JOSEPH M. AKANA MURPHY

Updated January 3, 2023 ◇ Pronouns: He/him/his
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SCIENTIFIC INTERESTS

Exoplanet characterization and formation, applications of statistical modeling and machine learning

EDUCATION

University of California, Santa Cruz
Ph.D. in Astronomy and Astrophysics 2019 - Expected 2024
Advisor: Professor Natalie Batalha

Stanford University
Master of Science in Applied and Engineering Physics 2018 - 2019
Bachelor of Science in Physics 2014 - 2018
Minor in Mathematics
Advisors: Professor Bruce Macintosh, Dr. Ian Czekala
Thesis: *Inferring the Veiling Spectrum of the Pre-Main Sequence Star LkCa 15 with Gaussian Processes*

SCIENTIFIC RESEARCH

The TESS-Keck Survey 2019 - present
Observing and analysis support for the TESS-Keck Survey, a multi-institution collaboration with the goal of measuring the orbits and masses of 100 TESS planets with Keck-HIRES.

Prioritizing TESS Targets for Atmospheric Characterization 2019 - 2021
A prioritization scheme to systematically search for the TESS targets that are best-suited for atmospheric follow-up with *JWST*.

Unveiling the Spectra of Young Stars with Gaussian Processes 2017 - 2019
Using Gaussian processes to model time-series spectroscopic observations of a young star, LkCa 15, we disentangle the stellar atmosphere from the spectrum of accretion, revealing time-variable, line-specific emission related to the infalling material.

HONORS AND AWARDS

ARCS Foundation Scholarship, Northern California Chapter 2022 - present
Osterbrock Leadership Program Fellowship, University of California, Santa Cruz 2021 - present
National Science Foundation Graduate Research Fellowship 2019 - present
LSST Corporation Data Science Fellowship 2019 - 2022
Regents' Fellowship, University of California, Santa Cruz Fall 2019, Winter 2020
Conference Travel Grant, Stanford University 2017
Thomas J. Watson Memorial Scholarship, IBM 2014 - 2018

OBSERVING EXPERIENCE

10-meter Keck I telescope (HIRES) - 63 half-nights January 2020 - present

PROFESSIONAL EXPERIENCE

Graduate Student
Department of Astronomy and Astrophysics, University of California, Santa Cruz — 2019 - present

Research Assistant
Kavli Institute for Particle Astrophysics and Cosmology, Stanford University — 2017 - 2019

Research and Development Intern
Pathfinder Systems, Inc., Denver, CO — Summer 2016

PUBLICATIONS (Link to NASA ADS search results)

First and second author publications

22. Chontos, A., **Murphy, J. M. A.** *et al.* "The TESS-Keck Survey: Science Goals and Target Selection." *The Astronomical Journal*, 163, 297, 2022.

21. **Murphy, J. M. A.** *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.

20. Scarsdale, N., **Murphy, J. M. A.** *et al.* "TESS-Keck Survey. V. Twin Sub-Neptunes Transiting the Nearby G Star HD 63935." *The Astronomical Journal*, 162, 215, 2021.

Significant contribution

19. Lubin, J. *et al.* **including Murphy, J. M. A.** "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.

18. Kosiarek, M. *et al.* **including Murphy, J. M. A.** "Physical Parameters of the Multiplanet Systems HD 106315 and GJ 9827." *The Astronomical Journal*, 161, 47, 2021.

Many-author publications

17. Knudstrup, E. *et al.* **including Murphy, J. M. A.** "Radial velocity confirmation of a hot super-Neptune discovered by TESS with a warm Saturn-mass companion." Accepted for publication in the *Monthly Notices of the Royal Astronomical Society*, December 12, 2022.

16. Van Zandt, J. E. *et al.* **including Murphy, J. M. A.** "TESS-Keck Survey XIV: Two giant exoplanets from the Distant Giants Survey." Accepted for publication in *The Astronomical Journal*, December 1, 2022.

15. El Mufti, M. *et al.* **including Murphy, J. M. A.** "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 Murphy, J. M. A.** "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. Turtelboom, E. *et al.* **including Murphy, J. M. A.** "The TESS-Keck Survey. XI. Mass Measurements for Four Transiting sub-Neptunes orbiting K dwarf TOI-1246." *The Astronomical Journal*, 163, 293, 2022.

12. Barragán, O. *et al.* **including Murphy, J. M. A.** "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*, 2022.

11. Winters, J. *et al.* **including Murphy, J. M. A.** "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 Murphy, J. M. A.** "*TESS* Giants Transiting Giants II: The hottest Jupiters orbiting evolved stars." *The Astronomical Journal*, 163, 120, 2022.

9. Dalba, P. A. *et al.* **including Murphy, J. M. A.** "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 Murphy, J. M. A.** "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 Murphy, J. M. A.** "The TESS-Keck Survey. VI. Two Eccentric sub-Neptunes Orbiting HIP-97166." *The Astronomical Journal*, 162, 265, 2021.

6. Dai, F. *et al.* **including Murphy, J. M. A.** "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 Murphy, J. M. A.** "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 Murphy, J. M. A.** "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 Murphy, J. M. A.** "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 Murphy, J. M. A.** "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 Murphy, J. M. A.** "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.

SUCCESSFUL TELESCOPE PROPOSALS

Co-Investigator

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

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, effective 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

Students advised

Ms. Sarah Lange, UCSC undergraduate, Koret Scholarship Award winner — October 2021 - present
A superdense sub-Neptune orbiting TOI-1824.

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

Contributed Talks

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

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

Volunteering

Mentor, Latitude High School, Oakland, CA Fall 2022

Advise 10th grade computer science students as they develop a math-based video game.

Invited Public Talks

3. *Exoplanets: Detecting and Characterizing Worlds Beyond the Solar System*, 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.