MELODIE KAO

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Research Interests

Brown dwarf and planetary magnetic fields, magnetic activity, magnetic dynamos, aurorae

Education

Jun 2017	California Institute of Technology Advisor: Professor Gregg Hallinan Thesis: *Constraining Substellar Magnetic Dynamos using Brown Dwarf Radio Aurorae*	PhD | Astrophysics
Jun 2013	California Institute of Technology	MS | Astrophysics
Feb 2011	Massachusetts Institute of Technology Minor Focus in Architectural Design	SB | Physics

Appointments

Oct 2017 – Present	*Postdoctoral Researcher* — Arizona State University Testing Planetary Magnetic Dynamo Mechanisms
Jan 2017 – Jun 2017	*NRAO Grote Reber Doctoral Fellow* — NRAO Socorro
Mar 2013 – Aug 2017	*Graduate Student* — Caltech Harnessed brown dwarf radio aurorae to probe substellar dynamos: First systematically successful radio search of L7.5–T6.5 dwarfs First radio detection of free-floating planetary mass object Measured strongest known magnetic fields in L7.5–T6.5 dwarfs Tested magnetic dynamo model of low-mass stars and planets Led first radio study of Y dwarfs
Oct 2011 – Mar 2013	*Graduate Student* — Caltech Tested gas giant planet migration mechanisms: Searched for widely separated companions to 51 hot Jupiters Constrained companion masses with radial velocities and imaging Observed with Keck HIRES and Keck NIRC2 adaptive optics
Mar 2011 – Aug 2017	*Post-Baccalaureate Research Assistant* — MIT Studied C IV evolution of universe for $1.5 < z < 4.5$: Compiled largest spectral catalog of carbon-absorbing quasars Automated robust continuum fitting of 105,000+ spectra Built software pipeline identifying spectral features

Honors

2018 NASA Hubble Postdoctoral Fellowship
2018 Exploration Postdoctoral Fellowship, Arizona State University (declined)
2017 Caltech Leadership Award
2017 National Radio Astronomy Observatory Grote Reber Doctoral Fellowship
2011 NSF Graduate Research Fellowship Honorable Mention
2011 Caltech Greenstein Fellowship
2008 MIT Program on Human Rights and Justice Grant
2008 MIT Sigma Phi Epsilon Balanced Man Scholarship

Telescope Proposals

VLA Semester 2018B	Principal Investigator	Awarded: 10 hours
VLA Semester 2018B	Co-Investigator (PI J. Sebastian Pineda)	Awarded: 27 hours
VLA Semester 2018A	Principal Investigator	Awarded: 44 hours
VLA Semester 2017B	Principal Investigator	Awarded: 66 hours
VLA Semester 2016A	Principal Investigator	Awarded: 43 hours
VLA Semester 2015A	Co-Investigator (PI Gregg Hallinan)	Awarded: 28 hours
VLA Semester 2013A	Co-Investigator (PI Gregg Hallinan)	

Talks Presented

Mar 2018	Invited	VLBI Futures Meeting
Nov 2017	Contributed	Radio Stars from kHz to THz
May 2017	Contributed	Radio Exploration of Planetary Habitability
Mar 2017	Invited	NRAO Wednesday Lunch Seminar
Jan 2017	Contributed	American Astronomical Society 229th Meeting
Oct 2016	Invited	Harvard CfA Stars and Planets Seminar
Oct 2016	Invited	MIT Exoplanet Seminar
Oct 2015	Invited	Caltech Heather Knutson Group
Jun 2015	Contributed	Magnetospheres of Outer Planets
Jun 2014	Contributed	18th Cool Stars Workshop

Significant Publications

1. **M. Kao**, et al. "Constraints on Auroral Radio Emission from Y Dwarfs." Submitted to *ApJ*, Aug 2017. Preprint at www.melodiekao.com/research.html
2. **M. Kao**, et al. "The Strongest Magnetic Fields on the Coolest Brown Dwarfs." *ApJS*, accepted May 2018.
3. J.S. Pineda, G. Hallinan, & **M. Kao**. "A Panchromatic View of Brown Dwarf Aurorae." *ApJ*, 846, 75, Sept 2017.
4. **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.
5. J.S. Pineda, et al., including **M. Kao**. "A Survey for Auroral Hα Emission from Late L Dwarfs and T Dwarfs." *ApJ*, 826, 73. Jul 2016.
6. G. Hallinan, et al., including **M. Kao**. "Magnetospherically Driven Optical and Radio Aurorae at the End of the Stellar Main Sequence." *Nature*, 523, 568. Jul 2015.
7. H. Knutson, et al., including **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.

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

Teaching and Mentoring

Oct 2011 – Present	Mentor
	Thomas Anderson (graduate, 2017 – 2018)
	Alexei Vaschillo (graduate, 2014 – 2016)
	Marta Bryan (graduate, 2013 – 2015)
	Io Kleiser (graduate, 2012 – 2013)
	Monica He (undergraduate, 2011 – 2012)
Oct 2014 – Apr 2016	Caltech Tango Immersion Program *Program Designer* for multidisciplinary course: Integrated dance, history, music, conflict resolution, mindfulness
Fall 2015	Research-Based Principles of University Teaching in STEM *Course Participant*
Winter 2013	Undergraduate Relativistic Physics *Teaching Assistant* for Professor E. Sterl Phinney
Fall 2012	Basic Astronomy and the Galaxy *Teaching Assistant* for Professor John Johnson Inverted classroom format: Created video lectures to teach class concepts Facilitated in-class group problem solving sessions
Jul 2011	Waves and Vibrations for Middle Schoolers *Instructor* for MIT Educational Series Program
Fall 2010	Physics III Waves and Vibrations *Grader*
Fall 2007	MIT Freshman Advising Seminar: Blacksmithing *Undergraduate Co-Advisor* with Professor Samuel Allen *Teaching Assistant* for weekly blacksmithing class
Summer 2007	MIT Women's Technology Program (Math, EE, CS) *Residential Assistant*, mentored 40 high school girls *Teaching Assistant* for motor-building workshop

Service

Feb 2017	National Radio Astronomy Observatory Outreach Volunteer
Spring 2014	Caltech Graduate Student Recruitment Co-Organizer
Oct 2011 – Dec 2016	Caltech Astronomy Outreach Volunteer Elementary school lectures Community observing nights Press liaison for Backpacker Magazine
Aug 2010	MIT Freshman Pre-Orientation Program Volunteer, Physics