

# JOSEPH M. AKANA MURPHY



Updated April 9, 2024 ◊ Pronouns: He/him ◊ Based in: San Francisco, CA

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## EDUCATION

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### University of California, Santa Cruz

*Ph.D.* in Astronomy and Astrophysics

2019–Expected 2025

Advisor: Professor Natalie Batalha

### Stanford University

*Master of Science* in Applied and Engineering Physics, Depth in Computer Science

2018–2019

*Bachelor of Science* in Physics, Minor in Mathematics

2014–2018

Advisors: Professor Bruce Macintosh, Dr. Ian Czekala

Thesis: *Inferring the Veiling Spectrum of the Pre-Main Sequence Star LkCa 15 with Gaussian Processes*

## HONORS AND AWARDS

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National Science Foundation Graduate Research Fellowship

2019–present

National Osterbrock Leadership Program Fellowship

2021–present

ARCS Foundation Scholarship, Northern California Chapter

2022–2023

LSST Corporation Data Science Fellowship

2019–2022

Regents' Fellowship, University of California

Fall 2019, Winter 2020

Thomas J. Watson Memorial Scholarship, IBM

2014–2018

Conference Travel Grant, Stanford University

2017

Wong Family Scholarship, Morristown High School (NJ) Alumni Association

2014–2018

## SOFTWARE

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tessla: [github.com/murphyjm/tessla](https://github.com/murphyjm/tessla)

A joint photometry and radial velocity modeling framework for exoplanets.

## PUBLICATIONS — Click [here](#) to view on NASA ADS.

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### First and second author publications

42. Lange, S.,<sup>†</sup> Akana Murphy, J. M. *et al.* “The TESS-Keck Survey. VII: A Superdense Sub-Neptune Orbiting TOI-1824.” Accepted for publication in *The Astronomical Journal*, March 2024.
41. Bowens-Rubin, R., Akana Murphy, J. M. *et al.* “A Wolf 359 in Sheep’s Clothing: Hunting for Substellar Companions in the Fifth-closest System Using Combined High-contrast Imaging and Radial Velocity Analysis.” *The Astronomical Journal*, 166, 260, 2023.
40. Akana Murphy, J. M. *et al.* “The TESS-Keck Survey. XVI. Mass Measurements for 12 Planets in Eight Systems.” *The Astronomical Journal*, 166, 153, 2023.
39. Chontos, A., Akana Murphy, J. M. *et al.* “The TESS-Keck Survey: Science Goals and Target Selection.” *The Astronomical Journal*, 163, 297, 2022.
38. Akana Murphy, J. M. *et al.* “Another Superdense Sub-Neptune in K2-182 b and Refined Mass Measurements for K2-199 b and c.” *The Astronomical Journal*, 162, 294, 2021.
37. Scarsdale, N., Akana Murphy, J. M. *et al.* “TESS-Keck Survey. V. Twin Sub-Neptunes Transiting the Nearby G Star HD 63935.” *The Astronomical Journal*, 162, 215, 2021.

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<sup>†</sup>Student directly supervised.

## Significant contribution

36. Beard, C. *et al.* **including Akana Murphy, J. M.** “Utilizing Photometry from Multiple Sources to Mitigate Stellar Variability in Precise Radial Velocities: A Case Study of Kepler-21.” In preparation.
35. Polanski, A. *et al.* **including Akana Murphy, J. M.** “The TESS-Keck Survey XX: 15 New TESS Planets and a Uniform RV Analysis of all Survey Targets.” In revision for *The Astronomical Journal*.
34. Lubin, J. *et al.* **including Akana Murphy, J. M.** “TESS-Keck Survey. IX. Masses of Three Sub-Neptunes Orbiting HD 191939 and the Discovery of a Warm Jovian Plus a Distant Substellar Companion.” *The Astronomical Journal*, 163, 101, 2022.
33. Kosiarek, M. *et al.* **including Akana Murphy, J. M.** “Physical Parameters of the Multiplanet Systems HD 106315 and GJ 9827.” *The Astronomical Journal*, 161, 47, 2021.

## $N^{\text{th}}$ -author publications

32. Chontos, A. *et al.* **including Akana Murphy, J. M.** “The TESS-Keck Survey XXI: 13 New Planets and Homogeneous Properties for 21 Subgiant Systems.” Submitted to *The Astronomical Journal*, February 2024.
31. Desai, A. *et al.* **including Akana Murphy, J. M.** “The TESS-Keck Survey. XVIII. A Sub-Neptune and Spurious Long-period Signal in the TOI-1751 System.” *The Astronomical Journal*, 167, 194, 2024.
30. Dalba, P. *et al.* **including Akana Murphy, J. M.** “Giant Outer Transiting Exoplanet Mass (GOT ’EM) Survey. IV. Long-term Doppler Spectroscopy for 11 Stars Thought to Host Cool Giant Exoplanets.” *The Astrophysical Journal Supplement Series*, 271, 16, 2024.
29. Rubenzahl, R. *et al.* **including Akana Murphy, J. M.** “The TESS-Keck Survey. XII. A Dense  $1.8 R_{\oplus}$  Ultra-short-period Planet Possibly Clinging to a High-mean-molecular-weight Atmosphere after the First Gigayear.” *The Astronomical Journal*, 167, 153, 2024.
28. Hill, M. *et al.* **including Akana Murphy, J. M.** “The TESS-Keck Survey. XIX. A Warm Transiting Sub-Saturn-mass Planet and a Nontransiting Saturn-mass Planet Orbiting a Solar Analog.” *The Astronomical Journal*, 167, 151, 2024.
27. Householder, A. *et al.* **including Akana Murphy, J. M.** “Investigating the Atmospheric Mass Loss of the Kepler-105 Planets Straddling the Radius Gap.” *The Astronomical Journal*, 167, 84, 2024.
26. Beard, C. *et al.* **including Akana Murphy, J. M.** “The TESS-Keck Survey. XVII. Precise Mass Measurements in a Young, High-multiplicity Transiting Planet System Using Radial Velocities and Transit Timing Variations.” *The Astronomical Journal*, 167, 70, 2024.
25. Mallorquín Díaz, M. *et al.* **including Akana Murphy, J. M.** “TOI-1801 b: a temperate mini-Neptune around a young M0.5 dwarf.” *Astronomy & Astrophysics*, 680, A76, 2023.
24. Blunt, S. *et al.* **including Akana Murphy, J. M.** “Overfitting Affects the Reliability of Radial Velocity Mass Estimates of the V1298 Tau Planets.” *The Astronomical Journal*, 166, 62, 2023.
23. Dai, F. *et al.* **including Akana Murphy, J. M.** “A Mini-Neptune Orbiting the Metal-poor K Dwarf BD+29 2654.” *The Astronomical Journal*, 166, 49, 2023.
22. MacDougall, M. *et al.* **including Akana Murphy, J. M.** “The TESS-Keck Survey. XV. Precise Properties of 108 TESS Planets and Their Host Stars.” *The Astronomical Journal*, 166, 33, 2023.

21. Deeg, H. J. *et al.* **including Akana Murphy, J. M.** “TOI-1416: A system with a super-Earth planet with a 1.07d period.” *Astronomy & Astrophysics*, 677, A12, 2023.
20. Hon, M. *et al.* **including Akana Murphy, J. M.** “A close-in giant planet escapes engulfment by its star.” *Nature*, 618, 2023.
19. Knudstrup, E. *et al.* **including Akana Murphy, J. M.** “Radial velocity confirmation of a hot super-Neptune discovered by TESS with a warm Saturn-mass companion.” *Monthly Notices of the Royal Astronomical Society*, 519, 2023.
18. Brinkman, C. L. *et al.* **including Akana Murphy, J. M.** “TOI-561 b: A Low-density Ultra-short-period “Rocky” Planet around a Metal-poor Star.” *The Astronomical Journal*, 165, 88, 2023.
17. Van Zandt, J. E. *et al.* **including Akana Murphy, J. M.** “TESS-Keck Survey XIV: Two giant exoplanets from the Distant Giants Survey.” *The Astronomical Journal*, 165, 60, 2023.
16. Dai, F. *et al.* **including Akana Murphy, J. M.** “TOI-1136 is a Young, Coplanar, Aligned Planetary System in a Pristine Resonant Chain.” *The Astronomical Journal*, 165, 33, 2023.
15. El Mufti, M. *et al.* **including Akana Murphy, J. M.** “TOI 560: Two Transiting Planets Orbiting a K Dwarf Validated with iSHELL, PFS, and HIRES RVs.” *The Astronomical Journal*, 165, 10, 2023.
14. MacDougall, M. *et al.* **including Akana Murphy, J. M.** “The TESS-Keck Survey. XIII. An Eccentric Hot Neptune with a Similar-mass Outer Companion around TOI-1272.” *The Astronomical Journal*, 164, 97, 2022.
13. Barragán, O. *et al.* **including Akana Murphy, J. M.** “The young HD 73583 (TOI-560) planetary system: Two 10- $M_{\oplus}$  mini-Neptunes transiting a young, bright, and active K dwarf.” *Monthly Notices of the Royal Astronomical Society*, 514, 2022.
12. Turtelboom, E. *et al.* **including Akana Murphy, J. M.** “The TESS-Keck Survey. XI. Mass Measurements for Four Transiting sub-Neptunes orbiting K dwarf TOI-1246.” *The Astronomical Journal*, 163, 293, 2022.
11. Winters, J. *et al.* **including Akana Murphy, J. M.** “A Second Planet Transiting LTT 1445A and a Determination of the Masses of Both Worlds.” *The Astronomical Journal*, 163, 168, 2022.
10. Grunblatt, S. K. *et al.* **including Akana Murphy, J. M.** “TESS Giants Transiting Giants II: The hottest Jupiters orbiting evolved stars.” *The Astronomical Journal*, 163, 120, 2022.
9. Dalba, P. A. *et al.* **including Akana Murphy, J. M.** “The TESS-Keck Survey. VIII. Confirmation of a Transiting Giant Planet on an Eccentric 261-day Orbit with the Automated Planet Finder Telescope.” *The Astronomical Journal*, 163, 61, 2022.
8. Heidari, N. *et al.* **including Akana Murphy, J. M.** “HD 207897 b: A dense sub-Neptune transiting a nearby and bright K-type star.” *Astronomy & Astrophysics*, 658, A176, 2022.
7. MacDougall, M. *et al.* **including Akana Murphy, J. M.** “The TESS-Keck Survey. VI. Two Eccentric sub-Neptunes Orbiting HIP-97166.” *The Astronomical Journal*, 162, 265, 2021.
6. Dai, F. *et al.* **including Akana Murphy, J. M.** “TKS X: Confirmation of TOI-1444b and a Comparative Analysis of the Ultra-short-period Planets with Hot Neptunes.” *The Astronomical Journal*, 162, 62, 2021.
5. Rubenzahl, R. *et al.* **including Akana Murphy, J. M.** “The TESS-Keck Survey IV: A Retrograde, Polar Orbit for the Ultra-Low-Density, Hot Super-Neptune WASP-107b.” *The Astronomical Journal*, 161, 119, 2021.

4. Weiss, L. *et al.* including Akana Murphy, J. M. “The TESS-Keck Survey II: An Ultra-Short Period Rocky Planet and its Siblings Transiting the Galactic Thick-Disk Star TOI-561.” *The Astronomical Journal*, 161, 56, 2021.
3. Dai, F. *et al.*, including Akana Murphy, J. M. “The TESS-Keck Survey. III. A Stellar Obliquity Measurement of TOI-1726 c.” *The Astronomical Journal*, 160, 193, 2020.
2. Cloutier, R. *et al.* including Akana Murphy, J. M. “TOI-1235 b: A Keystone Super-Earth for Testing Radius Valley Emergence Models around Early M Dwarfs.” *The Astronomical Journal*, 160, 22, 2020.
1. Dalba, P. A. *et al.* including Akana Murphy, J. M. “The TESS-Keck Survey. I. A Warm Sub-Saturn-mass Planet and a Caution about Stray Light in TESS Cameras.” *The Astronomical Journal*, 159, 241, 2020.

## OBSERVING EXPERIENCE

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10-meter Keck I telescope (HIRES) - 65 nights

January 2020–March 2023

## SUCCESSFUL TELESCOPE PROPOSALS

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### Co-Investigator

7. NASA KSMS, KPF/Keck, PI: Luque, R., “THIRSTEE: Understanding the origin and nature of the small exoplanet population.” 10 nights, 2024A–2025B (4 semesters total).
6. NASA KSMS, KPF/Keck, PI: Crossfield, C., “A3C RVs: Atmospheres, Activity, Architectures, and Compositions of Sub-Neptunes with KPF.” 10 nights, 2024A–2025B (4 semesters total).
5. KPF/Keck, PI: Dressing, C., “The TESS-Keck Survey 2.0: Diving Deeper into the Planetary Mass Regime with the Keck Planet Finder.” 6 nights, 2023B.
4. HIRES/Keck, PI: Batalha, N., “Are Water Worlds Ubiquitous in the Milky Way?” 4.5 nights, 2023A.
3. HIRES/Keck, PI: Batalha, N., “Simultaneous Radial Velocity and Photometric Monitoring of an Evaporating Sub-Neptune.” 1 night, 2022B.
2. STIS/*HST*, PI: Loyd, R. O. P., “Leveraging High Radial Velocities to Get to the Core of Planetary Lyman-alpha Transits.” 12 orbits, Cycle 29.
1. MAROON-X/Gemini North, PI: Crossfield, I., “Mass and Spin-Orbit Alignment of a Temperate Neptune.” 14.7 hours, 2021B.

## SUCCESSFUL COMPUTING RESOURCE PROPOSALS

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### Principal Investigator

The following programs make use of the **Expanse** supercomputer at the San Diego Supercomputer Center through the National Science Foundation’s Advanced Cyberinfrastructure Coordination Ecosystem: Services & Support (ACCESS) program and its predecessor, the eXtreme Science and Engineering Discovery Environment (XSEDE).

3. ACCESS Explore, “A Mass and Radius Catalog of Small TESS Planets Amenable to Atmospheric Characterization with JWST.” 200,000 core hours, January 2023.
2. ACCESS Startup Allocation Supplement, “A Mass and Radius Catalog of Small TESS Planets Amenable to Atmospheric Characterization with JWST.” 5,000 core hours, November 2022.
1. XSEDE Startup Allocation, “A Mass and Radius Catalog of Small TESS Planets Amenable to Atmospheric Characterization with JWST.” 10,000 core hours, 500 GB memory, January 2022.

## ADVISING AND TEACHING EXPERIENCE

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### Students advised

Ms. Sarah Lange, UCSC undergraduate, Koret Scholarship Award winner October 2021–March 2024  
A superdense sub-Neptune orbiting TOI-1824. Paper accepted for publication in *AJ*.

Ms. Bronwen Hardee, UCSC undergraduate June 2020–January 2021  
Constructing a high-fidelity exoplanet mass and radius catalog.

### Volunteer Instructor

Introduction to Astronomy Research Summer 2020, 2021  
GitHub repositories: [2020](#), [2021](#)

### Teaching Assistant

Astronomy 119: Introduction to Scientific Computing, UCSC Spring 2020  
Physics 43: Electricity and Magnetism, Stanford University Spring 2019  
Physics 41: Mechanics, Stanford University Winter 2019  
Physics 41A: Mechanics, Stanford University Winter 2018

### Course Instructor

Physics 91SI: Practical Computing for Scientists, Stanford University Spring 2017

## SCIENTIFIC PRESENTATIONS

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### Contributed Talks

9. *Accurate or TACcurate? Investigating the effects of time-sampling & undetected companions on the accuracy of RV mass measurements*, Density Matters, 2024 February 8.
8. *12 New Planets from the TESS-Keck Survey and a Fresh Look at the Exoplanet Mass-Radius Diagram*, W. M. Keck Observatory Science Meeting, 2023 September 8.
7. *12 New Planets from the TESS-Keck Survey*, The Other Worlds Laboratory (OWL) Exoplanet Summer Program, 2023 July 11.
6. *The Masses and Radii of Eight Sub-Neptunes Amenable to Atmospheric Characterization*, Exoplanets IV, 2022 May 5.
5. *Superdense Sub-Neptunes? The Curious Case of K2-182 b*, Bay Area Exoplanet Meeting #39, 2021 December 3.
4. *The TESS-Keck Survey: Building a Statistical Sample of Sub-Neptunes Primed for Atmospheric Characterization*, TESS Science Conference II, 2021 August 3.
3. *Sub-Neptune Diversity in the Exoplanet Mass-Radius Diagram: The masses of three K2 sub-Neptunes and preliminary analysis of atmospheric targets from the TESS-Keck Survey*, UCSC FLASH Seminar, 2021 May 21.
2. *The TESS-Keck Survey: Building a Statistical Sample of Sub-Neptunes Primed for Atmospheric Characterization*, TESS Science Team Meeting #25, 2021 March 25.
1. *The TESS-Keck Survey: Building a Statistical Sample of Sub-Neptunes Primed for Atmospheric Characterization*, Bay Area Exoplanet Meeting #36, 2021 March 5.

### Posters

3. *Accurate or TACcurate? Investigating the effects of time-sampling & undetected companions on the accuracy of RV mass measurements*, Extreme Solar Systems V, 601.28, 2024.
2. *Inferring the spectrum of accretion onto LkCa 15 with Gaussian Processes*, [AAS Meeting 233, 360.19, 2019](#).

1. *Disentangling spectra of young stars*, [AAS Meeting 231](#), 339.08, 2018.

## OUTREACH

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### Volunteering

Mentor, Latitude High School, Oakland, CA

Fall 2022

Advised 10th grade computer science students as they developed a math-based video game.

### Invited Public Talks

4. *Observing Exoplanets in the Era of JWST*, Morristown High School (NJ) STEM Academy Meeting, 2023 February 22.
3. *Uncovering the Nature of Exoplanets with Ground- and Space-based Telescopes*, Morristown High School (NJ) STEM Academy Meeting, 2022 February 9.
2. *Exoplanets: Detecting and Characterizing Worlds Beyond the Solar System*, Morristown High School (NJ) STEM Academy Meeting, 2021 April 7.
1. *Piecing Together the Universe with Generative Models*, Astronomy on Tap, Santa Cruz, 2020 March 5.

### Miscellaneous Presentations

2. Panelist, *The Ethics of Climate Change*, ARCS Supernova Research Symposium, 2023 April 17.
1. Session co-leader, *AAS National Osterbrock Leadership Program (NOLP): Reimagining the Astronomy PhD for the 21<sup>st</sup> Century*, AAS Meeting 241, 2023 January 10.