Thaddeus D. Komacek

Atmospheric Physics Clarendon Laboratory, Oxford, UK OX1 3PU
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Current Positions

Associate Professor of Physics of Exoplanet Atmospheres • The University of Oxford, Department of Physics, Sub-Department of Atmospheric, Oceanic, and Planetary Physics • 2024 -
Tutorial Fellow of Physics • Somerville College, Oxford • 2024 -

Previous Positions

Assistant Professor of Astronomy • The University of Maryland, College Park • 2021 - 2024
51 Pegasi b Postdoctoral Fellow • The University of Chicago • 2018 - 2021

Education

The University of Arizona 2013 - 2018 • Tucson, AZ
M.S. Planetary Sciences, Ph.D Planetary Sciences, Advisor: Prof. Adam P. Showman
The University of Chicago 2009 - 2013 • Chicago, IL
B.S. Geophysical Sciences with Honors, B.A. Physics with a Specialization in Astrophysics

Research Interests

My research efforts focus on understanding the impacts of the atmospheric dynamics, climate, and internal evolution of exoplanets on their observable properties. I use a first principles approach including a combination of detailed numerical modeling and simplified analytic theory. The bulk of my research to date has been focused on understanding the physical mechanisms that underlie the day-night heat transport and vertical mixing of cloud species in the atmospheres of exoplanets in order to interpret low- and high-resolution phase-resolved spectroscopic data from a variety of observatories including JWST, TESS, HST, Spitzer, VLT, Gemini, and others.

Publications

All peer-reviewed articles
⋆ Indicates work of students or postdocs advised or co-advised by T.D. Komacek.
◦ Indicates co-first authorship.

1. Seidel J., Parmentier V., Prinoth B., and 28 other authors including **Komacek T.D.**, Hot giant exoplanets have magnetic fields between Jupiter and Saturn, submitted.

2. Zhang M., Beleznay M., Brandt T.D., Romani R.W., Gao P., Beltz H., Bailes M., Nixon M.C., Bean J.L., **Komacek T.D.**, Coy B.P., Fu G., Luque R., Reardon D.R., Carli E., Shannon R., Fortney J.J., Piette A.A.A., Miller M.C., Desert J.-M., A carbon-rich atmosphere on a windy pulsar planet, accepted at ApJL.

3. Coulombe L.-P., Benneke B., Krissansen-Totton J., and 26 other authors including **Komacek T.D.**, Possible Evidence for the Presence of Volatiles on the Warm Super-Earth TOI-270 b, 2025, AJ, 170, 226.

4. Ahrer E.-M., Radica M., Piaulet-Ghorayeb C., and 27 other authors including **Komacek T.D.**, Escaping Helium and a Highly Muted Spectrum Suggest a Metal-Enriched Atmosphere on Sub-Neptune GJ3090b from JWST Transit Spectroscopy, 2025, ApJL, 985, L10.

5. ⋆Hammond, T., **Komacek T.D.**, Kopparapu R.K., Fauchez T.J., Mandell A.M., Wolf E.T., Kofman V., Johnson T.M., Arney G., Crouse J.S., Kane S.R., The climates and thermal emission spectra of prime nearby temperate rocky exoplanet targets, 2025, ApJ, 984, 181.

6. Chen H., De Luca P, Hochman A., **Komacek T.D.**, Effects of transient stellar emissions on planetary climates of tidally-locked exo-earths, 2025, AJ, 170, 40.

7. *Beltz H., Houck W., Mayorga L., **Komacek T.D.**, Livesey J., Becker J., The Effects of Kinematic MHD on the Atmospheric Circulation of Eccentric Hot Jupiters, 2025, ApJ, 984, 90.

8. **Komacek T.D.**, Limited hysteresis in the atmospheric dynamics of hot Jupiters, 2025, ApJ, 983, 7.

9. Swain M.R., Pearson K.A., **Komacek T.D.**, Bryden G., Fromont E., Vasisht G., Roudier G., Zellem R.T., Thermal Phase Curves in Hot Gas Giant Exoplanets Exhibit a Complex Dependence on Planetary Properties, 2025, ApJ, 982, 159.

10. Piaulet-Ghorayeb, C., Benneke B., Radica M., and 30 other authors including **Komacek T.D.**, JWST/NIRISS reveals the water-rich "steam world" atmosphere of GJ 9827 d, 2024, ApJL, 974, L10.

11. *Ealy J.N., Schlieder J.E., **Komacek T.D.**, Gilbert E.A., Flaring Activity for Low-Mass Stars in the β Pictoris Moving Group, 2024, AJ, 168, 173.

12. Savel, A.B., Beltz, H., **Komacek, T.D.**, Tsai, S.-M., Kempton E.M.-R., A new lever on exoplanetary B fields: measuring heavy ion velocities, 2024, ApJL, 969, L27.

13. Benneke, B., Roy P.-A., Coulombe L.-P., and 28 other authors including **Komacek T.D.**, JWST Reveals CH_4, CO_2, and H_2O in a Metal-rich Miscible Atmosphere on a Two-Earth-Radius Exoplanet, submitted to AAS Journals.

14. *Hammond, T. and **Komacek T.D.**, The Coupled Impacts of Atmospheric Composition and Obliquity on the Climate Dynamics of TRAPPIST-1e, 2024, ApJ, 968, 43.

15. De Luca, P., Braam, M., **Komacek T.D.**, Hochman A, The impact of Ozone on Earth-like exoplanet climate dynamics: the case of Proxima Centauri b, 2024, MNRAS, 531, 1471.

16. *Garcia, V., Smith C.M., Chavas D.R., and **Komacek T.D.**, Tropical cyclones on tidally locked rocky planets: Dependence on rotation period, 2024, ApJ, 965, 5.

17. Bell T.J., Crouzet N., Cubillos P.B., and 81 other authors including **Komacek T.D.**, Nightside clouds and disequilibrium chemistry on the hot Jupiter WASP-43b, 2024, Nature Astronomy, 8, 879.

18. *Yang H., **Komacek T.D.**, Toon B., Wolf E.T., Robinson T.D., Chael C., Abbot D.S., Impact of Planetary Parameters on Water Clouds Microphysics, 2024, ApJ, 966, 152.

19. Tan X., **Komacek T.D.**, Batalha N.E., Deming D., Lulu R., Parmentier V., Pierrehumbert R.T., Modeling the day-night temperature variations of ultra-hot Jupiters: confronting non-grey general circulation models and observations, 2024, MNRAS, 528, 1016.

20. Coulombe, L.-P., Benneke, B., Challener, R., and 74 other authors including **Komacek T.D.**, A broadband thermal emission spectrum of the ultra-hot Jupiter WASP-18b, 2023, Nature, 620, 292.

21. Hochman A., **Komacek T.D.**, De Luca P., Analogous response of temperate terrestrial exoplanets and Earth's climate dynamics to greenhouse gas supplement, 2023, Nature Scientific Reports, 13, 11123.

22. Deming D., Line M.R., Knutson H.A., Crossfield I.J.M., Kempton E.M.-R., **Komacek T.D.**, Wallack N.L., Fu G., Emergent Spectral Fluxes of Hot Jupiters: An Abrupt Rise in Dayside Brightness Temperature Under Strong Irradiation, 2023, AJ, 165, 104.

23. Ahrer E.-M., Stevenson K.B., Mansfield M., and 96 other authors including **Komacek T.D.**, Early Release Science of the exoplanet WASP-39b with JWST NIRCam, 2023, Nature, 614, 653.

24. The JWST Transiting Exoplanet Community Early Release Science Team, Identification of carbon dioxide in an exoplanet atmosphere, 2023, Nature, 614, 649.

25. Savel A.B., Kempton E.M.-R., Rauscher E., **Komacek T.D.**, Bean J.L., Malik M., Malsky I., Diagnosing limb asymmetries in hot and ultra-hot Jupiters with high-resolution transmission spectroscopy, 2023, ApJ, 944, 99.

26. *Rotman Y., **Komacek T.D.**, Villanueva G.L., Fauchez T.J., May E.M., GCM constraints on the detectability of the CO_2-CH_4 biosignature pair on TRAPPIST-1e with JWST, 2023, ApJL, 942, L4.

27. **Komacek T.D.**, Gao P., Thorngren D.P., May E.M., Tan X., The effect of interior heat flux on the atmospheric circulation of hot and ultra-hot Jupiters, 2022, ApJL, 941, L40.

28. Jacobs B., Désert J.-M., Pino L., Line M.R., Bean J.L., Khorshid N., Schlawin E., Arcangeli J., Barat S., Hoeijmakers H.J., Komacek T.D., Mansfield M., Parmentier V., Thorngren D., A strong H^- opacity signal in the near-infrared emission spectrum of the ultra-hot Jupiter KELT-9b, 2022, A&A, 668, L1.

29. Fu G., Espinoza N., Sing D.K., Lothringer J.D., Dos Santos L.A., Rustamkulov Z., Deming D., Kempton E.M.-R., **Komacek T.D.**, Knutson H.A., Albert L., Pontoppidan K., Volk K. Filippazo J., Water and an escaping helium tail detected in the hazy and methane-depleted atmosphere of HAT-P-18b from JWST NIRISS/SOSS, 2022, ApJL, 940, L35.

30. Hochman A., De Luca P., **Komacek T.D.**, Greater climate sensitivity and variability on TRAPPIST-1e than Earth, 2022, ApJ, 938, 114.

31. °**Komacek T.D.**, °Tan X., Gao P., Lee E.K.H., Patchy nightside clouds on ultra-hot Jupiters: General Circulation Model simulations with radiatively active cloud tracers, ApJ, 934, 79.

32. May E.M., Stevenson K.B., Bean J.L., Bell T.J., Cowan N.B., Dang L., Desert J.-M., Fortney J.J., Keating D., Kempton E.M.-R., **Komacek T.D.**, Lewis N.K., Mansfield M., Morley C., Parmentier V., Rauscher E., Swain M.R., Zellem R.T., Showman A.P., A New Analysis of Eight Spitzer Phase Curves and Hot Jupiter Population Trends: Qatar-1b, Qatar-2b, WASP-52b, WASP-34b, and WASP-140b, 2022, AJ, 163, 256.

33. Fu G., Sing D.K., Lothringer J.D, Drake D., Ih J. , Kempton E., Malik M., **Komacek T.D.**, Mansfield M., and Bean J.L., Strong H_2O and CO emission features in the spectrum of KELT-20b driven by stellar UV irradiation, 2022, ApJL, 925, L3.

34. Grunblatt S.K., Saunders N., Sun M., Chontos H., Soares-Furtado M., Eisner N., Pereira F., **Komacek T.D.**, Huber D.H., and 19 other authors, TESS Giants Transiting Giants II: The Hottest Jupiters Orbiting Evolved Stars, 2022, AJ, 163, 120.

35. Savel A.B., Kempton E.M-R., Malik M., **Komacek T.D.**, et al., No umbrella needed: Confronting the hypothesis of iron rain on WASP-76b with post-processed general circulation models, 2022, ApJ, 926, 85.

36. Li J., Jiang J., Yang H., Abbot D.S., Hu R., **Komacek T.D.**, Bartlett S., and Yung, Y.L., Rotation Period Detection for Earth-like Exoplanets, 2022, AJ, 163, 27.

37. Addison B.C. and 71 other authors including **Komacek T.D.**, TOI-1431b/MASCARA-5b: A Highly Irradiated Ultra-Hot Jupiter Orbiting One of the Hottest & Brightest Known Exoplanet Host Stars, 2021, AJ, 162, 292.

38. Wong I., Shporer A., Zhou G., Kitzmann D., **Komacek T.D.**, Tan X., and 50 other authors, TOI-2109b: An Ultra-Hot Gas Giant on a 16-Hour Orbit, 2021, AJ, 162, 256.

39. °May E.M., °**Komacek T.D.**, Stevenson K.B., et al., Spitzer Phase Curve Observations and Circulation Models of the Inflated Ultra-Hot Jupiter WASP-76b, 2021, AJ, 162, 158.

40. May E.M., Taylor J., **Komacek T.D.**, Line M.R., and Parmentier V., Water Ice Cloud Variability & Multi-Epoch Transmission Spectra of TRAPPIST-1e, 2021, ApJL, 911, L30.

41. *Checlair J.H., Villanueva G.L., Hayworth B.P.C., Olson S.L., **Komacek T.D.**, Robinson T.D., Popovic P., Yang H., and Abbot D.S., Probing the Capability of Future Direct Imaging Missions to Spectrally Constrain the Frequency of Earth-Like Planets, 2021, AJ, 161, 150.

42. **Komacek T.D.**, Chavas D.R., and Abbot D.S., Hurricane Genesis is Favorable on Terrestrial Exoplanets Orbiting Late-Type M Dwarf Stars, 2020, ApJ, 898, 115.

43. *Salazar A.M., Olson S.L., **Komacek T.D.**, Stephens H., and Abbot D.S., The Effect of Substellar Continent Size on Ocean Dynamics of Proxima Centauri b, 2020, ApJL, 896, L16.

44. **Komacek T.D.**, Thorngren D.P., Lopez E.D., and Ginzburg S., Re-inflation of Warm and Hot Jupiters, 2020, ApJ, 893, 36.

45. **Komacek T.D.**, Fauchez T., Wolf E.T., and Abbot D.S., Clouds Will Likely Prevent the Detection of Water Vapor in JWST Transmission Spectra of Terrestrial Exoplanets, 2020, ApJL, 888, L20.

46. Mansfield M., Bean J.L., Stevenson K.B., **Komacek T.D.**, et al., Evidence for H_2 Dissociation and Recombination Heat Transport in the Atmosphere of KELT-9b, 2020, ApJL, 888, L15.

47. **Komacek T.D.** and Showman A.P., Temporal Variability in Hot Jupiter Atmospheres, 2020, ApJ, 888, 2.

48. Tan X. and **Komacek T.D.**, The Atmospheric Circulation of Ultra-Hot Jupiters, 2019, ApJ, 886, 26.

49. **Komacek T.D.**, Jansen M.F., Wolf E.T., and Abbot D.S., Scaling Relations for Terrestrial Exoplanet Atmospheres from Baroclinic Criticality, 2019, ApJ, 883, 46.

50. **Komacek T.D.**, Showman A.P., and Parmentier V., Vertical Tracer Mixing in Hot Jupiter Atmospheres, 2019, ApJ, 881, 152.

51. Zellem R.T., Swain M.R., Cowan N.B., Bryden G., **Komacek T.D.** et al., Constraining Exoplanet Metallicities and Aerosols with ARIEL: An Independent Study by the Contribution to ARIEL Spectroscopy of Exoplanets (CASE) Team, 2019, PASP, 131, 094401.

52. *Yang H., **Komacek T.D.**, and Abbot D.S., 2019, Effects of Radius and Gravity on the Inner Edge of the Habitable Zone, ApJL, 876, L27.

53. **Komacek T.D.** and Abbot D.S., The Atmospheric Circulation and Climate of Terrestrial Planets Orbiting Sun-like and M-dwarf Stars over a Broad Range of Planetary Parameters, 2019, ApJ, 871, 245.

54. °Koll D.D.B. and °**Komacek T.D.**, Atmospheric Circulations of Hot Jupiters as Planetary Heat Engines, 2018, ApJ, 853, 133.

55. **Komacek T.D.** and Youdin A.N., Structure and Evolution of Internally Heated Hot Jupiters, 2017, ApJ, 844, 94.

56. **Komacek T.D.**, Showman A.P., and Tan X., Atmospheric Circulation of Hot Jupiters: Dayside-Nightside Temperature Differences. II. Comparison with Observations, 2017, ApJ, 835, 198.

57. **Komacek T.D.** and Abbot D.S., Effect of Surface-Mantle Water Exchange Parameterizations on Exoplanet Ocean Depths, 2016, ApJ, 832, 54.

58. **Komacek T.D.** and Showman A.P., Atmospheric Circulation of Hot Jupiters: Dayside-Nightside Temperature Differences, 2016, ApJ, 821, 16.

59. Rogers T.M. and **Komacek T.D.**, Magnetic Effects in Hot Jupiter Atmospheres, 2014, ApJ, 794, 132.

Unrefereed articles

1. **Komacek T.D.** and Tan X., Effects of Dissociation/Recombination on the Day–Night Temperature Contrasts of Ultra-hot Jupiters, 2018, Research Notes of the AAS, 2, 36.

2. Apai D. and 32 other authors including **Komacek T.D.**, Exploring Other Worlds: Science Questions for Future Direct Imaging Missions (EXOPAG SAG15 Report), 2017, arXiv:1708.02821.

Reviews and commentaries

1. **Komacek T.D.**, Kang W, Lustig-Yaeger J, and Olson, S., Leveraging Models to Constrain the Climates of Rocky Exoplanets, 2021, Elements, 17, 251, in special issue "Geoscience beyond the Solar System."

2. Fortney J.J, Dawson B.I., and **Komacek T.D.**, Hot Jupiters: Origins, Structure, Atmospheres, 2021, JGR: Planets, 126, e06629, in special issue "Exoplanets: The nexus of astronomy and geoscience."

3. **Komacek T.D.** Stable Climates for Temperate Rocky Circumbinary Planets, 2020, JGR: Planets, 125, e06712, in special issue "Exoplanets: The nexus of astronomy and geoscience."

Research Advising

⋆ Indicates Komacek as primary advisor. ◦ Indicates Komacek as co-advisor.
◦**Sonny Fecanin** (MMathPhys Student, Oxford, October 2024 -)
⋆**John Allen** (DPhil Student, Oxford AOPP, September 2024 -)
◦**Deepayan Banik** (Ph.D student, UToronto, September 2024 -)
◦**Chase Alvarado-Anderson** (Ph.D student, Stanford, April 2024 -)
⋆**Ryan Chang** (High School Student, Centennial H.S., July 2024 - June 2025)
⋆**Anshuraj Sedai** (GRAD-MAP Student, UMD, June 2024 - August 2024)
◦**Matt Lastovka** (Graduate Student, UMD, October 2023 - August 2024)
◦**Willow Houck** (Post-Baccalaureate Researcher, UMD, September 2023 - August 2024)
⋆**Hayley Beltz** (Postdoc, UMD, August 2023 -)
⋆**Cole Smith** (Undergraduate and Graduate Student, UMD, June 2023 - September 2024)
⋆**Emeline Fromont** (Graduate Student, UMD, August 2022 -)
⋆**Kiana Whitfield** (Graduate Student, UMD, August 2022 - August 2023)
⋆**Justin Chen** (High School Student, Montgomery Blair H.S., February 2022 - August 2023)
⋆**Shazali Audu** (Undergraduate Student, UMD, February 2022 - January 2023)
⋆**Ronit Kapur** (High School Student, Thomas Jefferson H.S., February 2022 -)
◦**Ell Bogat** (Graduate Student, UMD, October 2021 - September 2024)
⋆**Tobi Hammond** (Undergraduate Student, UMD and post-bacc, NASA Goddard, June 2021 - August 2024)
◦**Jordan Ealy** (Graduate Student, UMD, June 2021 - September 2024)
⋆**Yoav Rotman** (Undergraduate Student, UMD, June 2021 - December 2022)
◦**Valeria Garcia** (Undergraduate researcher, Purdue, June-August 2021, June-August 2022)
◦**Julianna Heptinstall** (Undergraduate researcher, Purdue, June-August 2021)
◦**Olivia Alcabes** (Undergraduate researcher, UChicago, October 2020-June 2021)
◦**Andrea Salazar** (Undergraduate researcher, UChicago, October 2019-June 2020)
◦**Caroline Chael** (High School visiting researcher, UChicago, June-August 2019)
◦**Hang Luo** (Undergraduate visiting researcher, UChicago, July-September 2019)
◦**Haynes Stephens** (Graduate student, UChicago, September 2018-September 2019)
◦**Huanzhou Yang** (Undergraduate visiting researcher and graduate student, UChicago, June 2018-August 2025)

Mentorship

Teresa Monsue (CRESST Postdoctoral Scholar, October 2022 - September 2023)
Eric Yates (UMD Graduate Student, September 2022 - May 2023)
Emma Mirizo (UMD Graduate Student, September 2021 - May 2022)

Theses evaluated

Huanzhou Yang (University of Chicago, committee member, 2025)
Daniel Williams (University of Exeter, external examiner, 2025)
Jingxuan Yang (University of Oxford, internal examiner, 2025)
Pascal Noti (University of Bern, external examiner, 2024)

Alex Roth (University of Oxford, internal examiner, 2024)
Ben Hord (University of Maryland, committee member, 2023)
Guangwei Fu (University of Maryland, committee member, 2022)

Transfer and Confirmation of Status Committees

Emma Belhadfa (University of Oxford, Transfer of Status, 2025)
Henrik Auestad (University of Oxford, Confirmation of Status, 2024)

Service

Referee (AAS Journals, Geophysical Research Letters, Journal of Geophysical Research: Planets, Journal of Geophysical Research: Atmospheres, Nature, Nature Astronomy, Monthly Notices of the Royal Astronomical Society, Science, Astronomy & Astrophysics, Open Astronomy, Elements, Icarus)

- 49 manuscripts reviewed to date

UMD EDI Committee Chair (2022-2023, 2023-2024)
UMD GRAD-MAP Summer Scholars (Research advisor, 2022, 2024)
UMD GRAD-MAP Winter Workshop (Research advisor, 2022)
UMD Planetary Astronomy Lunch Seminar (PALS) Co-lead (2022-2023)
UMD Astronomy Merit Committee (2022-)
UMD Astronomy Graduate Admissions Committee (2021-2022)
UMD Astronomy First-Year Mentoring Program (2021-)
UMD Astronomy BANG! Seminar Committee (2021-2023)
Review Panel Member (NASA, 5 times)
External Reviewer (NASA, STFC, STScI, PRFP, SNSF, DiRAC, NWO, SNF, NCN, BSF)
Conference Organizer (2026 UK Exoplanet Meeting (SOC), 2025 Aspen Center for Physics Winter Conference on Atmospheric characterization of rocky to giant exoplanets in thermal emission with JWST (co-lead organizer), 2024 UMD Brin MRC Summer School on Tracer Mixing Across Planetary Scales (co-lead organizer), 2024 NASA SEEC Symposium (co-lead organizer), 2023 Building Bridges Across Planetary-Related Science II (co-lead organizer))
Session Convener (American Geophysical Union (5 times))
UChicago Department of Geophysical Sciences EDI discussion series (2020-2021)

- I served as a facilitator in our Department of Geophysical Sciences monthly discussions on equity, diversity, and inclusion in academia.

UChicago Exoplanet Journal Club (2020-2021)

- I was one of two organizers of the UChicago Exoplanet Journal Club for the 2020-2021 academic year.

UChicago Astronomy & Astrophysics Inclusion, Diversity, and Equity in Astronomy (IDEA) (2018-2021)

- I regularly attended the IDEA group for students and postdocs in the UChicago Astronomy & Astrophysics department, which includes bi-weekly journal club meetings on EDI topics.

Lunar and Planetary Laboratory Allyship Auxiliary (Co-founder: 2017-2018)

- Helped start the LPL Allyship Auxiliary (https://www.lpl.arizona.edu/about/department-life/allyship), a biweekly discussion on equity, diversity, and inclusion based on the DPS Men's Auxiliary.

Lunar and Planetary Laboratory Journal Club (Graduate Student Coordinator: 2015-2018)

- I organized, found speakers for, and ran the weekly departmental journal club as a graduate student at LPL.

Teaching

University of Maryland (Assistant Professor: 2021-)

- Instructor for "ASTR 435: Astrophysics of Exoplanets," Spring 2023.
- Instructor for "ASTR 100: Introduction to Astronomy," Spring 2022, Fall 2022.
- Instructor for "ASTR 380: Life in the Universe," Fall 2021.

University of Arizona (Teaching Assistant: 2017-2018)

- Teaching assistant for "The Universe and Humanity: Origin and Destiny," Fall 2017, with Prof. Travis Barman.
- Teaching assistant for "Our Golden Age of Planetary Exploration," Spring 2018, with Prof. Jeff Andrews-Hanna.

Outreach

Science Olympiad (National Science Olympiad Astronomy Co-Supervisor: 2010-Present)

- As a national event co-supervisor for Science Olympiad, I present at coaches clinics, develop educational materials and exams, and supervise the Astronomy event at invitational, regional, and national competitions.

International Olympiad on Astronomy and Astrophysics (United States Astronomy and Astrophysics Team: 2014-Present)

- I am a member of the U.S.A. team board, which involves organizing the National Astronomy Competition yearly.
- I was a U.S.A. team leader in 2014 and 2020, with the role of mentoring the high-school students competing in the competition and supervising the 2014 competition in Romania and the 2020 competition held online.

UChicago Physical Science Division (2020)

- I served as a panelist for the 2020 "Life During Graduate School" seminar series.

Noble Academy Python Club (Instructor: 2018-2019)

- I taught Chicago high school students the Python programming language as a weekly after-school activity.

Ryerson Astronomical Society (UChicago) (President: 2011-2013; Webmaster: 2010-2011)

- As an undergraduate, I ran weekly meetings and public observing nights.
- Additionally, I organized and led trips for local elementary school students to tour Ryerson observatory.

Splash! Chicago (Instructor: 2009-2012)

- As an undergraduate, I developed and taught introductory astronomy courses for local high school students.

Honors and Awards

1. 2024 UMD Department of Astronomy Excellence in Mentoring Prize

2. 2023 National Science Olympiad Heart of Gold Award
3. Recipient of 2018-2021 Heising-Simons Foundation 51 Pegasi b Postdoctoral Fellowship
4. Recipient of 2017 LPL Gerard P. Kuiper Memorial Award for graduate student scholarship
5. Recipient of 2015 and 2016 University of Arizona Galileo Circle Scholarship
6. Recipient of 2014-2017 NASA Earth and Space Science Fellowship (NESSF) Program Award
7. Recipient of 2013-2014 Lieutenant Colonel Kenneth Rondo Carson and Virginia Bryan Carson LPL Graduate Fellowship

Research Funding

1. "Characterizing The Gamut Of Habitable Zone Rocky Exoplanets Around M-Dwarfs With Next-Generation Observatories." NASA HW (22-HW22_2-0039), 8/1/23-7/31/25. $365,416 total, $187,256 to UMD. PI: Komacek. Co-I: Thomas Fauchez, Avi Mandell. Collaborator: Giada Arney, Stephen Kane, Ravi Kopparapu, Eric Wolf.
2. "Inhomogeneous aerosol coverage in the atmospheres of hot and ultra-hot Jupiters: A hierarchical cloud microphysics and dynamics approach." NASA XRP (22-XRP22_2-0125), 8/1/23-7/31/26. $641,945 total, $481,761 to UMD. PI: Komacek. Co-I: Peter Gao, Diana Powell, Eliza Kempton. Collaborator: Vivien Parmentier, Xianyu Tan.
3. "Characterizing Tropical Cyclone Genesis and Evolution in Tidally Locked Rocky Planet Atmospheres with High-Resolution GCMs." Heising-Simons Foundation (2023-4049), 5/1/23-7/31/24. $125,000 to UMD. PI: Komacek. Co-I: Dan Chavas.
4. "From East to West: the first simultaneous temperature and cloud map of a hot Jupiter." JWST Cycle 1 (GO-02158), 4/1/23-3/31/26. $9,423 to UMD. PI: Vivien Parmentier. Admin PI: Michael Line.
5. Heising-Simons Foundation 51 Pegasi b Postdoctoral Fellowship. 8/1/18-7/31/21. $362,247 to the University of Chicago.
6. NASA NESSF Graduate Student Fellowship. 9/1/14-8/31/14. PI Adam Showman. $90,000 to the University of Arizona.

Presentations

Colloquia & Invited Talks

1. "Characterizing the three-dimensional nature of exoplanet atmospheres: from hot gas giants to temperate rocky planets," Astrophysics Colloquium, Ludwig Maximilian University. July 23, 2025.
2. "Characterizing the three-dimensional nature of exoplanets in the era of JWST," Astrophysics Colloquia, University of Oxford. March 3, 2025.
3. "Atmospheric physics of extrasolar worlds," Department of Physics State of the Nation, University of Oxford. January 17, 2025.

4. "Characterizing the Three-Dimensional Nature of Hot Gas Giant Exoplanets in the Era of JWST," EAPS Bromery Lecture, Johns Hopkins University. February 1, 2024.

5. "Interpreting astronomical observations to characterize the atmospheric circulation, climate, and habitability of exoplanets," Oxford University Department of Physics, Atmospheric, Oceanic, and Planetary Physics Sub-Department. November 22, 2023.

6. "Characterizing the Three-Dimensional Nature of Hot Gas Giant Exoplanets in the Era of JWST," Lunar and Planetary Laboratory Colloquium, University of Arizona. October 17, 2023.

7. "Characterizing the 3D nature of hot Jupiter atmospheres in the era of JWST," Peking University. August 9, 2023.

8. "Characterizing the Atmospheres of Temperate Rocky Planets in the Era of JWST," AOGS Invited Talk (session: Planetary Atmospheres and Climates in and Beyond the Solar System). August 2, 2023.

9. "Exoplanet atmospheres as a natural fluid dynamics laboratory: from ultra-hot Jupiters to temperate rocky exoplanets," The Burgers Program for Fluid Dynamics Nineteenth Annual Symposium. October 7, 2022.

10. "The effects of clouds on observable properties of temperate rocky exoplanets," RAS Specialist Meeting on Exoplanet Modeling in the JWST Era II: Terrestrial planets and Sub-Neptunes. April 8, 2022.

11. "Characterizing the Atmospheres of Extreme Gas Giants: Atmospheric circulation and mineral cloud transport on ultra-hot Jupiters," TCU Physics & Astronomy Colloquium. Jan. 28, 2022.

12. "Interpreting Astronomical Observations to Characterize the Atmospheric Circulation, Climate, and Habitability of Exoplanets," University of Maryland Astronomy Colloquium. April 15, 2020.

13. "The Atmospheric Circulation and Evolution of Warm, Hot, and Ultra-Hot Jupiters," Purdue EAPS Colloquium. January 30, 2020.

14. "Understanding Water Cycling Between Mantle and Surface on Terrestrial Exoplanets Using Simplified Models." *Lunar and Planetary Laboratory Conference*, University of Arizona. August 19, 2016.

Seminars

1. "Clouds across exoplanetary regimes: from hot gas giants to habitable rocky exoplanets," ExoCam Seminar, University of Cambridge. October 7, 2025.

2. "Characterizing the three-dimensional nature of exoplanet atmospheres: from hot gas giants to temperate rocky planets," Geophysical and Astrophysical Fluid Dynamics Seminar Series, University of Exeter. May 12, 2025.

3. "Characterizing the three-dimensional nature of exoplanet atmospheres: from hot gas giants to temperate rocky planets," Noble Seminar, University of Toronto. January 20, 2025.

4. "Limited Hysteresis in the Atmospheric Dynamics of Hot Jupiters," AOPP Research Reports, University of Oxford. January 9, 2025.

5. "Leveraging exoplanet atmospheric characterization to provide a universal understanding of planetary climates," AOPP Seminar, Oxford University. November 2, 2023.

6. "Characterizing the Climates of Temperate Rocky Exoplanets in the Era of JWST," Origins Seminar, University of Arizona. October 23, 2023.

7. "The effect of interior heat flux on the atmospheric circulation of hot and ultra-hot Jupiters," Planet Theory Talk, University of Arizona. October 19, 2023.

8. "Coupling the inflated interiors, atmospheric dynamics, and mineral clouds of hot and ultra-hot Jupiters," Tsung-Dao Lee Institute, Shanghai Jiao Tong University. August 15, 2023.

9. "Characterizing the atmospheres of temperate rocky exoplanets in the era of JWST," HUJI CAO Seminar. March 22, 2023.

10. "Characterizing the 3D nature of hot Jupiter atmospheres in the era of JWST," Carnegie EPL Astro Seminar. February 24, 2023.

11. "Clouds and climate variability in the atmospheres of temperate rocky exoplanets," NASA HabWorlds Biosignatures STG. February 14, 2023.

12. "The effect of interior heat flux on the atmospheric circulation of hot and ultra-hot Jupiters," MPIA ExoCoffee. February 14, 2023.

13. "Studying extreme planets as a natural fluid dynamics laboratory: Atmospheric circulation and mineral cloud transport on ultra-hot Jupiters," UMD Department of Atmospheric & Oceanic Science Seminar. Jan. 27, 2022.

14. "Clouds, Storms, and Variability in Exoplanet Atmospheres," UMD Planetary Astronomy Lunch Seminar (PALS). Nov. 22, 2021.

15. "Clouds, Storms, and Variability in Exoplanet Atmospheres," Oxford Atmospheric, Oceanic, and Planetary Physics (AOPP) Seminar. Nov. 18, 2021.

16. "The Atmospheric Circulation and Evolution of Warm, Hot, and Ultra-Hot Jupiters," Exeter Astrophysics Seminar. March 17, 2021.

17. "Interpreting Astronomical Observations to Characterize the Atmospheric Circulation, Climate, and Habitability of Exoplanets," UChicago Department of Geophysical Sciences Seminar. April 3, 2020.

18. "The Atmospheric Circulation of Terrestrial Planets Orbiting M Dwarfs and Sun-like Stars." *Exoplanet Lunch*, Harvard CfA. April 9, 2019.

19. "The Atmospheric Circulation of Ultra-Hot Jupiters." *Stars & Planets Seminar*, Harvard CfA. April 8, 2019.

20. "The Atmospheric Circulation of Ultra-Hot Jupiters." *Exoplanet Tea*, MIT. April 4, 2019.

21. "The Atmospheric Circulation of Ultra-Hot Jupiters." *Astronomy Lunch*, MIT. February 7, 2019.

22. "The Atmospheric Circulation of Ultra-Hot Jupiters." *Noon Balloon*, University of Chicago. November 16, 2018.

23. "A Predictive Theory for the Atmospheric Circulation of Hot Jupiters." *Planetary Lunch*, University of California, Santa Cruz. February 14, 2017.

24. "A Predictive Theory for Vertical Mixing in Hot Jupiter Atmospheres." *Exoplanet Lunch*, Harvard CfA. January 24, 2017.

25. "A Predictive Theory for the Atmospheric Circulation of Hot Jupiters." *MIT Atmospheric Sciences Seminar*, MIT. January 23, 2017.

26. "Effect of Surface-Mantle Water Exchange Parameterizations on the Prevalence of Waterworlds." *Kavli Institute Brown Bag*, MIT. January 23, 2017.

27. "Partitioning of Water Between Surface and Mantle: What Makes a Waterworld?" *Origins Seminar*, University of Arizona. October 31, 2016.

Outreach Presentations

1. "Characterizing the three-dimensional nature of hot gas giant exoplanets in the era of JWST," American Physical Society Senior Physicists Group. Feb. 21, 2024.

2. "Characterizing the Atmospheric Circulation and Climate of Exoplanets in the Era of JWST," National Capital Astronomers. Feb. 11, 2023.

3. "The circulation and climate of exoplanets: from ultra-hot Jupiters to temperate rocky planets," Southern Maine Astronomers. Nov. 3, 2022.

4. "Finding Earth 2.0," Chautauqua Institution Women's Club. Aug. 25, 2022.

5. "Searching for Life in the Galaxy with JWST," LMSD YES Academy. July 19, 2022.

6. "Finding and Characterizing Another Earth," Bala Cynwyd Middle School. Apr 9, 2021.

Contributed Oral Presentations

1. Komacek T.D., Cottingham J., Fromont E., Gao P., Kempton E., Powell D., and Tan X. (2025) The impact of cloud microphysics on the atmospheric dynamics of hot Jupiters. *DPS-EPSC*.

2. Komacek T.D. (2025) Testing the standard model of hot Jupiter atmospheric circulation. *OWL Summer Program*.

3. Komacek T.D. (2025) Testing the standard model of hot Jupiter atmospheric circulation. *EGU*.

4. Komacek T.D. (2024) Limited Hysteresis in the Atmospheric Dynamics of Hot Jupiters. *AAS*.

5. Komacek T.D. (2023) Characterizing the atmospheric composition and climate of potentially habitable exoplanets in the era of JWST. *Space Telescope Science Institute Spring Symposium*.

6. Komacek T.D. (2023) Patchy clouds in the atmospheres of ultra-hot Jupiters. *Cloud Academy* **III**.

7. Komacek T.D. (2023) The effect of interior heat flux on the atmospheric circulation of hot and ultra-hot Jupiters. *AAS*.

8. Komacek T.D. (2022) Cloud variability and tropical cyclones in the atmospheres of temperate rocky exoplanets. *51 Pegasi b Summit*.

9. Komacek T.D. (2022) Patchy clouds on the nightsides of ultra-hot Jupiters. *Flatiron Exoplanet Symposium*.

10. Komacek T.D. (2022) Cloud variability and tropical cyclones in the atmospheres of temperate rocky exoplanets. *Rocky Worlds* **II**.

11. Komacek T.D. (2021) Characterizing weather in exoplanet atmospheres. *Exoplanets-A meeting*.

12. Komacek T.D., Lopez E., Thorngren D., and Ginzburg, S. (2020) Re-inflation of Warm and Hot Jupiters. *Exoplanets* **III**.

13. Komacek T.D., Jansen M., Wolf T., and Abbot D. (2019) Scaling Relations for the Equator-to-Pole Temperature Contrast and Bulk Lapse Rate of Terrestrial Exoplanets. *AGU*.

14. Komacek T.D., Lopez E., Thorngren D., and Youdin A. (2019) Re-inflation of Hot Jupiters. *Lake Michigan Exoplanet Meeting*.

15. Komacek T.D. (2019) The Atmospheric Circulation and Climate of Terrestrial Planets over a Broad Range of Planetary Parameters. *Exoclimes* **V**.

16. Komacek T.D. and Abbot D.S. (2019) The Climate and Habitability of Terrestrial Exoplanets Orbiting M Dwarf Stars. *51 Pegasi b Summit*.

17. Komacek T.D., Fauchez T., Kopparapu R., Wolf E.T., and Abbot D.S. (2019) The Effects of Clouds on Observable Properties of Terrestrial Exoplanets: Results from a Large Suite of GCMs. *AbSciCon*.

18. Komacek T.D. Tan X., Mansfield M., and Bean J. (2019) The Atmospheric Circulation of Ultra-Hot Jupiters. *OWL Summer Program*.

19. Komacek T.D., Showman A.P., and Parmentier V. (2018) Vertical Mixing in Hot Jupiter Atmospheres. *Lake Michigan Exoplanet Meeting*.

20. Komacek T.D. and Abbot D.S. (2018) The Atmospheric Circulation of Terrestrial Planets over a Broad Range of Planetary Parameters. *Sagan Fellows Symposium*.

21. Komacek T.D. and Koll D.D.B. (2018) Constraining Atmospheric Drag in Hot Jupiter Atmospheres Using Doppler Spectroscopy. *High Resolution Spectroscopy for Exoplanet Atmospheres*.

22. Komacek T.D., Showman A.P., and Parmentier V. (2018) Vertical Mixing in Hot Jupiter Atmospheres. *Cloud Academy, École de Physique des Houches.*

23. Komacek T.D. and Abbot D.S. (2018) The Atmospheric Circulation and Cloud Behavior in a Large Suite of Terrestrial Planet GCMs. *CCTP* **III**.

24. Komacek T.D. and Abbot D.S. (2018) The Atmospheric Circulation and Cloud Behavior in a Large Suite of Terrestrial Planet GCMs. *51 Pegasi b Summit.*

25. Komacek T.D. and Showman A.P. (2017) The Atmospheric Circulation of Hot Jupiters: A Hierarchical Modeling Approach. *DPS* **49**.

26. Komacek T.D. and Abbot D.S. (2017) Effect of Surface-Mantle Water Exchange Parameterizations on the Prevalence of Waterworlds. *AbSciCon.*

27. Komacek T.D. and Abbot D.S. (2016) Partitioning of Water between Surface and Mantle on Terrestrial Exoplanets: Effect of Surface-Mantle Water Exchange Parameterizations on Ocean Depth. *AGU.*

28. Komacek T.D. and Showman A.P. (2016) A Predictive Theory for the Atmospheric Circulation of Hot Jupiters. *DPS* **48**.

29. Komacek T.D. and Showman A.P. (2016) A Predictive Theory for the Atmospheric Circulation of Hot Jupiters. *Exoclimes* **IV**.

30. Komacek T.D. and Youdin A.N. (2015) Structure and Evolution of Internally Heated Hot Jupiters. *DPS* **47**.

31. Komacek T.D. and Showman A.P. (2015) Transitions in Efficiency of Heat Redistribution in Hot Jupiter Atmospheres. *International Colloquium of the Paris Institute of Astrophysics* **31**.

32. Komacek T.D., Rogers T.M., Barman, T.S., Showman A.P., Youdin A.N. (2014) Effects of Magnetism on the Atmospheres and Evolution of Hot Jupiters. *DPS* **46**.

Contributed Poster Presentations

1. Komacek T.D. (2025) The past, present, and future of hot Jupiter circulation *BUFFET* **5**.

2. Komacek T.D. (2025) The past, present, and future of hot Jupiter circulation *Exoclimes.*

3. Komacek T.D., Hammond T., Kopparapu R., Mandell A., Wolf E.T., Kofman V., Fauchez T., Arney G.N., Crouse J., Kane S. (2025) Simulating the climates and thermal emission of prime nearby temperate rocky exoplanet candidates. *Atmospheric characterization of rocky to giant exoplanets in thermal emission with JWST, Aspen Center for Physics.*

4. Komacek T.D., Hammond T., Kopparapu R., Mandell A., Wolf E.T., Kofman V., Fauchez T., Arney G.N., Crouse J., Kane S. (2024) Simulating the climates and thermal emission of prime nearby temperate rocky exoplanet candidates. *AGU.*

5. Komacek T.D. (2024) The Stable atmospheric dynamics of hot Jupiters. *Exoplanets* **5**.

6. Komacek T.D., Rotman Y., Fauchez T., May E., Villanueva G. (2023) Characterizing the impact of clouds on the detection of key molecular features in temperate rocky exoplanet atmospheres with JWST. *AGU.*

7. Komacek T.D., Gao P., May E., Tan X., Thorngren D. (2023) The effect of interior heat flux on the atmospheric circulation of hot and ultra-hot Jupiters. *Exoclimes* **VI**.

8. Komacek T.D., Hochman A., De Luca P. (2022) Climate Extremes and Variability on TRAPPIST-1e. *AGU*.

9. Komacek T.D., Tan X., Gao P., Lee E. (2022) Patchy clouds on the nightsides of ultra-hot Jupiters: General Circulation Model simulations with radiatively active cloud tracers. *Exoplanets* **IV**.

10. Komacek T.D., May E.M., Gao P., Thorngren D. (2021) The effect of interior temperature on the atmospheric circulation and observable properties of hot and ultra-hot Jupiters. *AGU*.

11. Komacek T.D., Chavas D.R., Abbot D.S. (2020) Favorability of Hurricane Genesis on Tidally Locked Exoplanets Orbiting M-dwarf Stars. *AGU*.

12. Komacek T.D., Fauchez T., Wolf E.T., Abbot D.S. (2019) Clouds Inhibit the Detection of Water in Transmission Spectra of Terrestrial Exoplanets Orbiting M Dwarf Stars. *NASA SEEC Symposium*.

13. Komacek T.D. and Showman A.P. (2019) Time-Variability in Hot Jupiter Atmospheres. *ESS* **4**.

14. Komacek T.D., Abbot D.S. (2018) The Atmospheric Circulation and Observable Properties of a Large Suite of Terrestrial Planet GCMs. *AGU*.

15. Komacek T.D., Showman A.P., Tan X., Parmentier V. (2017) A Predictive Theory for Vertical Mixing in Hot Jupiter Atmospheres. *École de Physique des Houches*.

16. Komacek T.D. and Showman A.P. (2016) A Predictive Theory for the Atmospheric Circulation of Hot Jupiters. *Kavli Summer Program in Astrophysics*.

17. Komacek T.D. and Showman A.P. (2015) Dayside-Nightside Temperature Differences in Hot Jupiter Atmospheres. *AGU*.

18. Komacek T.D. and Showman A.P. (2015) Dayside-Nightside Temperature Differences in Hot Jupiter Atmospheres. *ESS* **3**.

19. Komacek T.D., Young D. (2015) Exoplanet Science in the National Science Olympiad. *DPS* **47**.

20. Komacek T.D. and Youdin A.N. (2015) Effects of Turbulent Mixing on the Evolution and Structure of Hot Jupiters. *SPF* **1**.

21. Youdin A.N. and Komacek T.D. (2014) Hot Jupiter Radii: A Turbulent History. *DPS* **46**.

22. Komacek T.D., Young D., Schroeder D.M., Van Hecke M.A. (2014) Star Formation and Exoplanetary Systems in the National Science Olympiad Astronomy Event for High School Students. *DPS* **46**.

23. Komacek T.D., Rogers T.M., Showman A.P. (2014) Magnetohydrodynamic Simulations of Hot Jupiters: Temperature Dependent Magnetic Conductivity. *Exoclimes* **III**.

24. Komacek T.D., Ciesla F.J, Davison T.M. (2013) A Model For the Three-Dimensional Heating of a Planetesimal. *LPSC* **44**.