Dorian S. Abbot
November 16, 2016

Research Focus

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

Positions

2015-Present	Associate Professor	Geophysical Sciences	University of Chicago
2011-2015	Assistant Professor	Geophysical Sciences	University of Chicago

Education

2009-2011	Postdoc	Geophysical Sciences	University of Chicago
2008-2009	Postdoc	Earth and Planet. Sci.	Harvard University
2008	Ph.D. (w/ Tziperman)	Applied Mathematics	Harvard University
2004	S.M.	Applied Mathematics	Harvard University
2004	A.B.	Physics	Harvard College

Fellowships and Honors

2013-2015	Alfred P. Sloan Research Fellowship (Physics)
2009-2011	Junior Fellow of the Canadian Institute for Advanced Research
2009-2011	TC Chamberlin Postdoctoral Fellowship
2007-2008	National Defense Science and Engineering Graduate Fellowship
2004-2007	National Science Foundation Graduate Research Fellowship
2002,04,08	Harvard University Certificate of Distinction in Teaching
2003	NERC/NIGEC Undergraduate Research Fellowship

Mentoring

PhD Students

Predrag Popovic	ex. 2019	Fractal behavior of melt ponds on sea ice
J. Bloch-Johnson	ex. 2017	Climate feedback temperature dependence and equilibrium climate sensitivity
Navah Farahat	ex. 2017	Assessing the role of seafloor weathering in carbon cycling and climate
David Plotkin	ex. 2017	Rare events in geophysical systems
Daniel Koll	2016	Dry atmospheric circulations of rocky exoplanets

MS Students

Nathan Baskin	2016	Investigating the effect of forced orbital evolution on planetary habitability using sophisticated global climate models

Postdocs

Jun Yang	2012-2015	M-star planet habitability
Yi-Ping Ma	2011-2013	Mathematics of climate

Courses Taught

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)

Publications

Yang, J., M.F. Jansen, F.A. MacDonald, and D.S. Abbot (2016), Persistence of A Surface Freshwater Ocean After A Snowball Earth, *Geology*.

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

Abbot, D.S. (2016), Analytical investigation of the decrease in the size of the habitable zone due to limited CO_2 outgassing rate, *Astrophysical Journal*, 827, 117.

Popovic, P. and D.S. Abbot (2016), A simple model for the evolution of melt pond coverage on permeable Arctic sea ice, *The Cyrosphere*, submitted.

Yang, J., J. Leconte, E.T. Wolf, C. Goldblatt, N. Feldl, T. Merlis, Y. Wang, D.D.B. Koll, F. Ding, F. Forget, and D.S. Abbot (2016), Differences in water vapor radiative transfer among 1D models can significantly affect the inner edge of the habitable zone, *Astrophysical Journal*, 826, 222.

Koll, D.D.B., and D.S. Abbot (2016), Temperature Structure and Atmospheric Circulation Strength of Tidally Locked Rocky Exoplanets, *Astrophysical Journal*, 825, 99.

Hill, K., D.S. Abbot, and M. Silber (2016), Analysis of an Arctic sea ice loss model in the limit of a discontinuous albedo, *SIAM Journal on Applied Dynamical Systems*, 15(2), 1163-1192.

Abbot, D.S. (2015), A proposal for climate stability on H_2-greenhouse planets, *Astrophysical Journal Letters*, 815, L3.

Bloch-Johnson, J., R.T. Pierrehumbert, and D.S. Abbot (2015), Feedback Temperature Dependence Determines the Risk of High Warming, *Geophysical Research Letters*, 43(12), 4973–4980.

Koll, D.D.B. and D.S. Abbot (2015), Deciphering Thermal Phase Curves of Dry, Tidally Locked Terrestrial Planets, *Astrophysical Journal*, 802, 21, doi: 10.1088/0004-637X/802/1/21.

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, doi:10.1088/2041-8205/796/2/L22.

Plotkin, D.A., J. Weare, and D.S. Abbot (2014), Distinguishing meanders of the Kuroshio using machine learning, *Journal of Geophysical Research*, 119, 6593–6604, doi:10.1002/2014JC010128.

Arnold, N.P., M. Branson, M.A. Burt, D.S. Abbot, Z. Kuang, D.A. Randall, E. Tziperman (2014), The effects of explicit atmospheric convection at high CO_2, *Proceedings of the National Academy of Sciences*, 111(30), 10943–10948, doi:10.1073/pnas.1407175111.

Yang, J., G. Boué, D.C. Fabrycky, and D.S. Abbot (2014), Strong Dependence of the Inner Edge of the Habitable Zone on Planetary Rotation Rate, *Astrophysical Journal Letters*, 787, L2, doi:10.1088/2041-8205/787/1/L2.

Abbot, D.S. (2014), Resolved Snowball Earth Clouds, *Journal of Climate*, 27(12), 4391–4402, doi: 10.1175/JCLI-D-13-00738.1.

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, doi:10.1088/0004-637X/784/2/155.

Cowan, N.B. and D.S. Abbot (2014), Water cycling between ocean and mantle: super-Earths need not be waterworlds, *Astrophysical Journal*, 781, 27, doi:10.1088/0004-637X/781/1/27.

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, doi: 10.3189/2014JoG13J124.

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, doi:10.1002/2013GL057582.

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, doi:10.1088/2041-8205/774/2/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, doi:10.1175/JCLI-D-13-00192.1.

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, doi:10.1088/2041-8205/771/2/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, doi:10.1002/jgrd.50540.

Voigt, A. and D.S. Abbot (2012), Sea-ice dynamics strongly promote Snowball Earth initiation and destabilize tropical sea-ice margins, *Climate of the Past*, 8, 2079-2092, doi:10.5194/cp-8-2079-2012.

Farrell, B.F. and D.S. Abbot (2012), A Mechanism for Dust-Induced Destabilization of Glacial Climates, *Climate of the Past*, 8, 2061-2067, doi:10.5194/cp-8-2061-2012.

Abbot, D.S., A. Voigt, M. Branson, R.T. Pierrehumbert, D. Pollard, G. Le Hir, D.D.B. Koll (2012), Clouds and Snowball Earth Deglaciation, *Geophysical Research Letters*, 39, L20711, doi:10.1029/2012GL052861.

Cowan, N.B., A. Voigt, and D.S. Abbot (2012), Thermal phases of exoplanets: Disentangling eccentricity, obliquity, and climate, *Astrophysical Journal*, 757, 80, doi:10.1088/0004-637X/757/1/80.

Abbot, D.S., N.B. Cowan, and F.J. Ciesla (2012), Indication of insensitivity of planetary weathering behavior and habitable zone to surface land fraction, *Astrophysical Journal*, 756, 178, doi:10.1088/0004-637X/756/2/178.

Leibowicz, B.D., D.S. Abbot, K.A. Emanuel, and E. Tziperman (2012), Correlation between present-day model simulation of Arctic cloud radiative forcing and sea ice consistent with positive winter convective cloud feedback, *Journal of Advances in Modeling Earth Systems*, 4, M07002, doi:10.1029/2012MS000153.

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, doi:10.1088/2041-8205/752/1/L3.

Tziperman, E., D.S. Abbot, Y. Ashkenazy, H. Gildor, D. Pollard, C.G. Schoof, and D.P. Schrag (2012), Continental constriction and oceanic ice-cover thickness in a Snowball-Earth scenario, *Journal of Geophysical Research*, Journal of Geophysical Research, 117, C05016, doi:10.1029/2011JC007730.

Burton, J.C., J.M. Amundson, D.S. Abbot, A. Boghosian, L. Mac. Cathles, S. Correa-Legisos, K.N. Darnell, N. Guttenberg, D.M. Holland, and D.R. MacAyeal (2012), Laboratory investigations of iceberg-capsize dynamics, energy dissipation and tsunamigenesis, *Journal of Geophysical Research*, 117, F01007, doi:10.1029/2011JF002055.

Abbot, D.S., M. Silber, and R.T. Pierrehumbert (2011), Bifurcations Leading to Summer Arctic Sea Ice Loss, *Journal of Geophysical Research*, 116, D19120, doi:10.1029/2011JD015653.

Abbot, D.S., A. Voigt, and D. Koll (2011), The Jormungand Global Climate State and Implications for Neoproterozoic Glaciations, *Journal of Geophysical Research*, 116, D18103, doi:10.1029/2011JD015927.

Cathles, L.M., D.S. Abbot, J.N. Bassis, D.R. MacAyeal (2011), Modeling surface-roughness/solar-ablation feedback: Application to small-scale surface channels and crevasses of the Greenland Ice Sheet, *Annals of Glaciology*, 52(59), 99–108.

Guttenberg, N., D.S. Abbot, J.M. Amundson, J.C. Burton, L.M. Cathles, D.R. MacAyeal, and W.W. Zhang (2011), A computational investigation of iceberg capsize as a driver of explosive ice-shelf disintegration, *Annals of Glaciology*, 52(59), 51–59.

Abbot, D.S. and E.R. Switzer (2011), The Steppenwolf: A proposal for a habitable planet in interstellar space, *Astrophysical Journal*, 735:L27, doi:10.1088/2041-8205/735/2/L27.

Pierrehumbert, R.T., D.S. Abbot, A. Voigt, and D. Koll (2011), Climate of the Neoproterozoic, *Annual Review of Earth and Planetary Sciences*, 39, 417-60, doi:10.1146/annurev-earth-040809-152447.

MacAyeal, D.R., D.S. Abbot, and O.V. Sergienko (2011), Iceberg capsize tsunamigenesis, *Annals of Glaciology*, 52(58), 51–56.

Voigt, A., D.S. Abbot, R.T. Pierrehumbert, and J. Marotzke (2011), Initiation of a Marinoan Snowball Earth in a state-of-the-art atmosphere-ocean general circulation model, *Climate of the Past*, 7, 249-263, doi:10.5194/cp-7-249-2011.

Abbot, D.S., I. Eisenman, and R.T. Pierrehumbert (2010), The Importance of Ice Resolution for Snowball Climate and Deglaciation, *Journal of Climate*, 23(22), 6100-6109, doi: 10.1175/2010JCLI3693.1.

Abbot, D.S. and I. Halevy (2010), Dust Aerosol Important for Snowball Earth Deglaciation, *Journal of Climate*, 23(15), 4121-4132, doi: 10.1175/2010JCLI3378.1.

Abbot, D.S., and R.T. Pierrehumbert (2010), Mudball: Surface dust and Snowball Earth deglaciation, *Journal of Geophysical Research*, 115, D03104, doi:10.1029/2009JD012007.

Abbot, D.S., C.C. Walker, and E. Tziperman (2009), Can a convective cloud feedback help to eliminate winter sea ice at high CO_2 concentrations? *Journal of Climate*, 22(21), 5719–5731, doi: 10.1175/2009JCLI2854.1.

Abbot, D.S., M. Huber, G. Bousquet, and C.C. Walker (2009), High-CO_2 Cloud Radiative Forcing Feedback over both Land and Ocean in a Global Climate Model, *Geophysical Research Letters*, 36, L05702, doi:10.1029/2008GL036703.

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.

Abbot, D.S. and E. Tziperman (2009), Controls on the Activation and Strength of a High Latitude Convective Cloud Feedback, *Journal of the Atmospheric Sciences*, 66(2), 519–529, doi: 10.1175/2008JAS2840.1.

Abbot, D.S. (2008), A High-Latitude Convective Cloud Feedback, PhD Thesis, advised by Eli Tziperman, Harvard University, Cambridge, MA.

Abbot, D.S. and E. Tziperman (2008), Sea Ice, High Latitude Convection, and Equable Climates, *Geophysical Research Letters*, 35(3), L03702, doi:10.1029/2007GL032286.

Abbot, D.S. and E. Tziperman (2008), A High Latitude Convective Cloud Feedback and Equable Climates, *Quarterly Journal of the Royal Meteorological Society*, 134(630), 165–185, doi: 10.1002/qj.211.

Abbot, D.S. and K.A. Emanuel (2007), A Tropical and Subtropical Land-Sea-Atmosphere Drought Oscillation Mechanism, *Journal of the Atmospheric Sciences*, 64(12), 4458–4466, doi: 10.1175/2007JAS2186.1.

Palmer, P. I., D.S. Abbot, et al. (2006), Quantifying the seasonal and interannual variability of North American isoprene emissions using satellite observations of formaldehyde column, *Journal of Geophysical Research*, 111(D12), D12315, doi:10.1029/2005JD006689.

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Abbot, D.S., P. I. Palmer, R. V. Martin, K. V. Chance, D. J. Jacob, and A. Guenther (2003), Seasonal and interannual variability of isoprene emissions as determined by formaldehyde column measurements from space, *Geophysical Research Letters*, 30(17), 1886, doi:10.1029/2003GL017336.