

Isaac Malsky

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Education

Ph.D. candidate, Astronomy and Astrophysics The University of Michigan
Advisor: Prof. Emily Rauscher 2019-2024
Dissertation: "Modeling the 3D Atmospheric Structure of Hot Gaseous Planets"

B.A., Physics, with honors The University of Chicago
Thesis: "The Coupled Thermal and Compositional Evolution of Planet Envelopes" 2014-2018

Research Experience

Rauscher Lab Ann Arbor, Michigan
Graduate Researcher 2019 - 2024
Characterizing the evolution and dynamics of exoplanet atmospheres through computational modeling. Implemented multiwavelength radiative transfer and cloud formation within a climate model, and created a pipeline to calculate simulated observables.

Rogers Lab Chicago, Illinois
Research Assistant November 2015 - June 2019
Created planetary structure simulations to determine whether billions of years of mass loss modulated by diffusive separation of hydrogen and helium could lead to He enhanced atmospheres.

Argonne National Lab Lemont, IL
Post-bac Researcher June 2018 - January 2019
Used density functional theory and X-ray pair distribution function data to create a Markov chain Monte Carlo sampling algorithm to determine the properties of complex Au and IrOx molecules.

Publications

First Author

Malsky, I., Rauscher, E. Radiatively Active Clouds and Hazes in the Atmosphere of GJ 1214 b. In Prep.

Malsky, I., Rauscher, E. Greater Spatial Variability in the Medium and High Resolution Emission Spectra of Polychromatic vs Double Gray GCMs. In Prep.

Malsky, I., Rauscher, E., Kempton, E., Roman, T., Lee, E., Savel, A., Beltz, H., Cinque, L. (2024). A Direct Comparison between the use of Double Gray and Multiwavelength Radiative Transfer in a General Circulation Model with and without Radiatively Active Clouds. *The Astrophysical Journal*.

Malsky, I., Rogers, L., Kempton, E., Marounina, N., (2022). A Prediction of Helium-Enhanced Atmospheres on the Edge of the Planetary Radius Gap. *Nature Astronomy*.

Malsky, I., Rauscher, E., Kempton, E., Roman, M., Long, D., Harada, C., (2021). Modeling the High-resolution Emission Spectra of Clear and Cloudy Nontransiting Hot Jupiters. *The Astrophysical Journal*.

Malsky, I., Rogers, L. (2020). Coupled Thermal and Compositional Evolution of Photo Evaporating Planet Envelopes. *The Astrophysical Journal*.

Second, Third or Fourth Author

Beltz, H., Rauscher, E., Kempton, E., **Malsky, I.**, Savel, A., (2023). Magnetic Effects and 3D Structure in Theoretical High-Resolution Transmission Spectra of Ultrahot Jupiters: the Case of WASP-76b. *The Astronomical Journal*.

Murphy, M., Beatty, T., Roman, T., **Malsky, I.**, Wingate, A., Ochs, G., Cinque, L., Beltz, H., Rauscher, E., Kempton, E., Stevenson K. (2023). A Lack of Variability Between Repeated Spitzer Phase Curves of WASP-43b. *The Astronomical Journal*.

Beltz, H., Rauscher, E., Kempton, E., **Malsky, I.**, Ochs, G., Arora, M., Savel, A., (2022). Magnetic Drag and 3D Effects in Theoretical High-resolution Emission Spectra of Ultrahot Jupiters: the Case of WASP-76b. *The Astronomical Journal*.

Belkovski, M., Becker, J., Howe, A., **Malsky, I.**, Batygin, K. (2022). A multi-planet system's sole super-puff: exploring allowable physical parameters for the cold super-puff HIP 41378 f. *The Astronomical Journal*.

Kasper, D., Bean, J., Oklopčić, A., **Malsky, I.**, Kempton, E., Désert, J., Rogers, L., Mansfield, M. (2020). Non-detection of Helium in the Upper Atmospheres of Three Sub-Neptune Exoplanets. *The Astronomical Journal*.

Contributing Author Hammond, M., including **Malsky, I.**, Two-dimensional Eclipse Mapping of the Hot-Jupiter WASP-43b with JWST MIRI/LRS (2024). *AJ*.

Kempton, E., including **Malsky, I.**, A reflective, metal-rich atmosphere for GJ 1214b from its JWST phase curve (2024). *Nature*.

Bell, T., including **Malsky, I.**, Nightside clouds and disequilibrium chemistry on the hot Jupiter WASP-43b (2024). *Nature Astronomy*.

King, G., including **Malsky, I.**, The XUV-driven escape of the planets around TOI-431 and ν 2 Lupi (2024). *The Monthly Notices of the Royal Astronomical Society*.

Gao, P., including **Malsky, I.** The Hazy and Metal-rich Atmosphere of GJ 1214 b Constrained by Near- and Mid-infrared Transmission Spectroscopy (2023). *The Astronomical Journal*.

Savel, A., including **Malsky, I.** Diagnosing limb asymmetries in hot and ultra-hot Jupiters with high-resolution transmission spectroscopy (2022). *The Astrophysical Journal*.

Christie, D., including **Malsky, I.**, (2022) CAMEMBERT: A Mini-Neptunes GCM Intercomparison, Protocol Version 1.0. A CUISINES Model Intercomparison Project. *The Planetary Science Journal*.

Caldirolì, A., including **Malsky, I.**, Rauscher, E., (2022). Irradiation-driven escape of primordial planetary atmospheres II. Evaporation efficiency of sub-Neptunes through hot Jupiters. *Astronomy and Astrophysics*.

Caldirolì, A., including **Malsky, I.**, Rauscher, E., (2021). Irradiation-driven escape of primordial planetary atmospheres I. The ATES photoionization hydrodynamics code. *Astronomy and Astrophysics*.

Harada, C., including **Malsky, I.**, Brinjikji, M. (2021). Signatures of Clouds in Hot Jupiter Atmospheres: Modeled High Resolution Emission Spectra from 3D General Circulation Models. *The Astrophysical Journal*.

Grants and Awards

Rackham Predoctoral Fellowship	2023
Rackham Professional Development Grant	2023
Rackham Graduate Student Research Grant	2023
Rackham Travel Grant	2023
Other Worlds Laboratory Summer Program	2022
NSF Graduate Research Fellowship Program Honorable Mention	2021
Michigan Space Grant	2021
Jeff Metcalf Fellowship	2015
University of Chicago Deans List	2014-2018

Mentoring

Alex Wingate, undergraduate research	2022-present
Eli Cinque, undergraduate research	2022-present

Teaching

ASTRO 105: Cosmos Constellations	The University of Michigan
<i>Graduate Student Instructor</i>	<i>Spring 2021</i>
ASTRO 101: The Solar System and the Search for a New Earth	The University of Michigan
<i>Graduate Student Instructor</i>	<i>Fall 2020</i>

Service, Outreach, and Skills

<i>Peer Review:</i>	<i>The Astrophysical Journal Letters (2023)</i>
	<i>The Journal of Open Source Software (2023)</i>
<i>Service:</i>	Intro2Astro Course Volunteer Summer (2021)
	Scarlett Middle School Teaching Assistant (2020)
	Science Olympiad Mentor at Slauson Middle School (2020)
	Ann Arbor Astronomy on Tap (2019)
	Invisible Institute Volunteer Infographic Designer (2018)
<i>Training:</i>	Exoclimes Summer School (2023)
	SC23 Supercomputing Workshops (2023)
	University of Chicago Supercomputer Workshops (2018)
<i>Computing:</i>	Advanced: Python, FORTRAN 77, FORTRAN 95, git, HPC systems
	Basic: C, OpenMP, Julia, SQL

Successful Observing Proposals

Co-I The Beginning of a High-Resolution Emission Spectroscopy Program at Magellan for the Characterization of Hot Jupiter Atmospheres with the WINERED Instrument - Sluijs et al., Accepted for Magellan, 3 nights (2023)

Co-I Tracing the Day-Night Structure of WASP-121b with Multi-Phase High-Resolution Spectroscopy - Rauscher et. al., Accepted for Gemini South, 12 hours (2023)

Co-I Tracing the Day-Night Structure of WASP-76b with Multi-Phase High-Resolution Spectroscopy - Rauscher et. al., Accepted for Gemini South, 20 hours (2023)

Co-I The First High-Resolution Emission Spectrum of an Exoplanet with WINERED at Magellan - Rauscher et. al., Accepted for Magellan, 12 hours (2022)

Selected Presentations

NASA Jet Propulsion Lab Characterizing Exoplanet Atmospheres: 1D and 3D. 2024. (talk)

Los Alamos National Lab. Characterizing Exoplanet Atmospheres: 1D and 3D. 2024. (talk)

Exoclimes VI. Clouds and Hazes in Polychromatic General circulation Models. 2023. (talk)

Bay Area Exoplanets Meeting. Clouds and hazes in Polychromatic GCMs. 2022. (talk)

The Other Worlds Laboratory. A Direct Comparison between a Double Gray and Multiwavelength GCMs. 2022. (talk)

The University of Michigan Lunch Talks. Modeling the Three-Dimensional Atmospheric Structure of Hot Gaseous Planets. 2022. (talk)

Great Lakes Exoplanet Area Meeting. Modeling the Three-Dimensional Atmospheric Structure of Hot Gaseous Planets. 2021. (talk)

Exoplanets IV. Modeling the High-resolution Emission Spectra of Clear and Cloudy non-transiting Hot Jupiters. 2020. (poster)

MIT-Harvard Poster Session The Coupled Thermal Evolution of sub-Neptune Atmospheres. 2018. (poster)

The US Naval Academy. The Coupled Thermal Evolution of sub-Neptune Atmospheres. 2018. (poster)