Joseph G. Schulze

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125 South Oval Mall, Columbus, OH, 43210

EDUCATION

The Ohio State University, Columbus, Ohio
Ph.D. in Earth Sciences
Jun 2020 – Present
      Advisor: Wendy R. Panero

M.S. in Earth Sciences
Aug 2018 – May 2020
    Advisor: Wendy R. Panero
    Thesis: [Can we predict the composition of an exoplanet?](#)
    GPA: 3.945 / 4.000

Dual B.S. in Physics & Astronomy and Astrophysics
Aug 2013 – May 2017
    Thesis Advisor: Donald M. Terndrup
    Thesis: [Characterization of LP133-373: A Double-line, Eclipsing dMe Binary](#)
    GPA: 3.758 / 4.000
    Honors: Magna Cum Laude, Research Distinction in Astronomy

FIRST AUTHOR PUBLICATIONS   ORCID: 0000-0003-3570-422X

Schulze, J. G., Wang, J., Johnson, J. A., Gaudi, B. S., Martinez, R. R., Unterborn, C. T., & Panero, W. R. (2024). A Gap in the Densities of Small Planets Orbiting M Dwarfs: Rigorous Statistical Confirmation Using the Open-source Code RhoPop. *The Planetary Science Journal*, 5(3), 71. DOI: 10.3847/PSJ/ad26f5

Schulze, J. G., Ji Wang, J. A. Johnson, B. S. Gaudi, C. T. Unterborn, and W. R. Panero. "On the Probability That a Rocky Planet's Composition Reflects Its Host Star." *The Planetary Science Journal* 2, no. 3 (2021): 113. DOI: 10.3847/PSJ/abcaa8

OTHER PEER-REVIEWD PUBLICATIONS   ORCID: 0000-0003-3570-422X

Martínez, Romy Rodríguez, David V. Martin, B. Scott Gaudi, **Joseph G. Schulze**, Anusha Pai Asnodkar, Kiersten M. Boley, and Sarah Ballard. "A Comparison of the Composition of Planets in Single-planet and Multiplanet Systems Orbiting M dwarfs." *The Astronomical Journal* 166, no. 4 (2023): 137. DOI: 10.3847/1538-3881/aced9a

Boley, Kiersten M., Wendy R. Panero, Cayman T. Unterborn, **Joseph G. Schulze**, Romy Rodríguez Martínez, and Ji Wang. "Fizzy Super-Earths: Impacts of Magma Composition on the Bulk Density and Structure of Lava Worlds." *The Astrophysical Journal* 954, no. 2 (2023): 202. DOI: 10.3847/1538-4357/acea85

Rodríguez-Martínez, Romy, B. Scott Gaudi, **Joseph G. Schulze**, et al. "A Reanalysis of the Composition of K2-106b: An Ultra-short-period Super-Mercury Candidate." *The Astronomical*

Journal 165, no. 3 (2023): 97. DOI: [10.3847/1538-3881/acb04b](10.3847/1538-3881/acb04b)

Unterborn, C. T., S. J. Desch, J. Haldemann, A. Lorenzo, **J. G. Schulze**, N. R. Hinkel, and W. R. Panero. "The Nominal Ranges of Rocky Planet Masses, Radii, Surface Gravities, and Bulk Densities." *The Astrophysical Journal* 944, no. 1 (2023): 42. DOI: 10.3847/1538-4357/acaa3b

Saup, Casey, Kara Lamantia, Zhaozhe Chen, Brandon Bell, **Joseph Schulze**, Douglas Alsdorf, and Audrey H. Sawyer. "On-Campus Field Experiences Help Students to Learn and Enjoy Water Science During the COVID-19 Pandemic." *Frontiers in Environmental Science* (2022): 483. DOI: 10.3389/fenvs.2022.877327

Phillips, Caprice L., Ji Wang, Sarah Kendrew, Thomas P. Greene, Renyu Hu, Jeff Valenti, Wendy R. Panero, and **Joseph Schulze**. "Detecting Biosignatures in the Atmospheres of Gas Dwarf Planets with the James Webb Space Telescope." *The Astrophysical Journal* 923, no. 2 (2021): 144. DOI: [10.3847/1538-4357/ac29be](10.3847/1538-4357/ac29be)

Martínez, Romy Rodríguez, Daniel J. Stevens, B. Scott Gaudi, **Joseph G. Schulze**, Wendy R. Panero, Jennifer A. Johnson, and Ji Wang. "Analytic Estimates of the Achievable Precision on the Physical Properties of Transiting Planets Using Purely Empirical Measurements." *The Astrophysical Journal* 911, no. 2 (2021): 84. DOI: [10.3847/1538-4357/abe941](10.3847/1538-4357/abe941)

M.R. Page, B. A. McCullian, C. M. Purser, **J. G. Schulze**, T. M. Nakatani, C.S. Wolfe, J. R. Childress et al. "Optically detected ferromagnetic resonance in diverse ferromagnets via nitrogen vacancy centers in diamond." *Journal of Applied Physics* 126, no. 12: 124902. DOI: [10.1063/1.5083991](10.1063/1.5083991)

OTHER PUBLICATIONS

Sawyer, A. H., J. Cervenec, **J. Schulze** (2022). Introductory groundwater laboratory exercise for in-person and online teaching modes, HydroShare, https://doi.org/10.4211/hs.7f6295a88f2743a58e3447db650df0d2

D.M. Terndrup, G. Calhoun, R. Cannata, **J. Schulze**, S. Dong, and J.L. Prieto. May 2016. Spectroscopic Classification of ASASSN-16fj/AT2016cmn as a Type Ia SN. *The Astronomer's Telegram,* No. 9075. https://www.astronomerstelegram.org/?findmsg

PRESENTATIONS

2022 Jul	Rocky Worlds II, Oxford, UK.
	Title: Uncertain Planets: Determining How Precisely We Can Know Rocky Planet Composition Given Equation of State Limitations.
2020 Dec	American Geophysical Union, Fall Meeting 2020, Virtual.
	Title: The rock- star relationship: assessing the probability that a rocky planet's Composition reflects its host star.
2019 Dec	American Geophysical Union, Fall Meeting 2019, San Francisco, CA.
	Title: Do the Composition's of Rocky Planets Reflect their Star's Refractory Abundances?
2019 Sep	School of Earth Sciences Graduate Student Seminar, The Ohio State University.

Title: Do Rocky Planets Reflect the Compositions of their Host Stars?

AWARDS

2019 Apr	Estwing Award: Distinguished First Year Graduate Student in Earth Science
2018 Aug	University Fellowship, The Ohio State University

OPEN-SOURCE SOFTWARE DEVELOPMENT

RhoPop (lead developer) – a python-based mixture model in a hierarchical Bayesian framework for determining whether populations of small planets represent a compositional continuum or multiple, distinct subpopulations, requiring novel formation models. Source: https://github.com/schulze61/RhoPop

ExoPlex (contributing developer) – a python-based mass-radius-composition calculator for small planets. I am working on allowing ExoPlex to handle asymmetric planet mass and radius uncertainties and implementing the methods described in Schulze et al. (2021) to determine the statistical likelihood that the composition of a rocky exoplanet is consistent with what is expected given its host star's composition. Source: https://github.com/CaymanUnterborn/ExoPlex

Exolens (lead developer) – software calculates the composition of a rocky planet as inferred from its density. It compares this with the expected composition per the composition of the planet's host and calculates the statistical likelihood that the two are the same. Source: https://github.com/schulze61/ExoLens

TEACHING EXPERIENCE

Instructor of Record for ES 5205 Planetary Science

SP 24

- I designed lectures, projects, and in-class python exercises and completed all grading for 9 junior and senior level Earth Science, Astronomy, and Engineering students. This is a required course for the undergraduate planetary science certificate at Ohio State.

Head Graduate Teaching Assistant for ES 1100/1121

SP 20, SU 20, AU 20, SP 21

- I was the head GTA for the introductory Earth Science courses. I oversaw between ~5-13 TAs and ~500-900 students, facilitated the transition to an online format during the CV19 pandemic, and lead the development of a hybrid online + in-person lab structure.

Graduate Teaching Assistant for Ohio State Geology Field Camp

SU 23

- I supervised 19 students in various UT field sites over a six-week period. My duties included assisting the students with geologic mapping in the field, grading exams and mapping exercises, and all daily logistics from coordinating meals and driving.

Graduate Teaching Assistant for ES 1100/1121

AU 19, SU 21, AU23

- I taught three lab sections per week, prepared introductory lectures for each lab, held

weekly office hours, and graded/provided feedback on labs.

ACADEMIC SERVICE & PUBLIC OUTREACH

Reviewer for *The Astrophysical Journal* (2022)

School of Earth Sciences Delegate to The Ohio State University Council of Graduate Students. During my time as a CGS delegate, I also served on the Data & Operations sub-committee and helped to design a targeted graduate student survey to help substantiate graduate student concerns with data.

Panel Member (exoplanet expert) for The Ohio State Department of Astronomy's Monthly *Science Fact or Science Fiction Movie Night!* (2021)

Metro Rocks – The Ohio State University School of Earth Sciences Outreach Program I designed and supervised workshop on the structure and relative size-scales of objects in the solar system to middle-school students. (2018)

TECHNICAL SKILLS

Computer Languages: Python, C++, Unix
Python-based Software: Dynesty, PyMC3, ExoPlex
Other Software: MATLAB, Adobe Illustrator, IGOR
Computational Methods: Mixture models, MCMC, Hierarchical Bayesian Models

CERTIFICATES

[The Erdős Institute](#) Fall 2023 Data Science Boot Camp Certificate of Completion