Ben Cassese

Astronomer, Minor Planet Center, Center for Astrophysics | Harvard & Smithsonian
Email: benjamin.cassese@cfa.harvard.edu; Website: ben-cassese.github.io; GitHub: ben-cassese

Employment

Harvard–Smithsonian Center for Astrophysics, Minor Planet Center 2026-
Astronomer, 2026-
Columbia University Department of Astronomy and Astrophysics 2021-2025
PhD Candidate, 2023-2025
PhD Student, Teaching Assistant, Lab Instructor 2021-2023

Education

PhD, Astronomy, Columbia University 2025
Advisors: David Kipping, Malena Rice. Dissertation:
"Differentiable Models for High-Precision Time Series Observations of Planetary Systems"
MPhil, Astronomy, Columbia University 2024
M.A., Astronomy, Columbia University 2023
B.S. Planetary Science and History, California Institute of Technology 2016-2020

Publications (view all records on ADS, incl. select scicomm)

As First Author:

5. **Cassese, B.**, and 7 others, "A JWST Transit of a Jupiter Analog I. Constraints on the Oblateness of Kepler-167 e" *AJ*, 171, 150
4. **Cassese, B.**, and 8 others, "Quantifying the Contamination of TESS Ecliptic-Plane Light Curves by Minor Planets" *AJ*, 171, 136
3. **Cassese, B.**, Rice, M., & Lu, T. (2025) "A High-Precision, Differentiable Code for Solar System Ephemerides" *PSJ*, 6, 252
2. **Cassese, B.**, Vega, J., Lu, T., Rice, M., Poddar, A., & Kipping, K. (2024) "`squishyplanet`: modeling transits of non-spherical exoplanets in JAX", *JOSS*, 9(100), 6972
1. **Cassese, B.** & Kipping, D. (2022) "Kepler-1708 b-i is likely undetectable with HST", *MNRAS*, 516, 3, 3701–3708

As Co-Author:

6. Kipping, D., **Cassese, B.**, and 3 others, "A JWST Transit of a Jupiter Analog II. A Search for Exomoons" *AJ* 172 76
5. Yahalomi, D. and 11 others, incl. **Cassese, B.** (2024) "The `democratic detrender`:Ensemble-Based Removal of the Nuisance Signal in Stellar Time-Series Photometry", *ApJS* 283 51
4. Lu, T., Li, G., **Cassese, B.** & Lin, D.N.C. (2024) "The Dynamical History of HIP-41378 f - Oblique Exorings Masquerading as a Puffy Planet", *ApJ*, 980, 39
3. Kipping, K. and 9 others, incl. **Cassese, B.** (2024) "Concerning the possible exomoons around Kepler-1625 b and Kepler-1708 b ", *Nat. Astronomy, Matters Arising*, Vol. 9, p. 795-798.
2. Hunt, J. and 6 others, incl. **Cassese, B.** (2023) "Radial phase spirals in the Solar neighbourhood", *MNRAS*, 527, 4, 11393–11403
1. Trumbo, S., Davis, M.R., **Cassese, B.** & Brown, M.E. (2022) "Spectroscopic mapping of Io's surface with HST/STIS: SO2 frost, sulfur allotropes, and large-scale compositional patterns", *Planet. Sci. J.* **3** 272

Telescope Time

As PI:

James Webb Space Telescope:

Cassese, B. & 6 others Cycle 5 GO. ID: 11253."Fluffy or Flashy? Resolving the Mystery of the Coldest-Known Super Puff", 44.7 hours, NIRISS

Cassese, B. & 11 others Cycle 3 GO. ID: 6491."Revealing the Oblateness and Satellite System of an Extrasolar Jupiter Analog", 71.62 hours, NIRSpec

Subaru 8.2m Telescope:

Cassese, B. & Rice, M. 2024a, "Follow up of TESS TNO Candidates", 1 night, HSC. Time granted via NSF/NOIRLab's share of Gemini Observatory time → Gemini Observatory's time sharing agreement w/ Subaru Telescope

Víctor M. Blanco 4m Telescope:

Cassese, B. & Rice, M. 2024a, "Follow up of TESS TNO Candidates", 3 nights, DECam. Time granted via NSF/NOIRLab's 2024a call for proposal

MDM Hiltner 2.4m Telescope:

Cassese, B. & Yahalomi, D. 2023a, "Follow up of a Candidate TNO Detection from TESS", 5 nights, OSMOS imager

Cassese, B. 2022b, "Attempted Recovery of a Distant Trans-Neptunian Object", 5 nights, OSMOS imager (shortened to 2 following the 2022 Contreras wildfire)

As Co-I:

James Webb Space Telescope:

(archival program) Kipping, D. **Cassese, B.**, Batygin, K. Cycle 4 GO. ID: JWST-AR-09042. "For the Love of Exoplanets: Characterization of the Internal Structure of Hot-Jupiters".

Changeat, Q.. & 11 others, incl. **Cassese, B.** Cycle 3 GO. ID: 5531."Contextualizing our solar-system: Atmospheric characterization of the Jupiter-analogue Kepler-167e", 39.26 hours. Selected, but observations not taken due to observatory conflicts

Palomar Observatory Palomar 200-inch Hale Telescope:

Rice, M., & **Cassese, B.**. 2024b, "Examining the Edges of the Solar System", 4 nights, WaSP imager

Rice, M., & **Cassese, B.**. 2023b, "Examining the Edges of the Solar System", 5 nights, WaSP imager

MDM McGraw-Hill 1.3m Telescope:

Yahalomi, D., **Cassese, B.**, Sayeed, M., & Hattori, S. 2023a, "Photometric Confirmation and Ephemeris Refinement of TESS Planet Candidates", 5 nights

Yahalomi, D., **Cassese, B.**, Sayeed, M., & Hattori, S. 2022b, "Photometric Confirmation and Ephemeris Refinement of TESS Planet Candidates", 5 nights (cancelled following the 2022 Contreras wildfire)

Conference Talks

Cassese, B. & Rice, M. (2024), "Initial results of a TESS outer solar system survey", TESS Science Conference III, Cambridge, MA

Cassese, B. & Kipping, D. (2022), "Detectability of Galilean Moon Analogs with JWST", Exoplanets IV, Las Vegas, NV, 105.01

Cassese, B. & Stevenson, D. (2018) "Feasibility of in-situ water production during fast-accreting super-earth formation", 50th AAS DPS Meeting, Knoxville, TN, 101.01

Teaching

As Instructor:

ASTR 1904: Astronomy Lab I, Columbia	Fall 2022

As Teaching Assistant:

ASTR 1610: Theories of the Universe, from Babylon to Big Bang, Columbia	Spring 2022
ASTR 1404: Stars, Galaxies, and Cosmology, Columbia	Fall 2021
Ge/Ay 103: Introduction to Planetary Science, Caltech (4.89/5 review)	Spring 2020
Ge 1: Earth and Environment, Caltech (4.9/5 review)	Spring 2018

Awards and Fellowships

AAS Media Fellowship, American Astronomical Society	2022-23
Fritz B. Burns Prize, Division of Geological and Planetary Sciences, Caltech	2019
Beckman Political Science Award, California Institute of Technology	2019
Perpall Speaking Competition Winner, California Institute of Technology	2019
Gee Family Poster Competition Winner, California Institute of Technology	2018
George W. Housner Student Discovery Fund, California Institute of Technology	2018
Perpall Speaking Competition Finalist, California Institute of Technology	2018

Computation Resources

Cassese, B. (2025) Simulating the solar system for automated asteroid detection, NSF Access Program PHY250025, Explore level (400k CPU-hours)

Professional Engagement

Small Bodies Assesment Group (SBAG)
- Early Career Coordination Lead — 2026-2027

TESS Users Committee
- Community Representative — 2025-2027

The Planetary Science Journal
- Volunteer Reviewer — 2025-

Publications of the Astronomical Society of the Pacific
- Volunteer Reviewer — 2025-

Journal of Open Source Software (JOSS)
- Volunteer Reviewer — 2024-

American Astronomical Society
- AAS Media Fellow: Writer for AAS Nova — 2022-2024

Astrobites Collaboration
- Co-Chair, Science Policy Committee — 2022-2023
- Member, Scheduling Committee — 2022-2023
- Author — 2022-2024

National Academy of Sciences, Space Studies Board
- Lloyd V. Berkner Space Policy Intern *(Astro2020 Decadal Survey staff)* — 2019

AAS Division of Planetary Science Federal Relations Subcommittee
- Undergraduate Member — 2018-2020

Columbia University Astronomy Department
- High school outreach co-coordinator — 2024
- Admissions visit co-coordinator — 2023

Outreach and Mentoring

Mentor, Student Training in Astronomy Research program, Columbia Astronomy — 2024-present
Mentor, grad/undergrad mentoring program, Columbia Astronomy — 2021-present
Mentor, Independent Inquiry Project, Inspired Teaching Demonstration School — 2021-2022
Mentored an 8th grade project on exoplanets
Volunteer Tutor, RISE Program, Caltech Y — 2016-2019

Software

Lead Developer:

`asterias` — 2025
JAXified limb darkening from stellar atmosphere models. Based on Grant & Wakeford 2024.

`jorbit` — 2024
Solar system orbit fitting and propagation in JAX. Open source python package.

`squishyplanet` — 2024
Transits and phase curves of non-spherical exoplanets in JAX. Open source python package.

`astro-forecaster` — 2021
A vectorized and packaged up rewrite of `forecaster` *from Chen & Kipping 2017.*

Open-source contributions (pull requests only, for issues see my github):

`SORA`: PR for correctly resolving spacecraft locations (03/2025)
`tesswcs`: PR for correcting pointing info bug (03/2025)

`tess-prf`: PR for correcting bug when querying coordinates on detector edge (03/2025)
`exotic-ld`: Large PR, pre-compute grids of stellar models for faster runtime interpolation (08/2024)
`democratic-detrender`: Several PRs for online docs skeleton+content (06/2024)
`nbi`: Small PR for docs rendering (05/2024)

Other Presentations

At Home Institution:

Inter-department STEM Grad Talks, Graduate School of Arts and Sciences	Oct. 2022
Astrofest 2022, Columbia Astronomy Dept.	Sept. 2022
Columbia Astro "Friends of the Department" Evening, Columbia Astronomy Dept.	Jun. 2022
Small Council Donors Meeting, Cool Worlds Lab	Nov. 2021

At Other Institutions: *(* = invited)*

*Exoplanet Pizza Lunch, Harvard & Smithsonian Center for Astrophysics	Jan. 2026
*Exoplanets, Star & Planet Formation Seminar, Space Telescope Science Institute	Aug. 2025
*Astronomy Seminar, Carnegie EPL	May 2025
*Planetary lunch (PLUNCH) & Stars Seminar, UC Santa Cruz	May 2025
NYC Exoplanets, Flatiron Institute Center for Computational Astrophysics	May 2024
*Yale Exoplanets & Stars Seminar, Yale University	Apr. 2023
GothamFest 2023, Flatiron Institute Center for Computational Astrophysics	Jan. 2023
GothamFest 2021, Flatiron Institute Center for Computational Astrophysics	Dec. 2021

Science Communication

With Sky and Telescope:
The Webb Telescope Reveals a "Featherweight Giant" Planet (online 12/2024, print April 2025)

With AAS Nova:
Who Needs Jupiter? (09/2026)
An Interstellar Comet's Coma Composition (08/2026)
Finishing Off an Asteroid (08/2026)
Noble Gases Along for the Ride (07/2026)
Putting the Landing Site Before the Lander (07/2026)
Detached but Not Alone (06/2026)
Courtside Seats on Mars (06/2026)
Playing Pool with Planets (05/2026)
A New View of the Spectroscopic Universe (05/2026)
How Galaxies Grow Up (04/2026)
Enhancing the Sharpest Images (04/2026)
An Impostor Explosion (03/2026)
Jupiter's Atmosphere Holds Steady (03/2026)
Black Holes with a Shared Background (11/2025)
The Sun Left Home in a Hurry (11/2025)
Standing on a Sub-Neptune (11/2025)
A Black Hole Family Tree (10/2025)
Planets Can Be Bells: The Aftermath of Major Mergers (10/2025)
A Strange Brown Dwarf Gets Stranger (10/2025)
Researchers Spot a Rare Glowing, Growing Planet (10/2025)
Kicking Neutron Stars from the Nest (09/2025)

Cluster Before Stack: A New Algorithm for Pulsar Timing (09/2025)
Scars from a Black Hole (09/2025)
A Dusty Disk Points to a Potential Planet (08/2025)
Potential Discovery of a World Next Door (08/2025)
Cool It Down: Warm Jupiters Are Better Aligned Than Hot Jupiters (10/2024)
Hunting for a Target on the Fly (09/2024)
    [Carried by Sky & Telescope Online (09/2024)]
The Odds of the Unthinkable (08/2024)
Plotting the Course, a Billion Miles Away (08/2024)
The Featherweight Champion of Black Holes (07/2024)
Hot Stars Spin Sideways (07/2024)
Dimorphos, from Up Close and Far Away (06/2024)
Modeling the Unknown: A New Tool for Radio Bursts (05/2024)
Huge Survey vs. Tiny Space Junk (05/2024)
Possibility of Detecting Clumsy Asteroids (04/2024)
Cosmic Rays Near and Far (04/2024)
Making Computers Count Pulses (03/2024)
How to Slice a Star (03/2024)
Supernova Nickel and Neural Nets (03/2024)
Magnetic Last Moments (02/2024)
What Kind of World is LHS 1140 b? (02/2024)
The AAS Goes to LIGO (01/2024)
JWST: The World's Most Sophisticated Carbon Monoxide Detector (12/2023)
Patience Rewarded with a Planet (12/2023)
Two-for-One, Three Times: New Candidate Brown Dwarf Binaries (11/2023)
Enceladus, Previous Speedster (10/2023)
Metal Before It Was Cool: Super-Enrichment in the Early Universe (10/2023)
A Forge Without Iron (09/2023)
Lonely Neutrinos: IceCube's First Population Limits (09/2023)
Fast Radio Burst Roundup (08/2023)
    [Carried by Sky & Telescope Online (08/2023)]
Spotting an Exoplanet in the Mid-Infrared (08/2023)
All Dust, No Ice: Comet 46P/Wirtanen (07/2023)
    [Carried by Sky & Telescope Online (08/2023)]
When White Dwarf Is on the Menu (07/2023)
Baby Brown Dwarf Might be Growing: JWST Observations of TWA 27B (06/2023)
Triage with Random Forests: Machine Learning for Transient Classification (06/2023)
Serendipitous Supernovae (05/2023)
The First Y+Y Binary: Cool Brown Dwarfs Come in Pairs (04/2023)
Planning for Touchdown: New Maps of the Moon's South Pole (04/2023)
Different Pipelines, Different Atmospheres? (03/2023)
Deep Learning, Deep Images, Disk Galaxies (03/2023)
Bangs Without Flashes: Gravitational Waves and Elusive Neutrinos (03/2023)
A New Spider Joins a Deadly Club (02/2023)
Plunging Through the Plumes of Enceladus (02/2023)
The Corgi of Exoplanets: Methane Mystery on HAT-P-18b (01/2023)
    [Carried by Sky & Telescope Online (01/2023)]
Dotting the i's, Crossing the t's: Follow-Up of an Exo-Venus (12/2022)
Four Stars, Many Eclipses (11/2022)
    [Carried by Sky & Telescope Online (11/2022)]

A Supernova Hits a Cosmic Speed Bump (11/2022)
[Carried by Sky & Telescope Online (11/2022)]
Under Pressure: A New Technique for Measuring Gas Surface Density (11/2022)
New Life for Lunar Seismic Data (10/2022)
[Carried by Sky & Telescope Online (10/2022)]
Software Updates: The Latest from the Astropy Project (9/2022)
Beginnings of a Branch (9/2022)

With Astrobites:
Fish(er)ing for Planet Nine (02/2023)
[Carried by AAS Nova (08/2023)]
Biases from Bulging Planets (12/2022)
[Carried by AAS Nova (4/2023)]
Twirling in the Cold: The spins of Eris and Dysnomia (12/2022)
Asteroids in the Archives (10/2022)
A Conversation with Dr. Julie Davis, AAS Bahcall Fellow (7/2022)
(Re)discovering Gravity (6/2022)
Star light, lamp bright (5/2022)
[Carried by AAS Nova (6/2022)]
Teamwork Across Timezones: The Transit of TOI-2180 b (4/2022)
The bigger they are, the smaller their moons? (2/2022)

Media

Scientists use space telescope to step up hunt for first 'exomoon' (The Times of London, 10/2024)
JWST will officially begin searching for exomoons around other planets (New Scientist, 03/2024)