DORIAN SCHUYLER ABBOT
THE UNIVERSITY OF CHICAGO
GEOPHYSICAL SCIENCES
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Research Focus

I use low-order mathematical models and complex numerical models to understand climate, paleoclimate, planetary habitability, planetary dynamics, and exoplanets.

Positions

2024-Present	Professor	Geophysical Sciences	U. of Chicago
2015-2024	Associate Prof	Geophysical Sciences	U. of Chicago
2011-2015	Assistant Prof	Geophysical Sciences	U. of Chicago

Education

2009-2011	Postdoc	Geophysical Sciences	U. of Chicago
2008-2009	Postdoc	Earth and Planet. Sci.	Harvard
2008	PhD	Applied Mathematics	Harvard
2004	S.M.	Applied Mathematics	Harvard
2004	A.B.	Physics	Harvard

Advising

Postdocs

○ RJ Graham	2023-	“Weathering parameterizations”
○ Mark Hammond	2020-2021	“Hot Jupiter weather”
○ Stephanie Olson	2018-2020	“Exoplanet oceanography”
○ Tad Komacek	2018-2020	“Clouds on terrestrial exoplanets”
○ Jun Yang	2012-15	“M-star planet habitability”
○ Yi-Ping Ma	2011-13	“Mathematics of climate”

PhD Students

○ Logan Cabral-Pelletier	ex. 2028	“Resolved exoplanet clouds”
○ Xuan Ji	ex. 2026	“Binary Star Habitability”
○ Huanzhou Yang	ex. 2025	“Cloud microphysics on terrestrial exoplanets”
○ Jade Checlair	2021	“Theoretical study of habitable terrestrial planets and

		statistical tests to inform future observations”
○ Navah Farahat	2020	“Numerical models for a better understanding of off-axis hydrothermal systems”
○ Predrag Popović	2020	“Idealized models of Arctic sea ice melt ponds”
○ Jonah Bloch-Johnson	2018	“Climate feedback temperature dependence”
○ David Plotkin	2018	“Rare events in weather and climate”
○ Daniel Koll	2016	“Dry atmospheric circulations on rocky exoplanets”

MS Students

○ Nathan Baskin	2016	“The effect of forced orbital evolution on planetary habitability”

Undergraduates

○ Michelle Hu	2022-24	“Observations of exoplanet cloud microphysics”
○ Jiaru Shi	2022-23	“Effect of tides on exoplanet climate”
○ George Afentakis	2021-24	“Stellar Flares with LUVOIR and HabEx” “Fastest possible Mercury instability”
○ Kyla Mullaney	2021-22	“Stellar Flares with LUVOIR and HabEx”
○ John Blalack	2021	“Stellar Flares with LUVOIR and HabEx”
○ Runxin Ni	2020	“Pacific typhoons in WRF”
○ James Butler	2020	“Sudden stratospheric warming”
○ Yixiao Zhang	2020	“Applying Romps equilibration to ExoCAM”
○ Hang Luo	2019	“Warm Jupiters”
○ Huanzhou Yang	2018	“Tidally locked runaway greenhouse”
○ Andrea Salazar	2018-20	“Tidally locked snowball planets”
○ Olivia Alcabes	2018-20	“Gaia hypothesis investigation”
○ Francisco Spaulding-Astudillo	2017-18	“Global glaciation and thick ice flow”
○ R.J. Graham	2016-18	“Snowball Earth stratospheric circulation”
○ Sean Mills	2011-12	“Weak temperature gradient approximation for tidally locked planets”

Courses Taught

Getting Something for Nothing (Undergraduate Core)
Global Warming (Undergraduate Core)
Science and Christianity (Undergraduate Big Problems)

Radiative Transfer (Undergraduate+Graduate)
The Atmosphere (Undergraduate)
Fundamentals of Geophysical Fluid Dynamics (Graduate)
What makes a planet habitable? (Undergraduate+Graduate)
Mathematical Methods for Earth Science (Graduate)
Topics in Atmospheric Science (Graduate)

Service and Outreach

- Member of the University of Chicago College Council (2024-2027)
- Member of the Committee of the Council of the University of Chicago Senate (2023-2024)
- Member of the Council of the University of Chicago Senate (2021-2024)
- Member of the Board of Trustees of Florida Polytechnic University (2023-)
- Member of the Advisory Board of Harvard Alumni for Free Speech (2022-)
- Member of the University of Austin Board of Advisors (2021-)
- Member of the Executive Review Committee for Oklahoma Academic Science Standards (2024)
- Founding member of the Academic Freedom Alliance
- Co-founder of UChicago Free
- Co-founder and moderator of The Heterodox Academy STEM Community (HxSTEM)
- Maintainer of the Heterodox STEM substack
- Taught physical sciences general education to thousands of undergraduates
- Served on panels and provided external reviews for NASA, NSF, ARO, foreign foundations, and private foundations
- Reviewed for 52 journals
- Public lectures, public essays, and opinion pieces
- Television, radio, and podcast guest

Publications

https://scholar.google.com/citations?user=UqDnxT0AAAAJ&hl=en

Yang, H., Komacek, T. D., Toon, O. B., Wolf, E. T., Robinson, T. D., Chael, C., and Abbot, D. S. (2024), “Impact of Planetary Parameters on Water Clouds Microphysics,” *The Astrophysical Journal*, 966(2), 152.

Song, Xinyi, Dorian S. Abbot, and Jun Yang (2024), "Critical role of vertical radiative cooling contrast in triggering episodic deluges in small-domain hothouse climates,” *Journal of Advances in Modeling Earth Systems*, 16, e2023MS003912.

Fu, Minmin, Dorian S. Abbot, Christian Koeberl, and Alexey Fedorov (2024), Impact-induced initiation of Snowball Earth: A model study, *Science Advances*, 10, eadk5489.

Abbot, Dorian S., J. D. Laurence-Chasen, Robert J. Webber, David M. Hernandez, and Jonathan Weare (2024), AI Can Identify Solar System Instability Billions of Years in Advance, *Res. Notes* AAS 8 3.

Abbot, Dorian S., Robert J. Webber, David M. Hernandez, Sam Hadden, and Jonathan Weare (2024), Mercury's chaotic secular evolution as a subdiffusive process, *The Astrophysical Journal,* 967:121.

Abbot, D.S. (2023), The Chicago Trifecta, *European Review*, 1-12.

Abbot, D.; Bikfalvi, A.; Bleske-Rechek, A.L.; Bodmer, W.; Boghossian, P.; Carvalho, C.M.; Ciccolini, J.; Coyne, J.A.; Gauss, J.; Gill, P.M.W.; Jitomirskaya, S.; Jussim, L.; Krylov, A.I.; Loury, G.C.; Maroja, L.; McWhorter, J.H.; Moosavi, S.; Nayana Schwerdtle, P.; Pearl, J.; QuintanillaTornel, M.A.; Schaefer, H.F., III; Schreiner, P.R.; Schwerdtfeger, P.; Shechtman, D.; Shifman, M.; Tanzman, J.; Trout, B.L.; Warshel, A.; West, J.D. (2023). In Defense of Merit in Science. *Journal of Controversial Ideas*, 3(1), 1.

Finkel, J., Webber, R. J., Gerber, E. P., Abbot, D. S., and Weare, J. (2023). Data-driven transition path analysis yields a statistical understanding of sudden stratospheric warming events in an idealized model. *Journal of the Atmospheric Sciences*, 80(2), 519-534.

Afentakis, Georgios P., Kyla Mullaney, Howard Chen, John Blalack, Jade Checlair, and Dorian S. Abbot (2023), Understanding the Capability of Future Direct-imaging Observations to Quantify Atmospheric Chemical Effects of Stellar Proton Events, *The Astrophysical Journal,* 166:117.

Abbot, Dorian S., David M. Hernandez, Sam Hadden, Robert J. Webber, Georgios P. Afentakis, and Jonathan Weare (2023), Simple physics and integrators accurately reproduce Mercury instability statistics, *The Astrophysical Journal,* 944:190.

Finkel, Justin, Edwin P. Gerber, Dorian S. Abbot and Jonathan Weare (2023), Revealing the statistics of extreme events hidden in short weather forecast data, *AGU Advances*, 4, e2023AV000881.

Ji, Xuan, Nora Bailey, Daniel Fabrycky, Edwin S. Kite, Jonathan H. Jiang, Dorian S. Abbot (2023), Inner Habitable Zone Boundary for Eccentric Exoplanets, *The Astrophysical Journal Letters,* 943:L1.

Hammond, M. and D.S. Abbot (2022), Numerical Dissipation Strongly Affects the Equatorial Jet Speed in Simulations of Hot Jupiter Atmospheres, *Monthly Notices of the Royal Astronomical Society*, 511, 2313–2325.

Olson, S., M.F. Jansen, D.S. Abbot, I. Halevy, & C. Goldblatt (2022), The effect of ocean salinity on climate and its implications for Earth's habitability, *Geophysical Research Letters*, 49, e2021GL095748.

Zhang, Y., J. Bloch-Johnson, D.M. Romps, and D.S. Abbot (2021), Evolving CO_2 rather than SST leads to a factor of ten decrease in GCM convergence time, *Journal of Advances in Modeling Earth Systems*, 13(11), e2021MS002505.

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Abbot, D.S., R.J. Webber, S. Hadden, D. Seligman, J. Weare (2021), Rare Event Sampling Improves Mercury Instability Statistics, *The Astrophysical Journal*, 923:236.

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Komacek, T.D., T.J. Fauchez, E.T. Wolf, and D.S. Abbot (2020), Clouds will likely prevent the detection of water vapor in JWST transmission spectra of terrestrial exoplanets, *Astrophysical Journal Letters*, 888:L20.

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Checlair, J.H., S.L. Olson, and D.S. Abbot (2019), No snowball on habitable tidally locked planets with a dynamic ocean, *Astrophysical Journal Letters*, 884:L46.

Checlair, J.H., A.M. Salazar, A. Paradise, K. Menou, and D.S. Abbot (2019), No snowball cycles at the outer edge of the Habitable Zone for habitable tidally locked planets, *Astrophysical Journal Letters*, 887:L3.

Komacek T.D., M.F. Jansen, E.T. Wolf, and D.S. Abbot (2019), Scaling Relations for Terrestrial Exoplanet Atmospheres from Baroclinic Criticality, *Astrophysical Journal*, 883:1.

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Checlair, J., K. Menou, and D.S. Abbot (2017), No snowball on habitable tidally locked planets, *Astrophysical Journal*, 845:132.

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Yang, J., M.F. Jansen, F.A. MacDonald, and D.S. Abbot (2017), Persistence of A Surface Freshwater Ocean After A Snowball Earth, *Geology*, 45(7), 615–618.

Hoffman, P.F., D.S. Abbot, Y. Ashkenazy, D.I. Benn, J.J. Brocks, P.A. Cohen, G.M. Cox, J.R. Creveling, Y. Donnadieu, D.H. Erwin, I.J. Fairchild, D. Ferreira, J.C. Goodman, G.P. Halverson, M.F. Jansen, G. Le Hir, G.D. Love, F.A. Macdonald, A.C. Maloof, C.A. Partin, G. Ramstein, B.E.J. Rose, C.V. Rose, P.M. Sadler, E. Tziperman, A. Voigt, and S.G. Warren (2017), Snowball Earth climate dynamics and Cryogenian geology-geobiology, *Science Advances*, 3:e1600983.

Komacek, T.D. and D.S. Abbot (2016), Effect of surface-mantle water exchange parameterizations on exoplanet ocean depths, *Astrophysical Journal*, 832, 54.

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Koll, D.D.B. and D.S. Abbot (2015), Deciphering Thermal Phase Curves of Dry, Tidally Locked Terrestrial Planets, *Astrophysical Journal*, 802, 21.

Yang, J., Y. Liu, Y. Hu, and D.S. Abbot (2014), Water Trapping on Tidally Locked Terrestrial Planets Requires Special Conditions, *Astrophysical Journal Letters*, 796, L22.

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Abbot, D.S. (2014), Resolved Snowball Earth Clouds, *Journal of Climate*, 27(12), 4391–4402.

Yang, J. and D.S. Abbot (2014), A Low-order Model of Water Vapor, Clouds, and Thermal Emission of Tidally Locked Terrestrial Planets, *Astrophysical Journal*, 784, 155.

Cowan, N.B. and D.S. Abbot (2014), Water cycling between ocean and mantle: super-Earths need not be waterworlds, *Astrophysical Journal*, 781, 27.

Cathles, L.M., D.S. Abbot, and D.R. MacAyeal (2014), Intra-surface radiative transfer limits the geographic extent of snow penitentes on horizontal snow fields, *Journal of Glaciology*, 60, 147–154.

Rodehacke, C.B., A. Voigt, F. Ziemen, and D.S. Abbot (2013), An open ocean region in Neoproterozoic glaciations would have to be narrow to allow equatorial ice sheets, *Geophysical Research Letters*, 40, 5503–5507.

Mills, S.M. and D.S. Abbot (2013), Utility of the Weak Temperature Gradient Approximation for Earth-like Tidally Locked Exoplanets, *Astrophysical Journal Letters*, 774, L17.

Koll, D.D.B. and D.S. Abbot (2013), Why Tropical Sea Surface Temperature is Insensitive to Ocean Heat Transport Changes, *Journal of Climate*, 26, 6742–6749.

Yang, J., N.B. Cowan, and D.S. Abbot (2013), Stabilizing Cloud Feedback Dramatically Expands the Habitable Zone of Tidally Locked Planets, *Astrophysical Journal Letters*, 771, L45.

Abbot, D.S., A. Voigt, D. Li, G. Le Hir, R.T. Pierrehumbert, M. Branson, D. Pollard, and D.D.B. Koll (2013), Robust elements of Snowball Earth atmospheric circulation and oases for life, *Journal of Geophysical Research*, 118, 6017-6027.

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Cowan, N.B., D.S. Abbot, and A. Voigt (2012), A false positive for ocean glint on exoplanets: the latitude-albedo effect, *Astrophysical Journal Letters*, 752, L3.

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Crouch, R.C. and D.S. Abbot (2009), Is Green Education Blue or Red? State-level Environmental Education Program Development through the Lens of Red- and Blue-State Politics, *Journal of Environmental Education*, 40(3), 52–62.

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Writing for the public

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