# Alex R. Howe

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RESEARCH INTERESTS

- Extrasolar planet atmospheres.
- Extrasolar planet spectral modeling.
- Extrasolar planet internal structure and evolution.
- Mass loss processes for extrasolar planets.

CURRENT POSITION

Postdoctoral Research Fellow, University of Michigan, 2016-Present

EDUCATION

Graduate School, Department of Astrophysical Sciences, Princeton University, August 2016

- Thesis: *Topics in Extrasolar Planet Characterization*
- Adviser: Professor Adam Burrows

B.S., Department of Physics and Astronomy, Ohio Wesleyan University, May 2011

- Thesis Adviser: Professor Robert A. Haring-Kaye

CONFERENCES

- American Astronomical Society January 2016: "Forward Models of Exoplanets for Atmosphere Retrievals with JWST" (Presentation).
- American Astronomical Society January 2015: "Structures, Cooling, and Mass Loss for Super-Earths and Sub-Neptunes" (Presentation).

TALKS

- Princeton University Department of Astrophysical Sciences Thursday Lunch Talk, "Forward Models of Exoplanets for Atmosphere Retrievals with JWST", October 15, 2015.

EXPERIENCES

- Summer Research Program at Carnegie Observatories, 2012

TEACHING EXPERIENCE

**Princeton University**,

*Teaching Assistant* for AST 205:"Planets in the Universe", taught by Professor Bakos, G., Fall 2014

- Undergraduate-level astronomy course for general audience.

*Teaching Assistant* for AST 204:"Topics in Modern Astronomy", taught by Professor Burrows, A., Spring 2014

- Undergraduate-level astronomy course for students in the sciences.

SOFTWARE SKILLS

Computer Programming:

- Thorough experience with Python, C, C++, object oriented programming, primarily under Linux (Unix like) operating systems.
- Experienced with: Fortran90, BASH, MATLAB, Mathematica

Version Control and Software Configuration Management:
- Git

Numerical skill set:
- Linear algebra, Group theory, Fourier transforms, Monte Carlo analysis, numerical inetgration, parallel processing, machine learning visualization

Operating Systems:
- Linux, Apple OS X, Windows

Software development:

- Transit Spectroscopy: Computation of transit spectra for a planets of a range of masses and radii, atmosphere compositions, and cloud and haze properties. Collaborator: Burrows, A.
- Planetary Structure: Computation of internal structures for planets of a range of masses, compositions, and internal entropies. Collaborators: Burrows, A. and Verne, W.
- Planetary Evolution: Computation of internal structures of planets evolving in time with cooling and mass loss. Collaborators: Burrows, A. and Verne, W.
- JWST Observation Modeling Pipeline: Conversion of theoretical spectra into synthetic JWST observations. Collaborator: Deming, D.
- Work with **CoolTLUSTY**: Software package for atmosphere profiles and emission spectra. Collaborator: Burrows, A.
- Work with **Athena**: Software package for magnetohydrodynamics. Collaborator: Stone, J.
- **Gaseous Planet Solver (GPS)**: One-dimensional gaseous planet internal structure solver. It employs a relaxation method to solve the one-dimensional PDEs in the planet interior. The package allows for quasi-static evolution calculation under external irradiation or internal heating source. Collaborators: Huang, X., Gong, M.N., Pattarakijwanich, P.

AWARDS
- 2011: Finalist for American Physical Society LeRoy Apker Award for Undergraduate Research Achievement

OUTREACH
- 2011-2015: Co-organizer of the Monthly Public Observation at Peyton Observatory.
- 2012-2014: Participant in Project ASTRO educator-astronomy partnerships.

REFEREED PUBLICATIONS
- (1) A.R.Howe & A.S.Burrows, *"Theoretical Transit Spectra for GJ 1214b and Other "Super-Earths""*, 2012, **ApJ**, 756, 176 (citations: 56)
- (2) A.R.Howe & R.R.Rafikov, *"Probing Oort Cloud and Local Interstellar Medium Properties via Dust Produced in Cometary Collisions"*, 2013, **ApJ**, 781, 52 (citations: 7)
- (3) V.Van Grootel, et al. *"Transit Confirmation and Improved Stellar and Planet Parameters for the Super-Earth HD 97658 b and its Host Star"*, 2012, **ApJ**, 786, 2 (citations: 17)
- (4) A.R.Howe, A.S.Burrows, & W.Verne, *"Mass-radius Relations and Core-envelope Decompositions of Super-Earths and Sub-Neptunes"*, 2014, **ApJ**, 787, 173 (citations: 25)
- (5) A.R.Howe, & A.S.Burrows, *"Evolutionary Models of Super-Earths and Mini-Neptunes Incorporating Cooling and Mass Loss"*, 2015, **ApJ**, 808, 150 (citations: 12)
- (6) G.Á.Bakos, et al., *"HATS-7b: A Hot Super Neptune Transiting a Quiet K Dwarf Star"*, 2015, **ApJ**, 813, 2 (citations: 9)
- (7) A.R.Howe, A.S.Burrows, & D.Deming, *"An Information-Theoretic Approach to Optimize JWST Observations and Retrievals of Transiting Exoplanet Atmospheres"*, 2017, accepted to **ApJ**