jun 2019	ASU Exploration Learning Workshop II
Jan 2019	AAS Teaching for Equity Workshop
Jan 2019	AAS Teaching Science Thought & Practices Weekend Intensive Workshop
Jun 2018	ASU Exploration Learning Workshop I
Jul 2018 – Nov 2018	Brilliance Coaching Academy
Fall 2015	Principles of University Teaching and Learning in STEM, Caltech course

Invited Workshops

Workshop materials available at: www.melodiekao.com/toolkit

2020 **Practical Skills for Emerging Scholars III: Navigating Interpersonal Boundaries**
Haverford College

2019 **Practical Skills for Emerging Scholars II: Collaborative Conflict Management**
St. Mary's College of Maryland

Practical Skills for Emerging Scholars I: Setting Personal Boundaries
Princeton, CUNY, STScI, NRAO Charlottesville, NRAO Socorro

Teaching

Spring 2019, 2020 **Wilderness Astronomy**
Co-Instructor, course co-creator
ASU

Oct 2014 – Apr 2016 **Tango Initiative Immersion Program**: Integrating dance, history, music, & boundary-setting
Head Teaching Assistant, program designer
Caltech

Winter 2013 **Undergraduate Relativistic Physics**
Teaching Assistant
Caltech, Professor E. Sterl Phinney

Fall 2012 **Basic Astronomy and the Galaxy**
Head Teaching Assistant
Caltech, Professor John Johnson

Jul 2011 **Waves and Vibrations for Middle Schoolers**
Instructor
MIT Educational Series Program

Fall 2007 **Freshman Advising Seminar: Blacksmithing**
Teaching Assistant
MIT

Summer 2007 **Women's Technology Program: Motor-building workshop**
Teaching Assistant
MIT