

Maria E. Steinrueck

Lunar and Planetary Laboratory, University of Arizona
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Education

University of Arizona, Tucson, AZ, USA 2016–present

PhD program in Planetary Sciences

M.S. in Planetary Sciences. December 2018.

Vienna University of Technology, Vienna, Austria 2010–2015

M.S. in Technical Physics, specializing in Theoretical Physics. Graduated with distinction in November 2015.

B.S. in Technical Physics. Graduated with distinction in August 2013.

University of Washington, Seattle, WA, USA 2013–2014

Transatlantic Science Student Exchange Program – Study Abroad (full academic year)

Research Experience

Graduate Research Assistant 2016–present

Lunar and Planetary Laboratory, University of Arizona

Advisors: Prof. Adam Showman (deceased, 2020), Prof. Tommi Koskinen

Master's Thesis 2015

Institute for Astrophysics, University of Vienna

Advisors: Dr. Eduard Vorobyov, Prof. Manuel Guedel

Thesis title: “Ejection of substellar objects from accretion disks through stellar encounters”

- Coded an extension to include the fly-by of a second star for a hydrodynamics code used to study the evolution of protostellar disks
- Ran and analyzed a series of numerical simulations of stellar encounters

Research Project on Extrasolar Planets 2013–2014, 9 months

Astronomy Department, University of Washington

Advisors: Dr. Ian Dobbs-Dixon, Prof. Eric Agol

Estimating the stratospheric heating in Hot Jupiters due to the interaction of winds with the stellar magnetic field

- Discretized the induction equation on a spherical grid
- Developed and coded a model for calculating conductivity

Bachelor's Thesis in Experimental High Energy Physics 2012, 10 weeks

Institute of High Energy Physics (HEPHY), Austrian Academy of Sciences

Advisors: Dr. Wolfgang Waltenberger, Dr. Claudia-Elisabeth Wulz

Thesis title: “Decomposition of the phenomenological MSSM into Simplified Model Spectra”

- Analyzed and compared the decomposition of two samples of subsets of phase space points in the phenomenological MSSM (pMSSM) into Simplified Model Spectra using ROOT and Python

- Added improvements to tools for analyzing pMSSM points in Python

Publications

Venot, O., Parmentier, V., Blecic, J., Cubillos, P. E., Waldmann, I. P., Changeat, Q., Moses, J. I., Tremblin, P., Crouzet, N., Gao, P., Powell, D., Lagage, P.-O., Dobbs-Dixon, I., **Steinrueck, M. E.**, Kreidberg, L., Batalha, N., Bean, J. L., Stevenson, K. B., Casewell, S., Carone, L. (2020): Global Chemistry and Thermal Structure Models for the Hot Jupiter WASP-43b and Predictions for JWST. *The Astrophysical Journal*, 890, 176, doi:10.3847/1538-4357/ab6a94.

Helling, Ch., Iro, N., Corrales, L., Samra, D., Ohno, K., Alam, M. K., **Steinrueck, M.**, Lew, B., Molaverdikhani, K., MacDonald, R. J., Herbort, O., Woitke, P., Parmentier, V. (2019): Understanding the atmospheric properties and chemical composition of the ultra-hot Jupiter HAT-P-7b. I. Cloud and chemistry mapping. *Astronomy & Astrophysics*, 631, A79, doi:10.1051/0004-6361/201935771.

Steinrueck, M. E., Parmentier, V., Showman, A. P., Lothringer, J. D., Lupu, R. E. (2019): The Effect of Disequilibrium Carbon Chemistry on the Atmospheric Circulation and Phase Curves of Hot Jupiter HD 189733b. *The Astrophysical Journal*, 880, 14, doi:10.3847/1538-4357/ab2598.

Lavvas, P., Koskinen, T., **Steinrueck, M.**, García Muñoz, A., Showman, A. P. (2019): Photochemical hazes in sub-Neptunian atmospheres with focus on GJ 1214b. *The Astrophysical Journal*, 878, 2, 118, doi:10.3847/1538-4357/ab204e.

Vorobyov, E. I., **Steinrueck, M. E.**, Elbakyan, V., Guedel, M. (2017): Formation of freely floating sub-stellar objects via close encounters. *Astronomy & Astrophysics*, 608, A107, doi:10.1051/0004-6361/201731565.

Conference Presentations

Steinrueck, M. E., Showman, A. P., Koskinen, T, Lavvas, P. (September 2019): Three-Dimensional Mixing of Photochemical Hazes in the Atmospheres of Hot Jupiters. Poster presentation at the European Planetary Science Congress and Division for Planetary Science Joint Meeting.

Steinrueck, M. E., Showman, A. P., Koskinen, T, Lavvas, P. (August 2019): Three-Dimensional Mixing of Photochemical Hazes in the Atmospheres of Hot Jupiters. Poster presentation at Extreme Solar Systems IV.

Steinrueck, M. E., Parmentier, V., Showman, A. P., Lothringer, J. D., Lupu, R. E. (June 2019): The Effect of Disequilibrium Carbon Chemistry on the 3-D Atmospheric Structure and Phase Curves of Hot Jupiters. Oral presentation at the 29th Bay Area Exoplanets Meeting.

Steinrueck, M. E., Parmentier, V., Showman, A. P., Lothringer, J. D., Lupu, R. E. (January 2019): The effect of disequilibrium carbon chemistry on the atmospheric circulation and phase curves of hot Jupiters. Oral presentation at the 233rd Meeting of the American Astronomical Society.

Steinrueck, M. E., Parmentier, V., Showman, A. P., Lothringer, J. D., Lupu, R. E. (September 2018): The effect of disequilibrium carbon chemistry in general circulation

models of hot Jupiters. Poster presentation at the Cloud Academy at the Les Houches School of Physics.

Steinrueck, M. E., Parmentier, V., Showman, A. P. (October 2017): The effects of disequilibrium carbon chemistry in general circulation models of hot Jupiters. Oral presentation at the 49th Meeting of the Division for Planetary Science.

Seminars and Colloquia

Exoplanet Atmospheres Seminar, Geneva Observatory (March 2020)

Presentation to Exoplanet Atmospheres Group, Center for Space and Habitability, University of Bern (March 2020)

Institute for Astrophysics, University of Vienna (September 2019)

Origins Seminar, University of Arizona (April 2019)

Teaching & Mentoring Experience

Lunar and Planetary Lab, University of Arizona 2017–2018

Teaching assistant for the following courses:

- *PTYS 170B2 The Universe and Humanity: Origins and Destiny* (Spring semester 2017 and 2018)
- *PTYS 170A1 Planet Earth: Evolution of the Habitable World* (Fall semester 2017)

Pupils Attending University 2012–2015

Program enabling high school students to enroll early at university, run by the Austrian Research and Support Centre for the Gifted and Talented (OEZBF)

- Mentored four students over the course of a year each

Institute for Theoretical Physics, Vienna University of Technology 2011–2014

Teaching assistant for the following courses:

- *Quantum Mechanics 1* (Fall semester 2014 and 2012)
- *Electrodynamics 1* (Spring semester 2013)
- *Mathematical Methods of Theoretical Physics* (Fall semester 2011)

Awards

NASA Earth and Space Sciences Fellowship (NESSF), 2018-current

Peter W. Likins Award for Inclusive Excellence (Student category), University of Arizona, 2020

Galileo Circle Scholarship College of Science, University of Arizona, 2018 & 2020

Other Worlds Laboratory (OWL) Mini-Grant for a collaborative stay at the Université de Reims, Champagne-Ardenne, France, 2019

Other Worlds Laboratory (OWL) Mini-Grant for travel to the Extreme Solar Systems IV Meeting, 2019

GPSC Travel Grant Graduate and Professional Student Council (GPSC), University of Arizona, 2018 & 2019

Lunar and Planetary Laboratory Student/Staff Travel Award, University of Arizona, 2019

Theoretical Astrophysics Program Small Grant University of Arizona, 2019

Leif Andersson Graduate Student Award for Service Lunar and Planetary Laboratory,

University of Arizona, 2018

Hartmann Student Travel Grant Division for Planetary Science/AAS, 2017

Leistungsstipendium (Academic Merit Award) Vienna University of Technology, 2012

Technical Skills

Programming Languages

Fortran, Python, Matlab, PHP, C, C++

Outreach

Lunar and Planetary Laboratory, University of Arizona 2016–present

Volunteer at the graduate student outreach booth at

- Summer Science Saturday (August 2016, July 2019)
- Tucson Festival of Books (March 2016, March 2018, March 2019)
- Solar Eclipse 2017
- SpaceFest (June 2016)
- STEAMworks (April 2016)

The Art of Planetary Science, University of Arizona 2017-2019

Volunteer at the art exhibition helping with setup, information desk, monitoring floors and taking down art after the event

University of Arizona Women's Hackathon 2016–2018

Member of the organizing committee of the University of Arizona Women's Hackathon (formerly Women Techmakers Tucson Hackathon)

Strange New Worlds: A Star Trek and Science Podcast 2017–2018

Guest on Episode 18: *The Chemistry & Clouds of Hot Jupiters* and Episode 52: *The Cloud Academy*

Physikmobil, Vienna 2012–2013

Physics outreach campaign

- Explained physics interactively to children (ages 6–14) with experiments using everyday life objects at schools, in public parks and at events

Professional & Departmental Service

Coordinator of the Lunar and Planetary Laboratory Women's group 2016–present

UA Graduate and Professional Student Council Travel Grant Judge 2018-2019

Member of the Lunar and Planetary Laboratory Conference (LPLC) planning committee 2016–2017

Professional Affiliations

Division of Planetary Science of the American Astronomical Society (Graduate Student Member)