Brett M. Morris
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Interests
I am interested in characterizing exoplanets, and their host stars. I study how stellar activity affects planet characterization via observations from the ground and from space.

Education

University of Washington, Seattle, WA — 2014 – present
PhD Candidate in Astronomy and Astrobiology (dual-title PhD program)

University of Washington, Seattle, WA — 2013 – 2014
M.S. in Astronomy

University of Maryland, College Park, MD — 2009 – 2012
B.S. with High Honors in Astronomy
B.S. in Physics (double degree)

Publications

First author:

– Photometric Analysis and Transit Times of TRAPPIST-1 b and c
Morris, B.M., Agol, E., Hawley S.L. Research Notes of the AAS, 2, 1 (2018)

– astroplan: An Open Source Observation Planning Package in Python
Morris, B.M., Tollerud E., Sipocz B., Deil C., Douglas S.T., Medina J.B., Vyhmeister K., Smith T.R., Littlefair S., Price-Whelan A.M., Gee W.T., Jeschke E. (AJ in press, 2018)

– Chromospheric Activity of HAT-P-11: an Unusually Active Planet-Hosting K Star
Morris, B.M., Hawley S.L., Hebb L., Saraki C., Davenport J.R.A., Isaacson H., Howard A.W., Montet B.T., Agol E., The Astrophysical Journal, 846, 99 (2017)

– The Starspots of HAT-P-11: Evidence for a Solar-like Dynamo
Morris, B.M., Hebb L., Davenport J.R.A., Rohn G., Hawley S.L., The Astrophysical Journal, 846, 2 (2017)

– Kepler's Optical Secondary Eclipse of HAT-P-7b and Probable Detection of Planet-induced Stellar Gravity Darkening.
Morris, B.M., Mandell, A.M., & Deming, D. Astrophysical Journal Letters, 764, L22 (2013)

n^{th} author:

– The Astropy Project: Building an inclusive, open-science project and status of the v2.0 software
Astropy Collaboration... Morris, B.M., et al. The Astrophysical Journal (submitted 2018)

– Toward Space-like Photometric Precision from the Ground with Beam-shaping Diffusers
Stefansson, G... Morris, B.M., et al. The Astrophysical Journal, Volume 848, Number 1 (2017)

– A seven-planet resonant chain in TRAPPIST-1.
Luger, R...Morris, B.M., et al. Nature Astronomy, Volume 1, id. 0129 (2017).

– SDSS J1152+0248: an eclipsing double white dwarf from the Kepler K2 campaign.
Hallakoun, N., Maoz, D., Kilic, M., Mazeh, T., Agol, E., Bell, K. J., Bloemen, S., Brown, W. R., Debes, J., Faigler, S., Gianninas, A., Kull, I., Kupfer, T., Loeb, A., Morris, B.M., Mullally, F. Monthly Notices of the Royal Astronomical Society, Volume 458, Issue 1, p.845-854 (2016)

Selected Graduate Research

Stellar active latitudes of HAT-P-11 — 2015 – present
Using Kepler transit observations of active star HAT-P-11 to study the latitude distribution of spots, with Prof. Leslie Hebb, Prof. Suzanne Hawley and Dr. Jim Davenport
– Modeling starspot positions along transit chord in 200 transits using an original photometric inversion model and a forward modelling approach developed by Prof. Hebb
– Measured starspot positions and radii, characterized properties of active latitudes
– Observed spectroscopic activity indicators to verify the phase in the activity cycle deduced from spot occultation photometry

KOINet: High-Speed Photometry for Transit Timing Variations 2014 – present
Using APO/ARC 3.5 m's high-speed camera Agile for transit timing follow-up of Kepler targets with
Prof. Eric Agol and Dr. Carolina von Essen
– Optimized observing techniques for high-precision transit timing observations from the ground

Astrobiology Research Rotation: **Digital holographic microscopy** Spring 2016
Developed numerical reconstruction and specimen tracking algorithms for life-detection with Prof. Jody
Deming and Dr. Jay Nadeau
– Developed an open source Python numerical hologram reconstruction pipeline called `shampoo`[1]
– Algorithmically measured motility in psychrophilic bacteria

Principle Investigator: **Two nights at Keck Observatory (MOSFIRE)** 2014
On transit transmission spectroscopy of giant exoplanet atmospheres in the near-infrared with Dr. Avi
Mandell and Dr. Daniel Angerhausen
– Developed observing, data reduction, and analysis techniques for transmission spectroscopy of
giant exoplanet atmospheres
– Achieved spectrophotometric precision of $<2\times$ the photon noise floor (Morris et al. 2016, in prep.)

Google Summer of Code: **Developer, maintainer of `astroplan`[2]** 2015 – present
Co-wrote and presently maintain an `astropy`-affiliated package for observation planning with Dr. Erik
Tollerud, Eric Jeschke, Dr. Christoph Deil and Dr. Adrian Price-Whelan
– Provides the first observation planning toolkit in Python built on the open source `astropy` ecosys-
tem of Python packages for astronomers
– Funded by the Python Software Foundation, `astroplan` was presented at the .Astronomy confer-
ence in Sydney, Australia in November 2015

Principle Investigator: **White dwarf photometry for 70+ nights at APO** 2014 – present
Pulsation photometry and transiting planet search targeting metal-polluted white dwarfs ("SPAMS")
– Monitoring newly classified, metal-polluted, ZZ Ceti white dwarfs for pulsations and transiting
planets/planetary debris with the ARC 3.5 m and ARCSAT 0.5 m telescopes
– Mentoring undergraduate Pre-MAP students to reduce, analyze the data for credit

Employment **Professional Assistantship in Holographic Microscopy** November 2016 – present
Software consultant position in the UW Department of Oceanography under Prof. Jody Deming and
Dr. J. Kent Wallace.
– Developed and maintained the `shampoo` digital holographic microscopy numerical reconstruction
toolkit in Python, which was created during my Astrobiology Rotation project.
– This software enables efficient reconstruction of holograms for bacterial motility studies, with
applications in life-detection for astrobiology.
– `shampoo` has become the lab-standard reconstruction software for our collaborators in the SHAMU
lab (PI Jay Nadeau, Caltech)

Consultant: Center for Inquiry Science at the Institute for Systems Biology 2014-2015
STEM curriculum consulting for middle school science teachers
– Worked with school science teachers in Renton School District to adapt their curriculum to comply
with new state standards as part of the Partnership in Science and Engineering Practices project.
– Collaborated with science teachers at Meeker Middle School (Tacoma, WA) to update a Sun-
Moon-Earth system lab as part of the Observing for Evidence of Learning professional develop-
ment model.

NASA Goddard Space Flight Center Research Assistantship Jan 2013 – Aug 2013
Post-baccalaureate research assistantship with advisor Dr. Avi Mandell at the Goddard Center for
Astrobiology.

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[1]https://github.com/bmorris3/shampoo
[2]https://github.com/astropy/astroplan

– Prepared a Python data reduction pipeline for near-infrared differential spectrophotometric observations with Keck/MOSFIRE and Keck/NIRSPEC of transiting exoplanet atmospheres.

Honors And Awards

– Poster competition winner at the NASA Kepler Science Conference IV (earned prize talk presentation)
– Pacific Science Center Science Communication Fellow (2016)
– Chambliss Astronomy Achievement Graduate Student Award Honorable Mention. 225th AAS, Seattle, WA (2015), and 222nd AAS, Indianapolis, IN (2013).
– Astrobiology Fellow, University of Washington, 2013-2014.

Observing Experience

– **Principle investigator** on Keck Observatory/MOSFIRE proposal: "Probing Giant Planet Formation with MOSFIRE Exoplanet Transmission Spectroscopy", awarded 2 nights (2014)
– **Co-investigator** on Very Large Telescope/KMOS proposal: "Exoplanet transits with KMOS: Is GJ 1214b a water-world Super Earth or a cloudy Mini-Neptune?", awarded 2 nights (PI: D. Angerhausen, 2014)
– **Co-investigator** on Keck Observatory/MOSFIRE proposal: "Comprehensive Characterization of CoRoT-2b and XO-1b with Keck Observatory/MOSFIRE", awarded 2 nights (PI: A. Mandell, 2013)
– **Co-investigator** on Kitt Peak National Observatory 2.1m/FLAMINGOS proposal: "A Near-infrared Exoplanet Transit and Eclipse Survey", awarded 6 nights (PI: D. Deming, 2012)
– Undergraduate research at the University of Maryland Observatory, 152 mm (2010-2013): > 100 hours collecting photometry of transiting exoplanets and asteroids.

Workshops

– Sagan Summer Workshop: "Is There a Planet in My Data? Statistical Approaches to Finding and Characterizing Planets in Astronomical Data." Caltech, 2016.

Professional Presentations

– Contributed talk: "The Active Latitudes of HAT-P-11." Northwest Astronomy Meeting 2016. Bellingham, WA. October 29, 2016.
– Contributed talk: "astroplan: Observation Planning for Astronomers." Python in Astronomy Conference 2016. Seattle, WA. March 25, 2016.
– Poster: "Exoplanet Transmission Spectroscopy in the Near-Infrared with Keck/MOSFIRE." 225th American Astronomical Society Meeting. Seattle, WA. January 6, 2015.
– Poster: "Kepler's Optical Secondary Eclipse of HAT-P-7b and Probable Detection of Planet-Induced Stellar Gravity Darkening." Second Kepler Science Conference, NASA Ames Research Center, Mountain View, CA. November 6, 2013.
– Talk: "Kepler's Optical Secondary Eclipse of HAT-P-7b and Probable Detection of Planet-Induced Stellar Gravity Darkening". AbGradCon 2013, McGill University, Montreal, Canada. June 11, 2013.

Teaching Experience

– Course instructor (full teaching responsibilities): ASTR192 Pre-Major in Astronomy Program (Pre-MAP) in Fall 2016, developed open-source Python curriculum
– Academic mentor ASTR192 Pre-Major in Astronomy Program (Pre-MAP) in Fall 2015
– Instructor of UW Astro/Phys Python Bootcamp, 2016 (and co-instructor in 2015)
– Teaching assistant for ASTR150 The Planets (three quarters) and ASTR101 Intro Astronomy (one quarter).

Mentorship

– 2014-present: Formed the Search for Planets Around post-Main Sequence stars (SPAMS) research group with five undergraduates in the University of Washington's Pre-Major in Astronomy Program (Pre-MAP), which searches for transiting planetary material orbiting white dwarfs
– 2015-2016: Academic mentor (paid position) for Pre-MAP Cohort 11

Public Outreach

– Co-founder and co-host of over twenty events of the Seattle branch of Astronomy on Tap (2015-present).

– Given many Seattle-area public science talks at the Pacific Science Center, Seattle Astronomical Society, Boeing Astronomical Society

– Developed open source differential photometry routine with educational documentation for amateur transiting exoplanet observations (OSCAAR).

Press

– Science outreach TwitterBots that I created and maintain have been featured by *Popular Mechanics* and *Vocativ*

– *Press release:* "NASA-funded Program Helps Amateur Astronomers Detect Alien Worlds". NASA Goddard Space Flight Center, Greenbelt, Md. September 4, 2013.

– Feature article in the UMD "Scholars Newsletter" for research achievements (Feb 2012).