

Dept. Earth and Planetary Sciences and School of Engineering and Applied Sciences

Harvard University, 20 Oxford St., Cambridge, MA 02138

Tel: (617) 495-2354, Fax: (617) 496-7660, Email:kuang@fas.harvard.edu

Homepage: www.people.fas.harvard.edu/~kuang

EDUCATION:

Peking University, Space Physics (minor in Electrical Engineering), B.S., 1996
Caltech, Planetary Science (minor in Applied Computation), Ph.D., 2003

PROFESSIONAL EXPERIENCE:

2012-present *Gordon McKay Professor of Atmospheric and Environmental Science*, Harvard University
2010-2012 *Associate Professor*, Harvard University
2005-2010 *Assistant Professor*, Harvard University
2004-2005 *Research Scientist*, California Institute of Technology
2002-2004 *NOAA Postdoctoral Fellow*, University of Washington
2000 *Geophysical Fluid Dynamics Fellow*, Woods Hole Oceanographic Institution

AWARDS AND RECOGNITIONS:

2012 Distinguished Lecturer, Asia Oceania Geosciences Society-American Geophysical Union Joint Assembly
2012 The Clarence Leroy Meisinger Award, American Meteorological Society
2002 NOAA Climate and Global Change Postdoctoral Fellowship
2000 Geophysical Fluid Dynamics Fellowship, Woods Hole Oceanographic Institution

SYNERGISTIC ACTIVITIES

External Advisory Panel member, NSF Center for Multiscale Modeling of Atmospheric Processes (CMMAP), 2011-2015

Co-Organizer: Workshop on large-scale circulations in moist convecting atmospheres, Oct. 16-17, 2009, Harvard University Center for the Environment, Cambridge, MA

Co-Organizer: Workshop on convection, water vapor, and climate, March. 27-29, 2012, Harvard University Center for the Environment, Cambridge, MA

Co-Organizer: Workshop on climate impacts of wind power extraction, June 24-25, 2015, Harvard University, Cambridge, MA

Member, Climate Resilience Advisory Group of Climate Ready Boston, 2015-2016

Co-Organizer: Joint Peking University and Harvard University Summer School, July 31-August 4, 2017, Beijing, China

PUBLICATIONS:

Mapes B, Chandra A S, Kuang Z, Zuidema P., Importance Profiles for Water Vapor. *Surveys in Geophysics*, 2017(38):1355-1369.

Singh M S, Kuang Z, Maloney E D, Hannah W., Wolding B., Increasing potential for intense tropical and subtropical thunderstorms under global warming. *Proceedings of the National Academy of Sciences*, 2017, 114(44):201707603.

Kelly P, Mapes B, Hu I, Song So., Kuang, Z., Tangent linear superparameterization of convection in a 10 layer global atmosphere with calibrated climatology. *Journal of Advances in Modeling Earth Systems*, 9,2(2017-04-24), 2017.

Torri G, Ma D, Kuang Z. Stable Water Isotopes and Large-Scale Vertical Motions in the Tropics. *Journal of Geophysical Research Atmospheres*, 122, 3703-3717, 2017.

Lowenthal D, Hallar A G, McCubbin I, R. David, R. Borys, P. Blossey, A. Muhlbauer, Z. Kuang, M. Moore, Isotopic Fractionation in Wintertime Orographic Clouds. *Journal of Atmospheric & Oceanic Technology*, 33(12) 2663-2678, 2016.

Singh M S, Kuang Z, Tian Y. Eddy influences on the strength of the Hadley circulation: dynamic and thermodynamic perspectives. *Journal of the Atmospheric Sciences*, 74(2), 467-486, 2017.

Torri G, Kuang Z. Rain evaporation and moist patches in tropical boundary layers. *Geophysical Research Letters*, 43, doi:10.1002/2016GL070893, 2016.

Ma D, Hassanzadeh P, Kuang Z. Quantifying the eddy-jet feedback strength of the annular mode in an idealized GCM and reanalysis data. *Journal of the Atmospheric Sciences*, 74(2), 393-407, 2017.

Hassanzadeh P, Kuang Z. The linear response function of an idealized atmosphere. Part 1: Construction using Green's functions and applications. *Journal of Atmospheric Sciences*, 73(9), 3423-3439, (2016).

Hassanzadeh P, Kuang Z. The linear response function of an idealized atmosphere. Part 2: Implications for the practical use of the Fluctuation-Dissipation Theorem and the role of operator's non-normality. *Journal of the Atmospheric Sciences*, 73, 3441-3452, (2016).

Tian, Y. and Z. Kuang, Dependence of entrainment in shallow cumulus convection on vertical velocity and distance to cloud edge, *Geophys. Res. Letters*, 43, doi:10.1002/2016GL069005., (2016)

Nie, J., Z. Kuang, D. Jacob, J. Guo, Representing effects of aqueous phase reactions of shallow cumuli in global models *J. Geophys. Res.*, 121, doi:10.1002/2015JD024208, (2016).

Torri, G. and Z. Kuang, A Lagrangian study of precipitation-driven downdrafts, *J. Atmos. Sci.*, 3, 839-854, 2016

Ma, D. and Z. Kuang, A mechanism-denial study on the Madden-Julian Oscillation with reduced interference from mean state changes *Geophys. Res. Letters*, 43, doi:10.1002/2016GL067702. (2016).

Singh M. S. and Z. Kuang, Exploring the role of eddy momentum fluxes in determining the characteristics of the equinoctial Hadley circulation: fixed-SST simulations. *J. Atmos. Sci.*, 73:6, 2427-2444 (2016).

Gentine P., Garelli A., Park S., Nie J. ,Torri G., Kuang Z., Role of surface heat fluxes underneath cold pools *Geophys. Res. Letters*, 43, doi:10.1002/2015GL067262, 2016.

Moore, M., P. N. Blossey, A. Muhlbauer, Z. Kuang, Microphysical controls on the isotopic composition of wintertime orographic precipitation *J. Geophys. Res.*, in press

Hassanzadeh, P. and Z. Kuang, Blocking variability: Arctic Amplification versus Arctic Oscillation *Geophys. Res. Letters*, 42, 2015.

Torri, G., Z. Kuang, Y. Tian, Mechanisms of convective triggering by cold pools, *Geophy. Res. Letts.*, 42, doi: 10.1002/2015GL063227, 2015.

Arnold, N. P., M. Branson, Z. Kuang, D. A. Randall, E. Tziperman, MJO Intensification with Warming in the Super-Parameterized CESM, *J. Climate*, 28, 2706-2724.

Hassanzadeh, P., Z. Kuang, B. F. Farrell, Responses of mid-latitude blocks and wave amplitude to changes in the meridional temperature gradient in an idealized dry GCM, *Geophy. Res. Letts.*, 41, 5223-5232, doi:10.1002/2014GL060764., 2014.

Ma, D., W. R. Boos, and Z. Kuang, Effects of orography and surface heat fluxes on the South Asian Summer Monsoon, *J. Climate*, 27, 6647-6659, 2014.

Arnold, N. P., M. Branson, M. A. Burt, D. S. Abbot, Z. Kuang, D. A. Randall, E. Tziperman Effects of explicit atmospheric convection at high CO₂, *PNAS*, 111, 10943-10948, doi: 10.1073/pnas.1407175111, 2014.

Moore, M., and Z. Kuang, P. N. Blossey, A moisture budget perspective of the amount effect, *Geophys. Res. Letts.*, 41, 1329-1335, doi:10.1002/2013GL058302, 2014.

Herman M. J., and Z. Kuang, Linear response functions of two convective parameterization schemes, *J. Advances in Modeling Earth Systems*, 5, 510-541, doi:10.1002/jame.20037. (2013)

Wang, S., A. H. Sobel, and Z. Kuang, Cloud-resolving simulation of TOGA-COARE using parameterized large-scale dynamics, *J. Geophys. Res.*, 118, 6290-6301. (2013).

Boos, W. R. and Z. Kuang, Sensitivity of the South Asian monsoon to elevated and non-elevated heating, *Scientific Reports*, 3, Article number:1192, (2013), doi:10.1038/srep01192.

Arnold, N., Z. Kuang, E. Tziperman, Enhanced MJO-Like Variability at High SST, *J. Climate*, 26, 988-1001, (2013).

Wofsy, J. F. and Z. Kuang, Cloud resolving model simulations and a simple model of an idealized Walker cell, *J. Climate*, 25, 8090-8107 (2012).

Nie, J. and Z. Kuang, Beyond bulk entrainment and detrainment rates: A new framework for diagnosing mixing in cumulus convection, *Geophys. Res. Lett.*, 39, L21803, (2012) doi:10.1029/2012GL053992.

Kuang, Z., Weakly forced mock-Walker cells, *J. Atmos. Sci.*, 69, 2759-2796, (2012)

Nie, J. and Z. Kuang, Responses of shallow cumulus convection to large-scale temperature and moisture perturbations: a comparison of large-eddy simulations and a convective parameterization based on stochastically entraining parcels, *J. Atmos. Sci.*, 69, 1936-1956 (2012).

Ma, D. and Z. Kuang, Modulation of radiative heating by the Madden-Julian Oscillation and convectively coupled Kelvin waves as observed by CloudSat, *Geophys. Res. Letts.*, 38, L21813 (2011).

Andersen, J. A. and Z. Kuang, Moist static energy budget of MJO-like disturbances in the atmosphere of a zonally symmetric aquaplanet, *J. Climate*, 25, 2782–2804, doi: 10.1175/JCLI-D-11-00168.1, (2012).

Romps, D. M. and Z. Kuang, A transilient matrix for moist convection, *J. Atmos. Sci.*, 68, 2009-2025, (2011).

Kuang, Z., The wavelength dependence of the gross moist stability and the scale selection in the instability of column integrated moist static energy, *J. Atmos. Sci.*, 68, 61-74, (2011).

Solodoch A., W. R. Boos, Z. Kuang, E. Tziperman, Excitation of intraseasonal variability in the equatorial atmosphere by Yanai wave-group via WISHE-induced convection, *J. Atmos. Sci.*, 68, 210-225 (2011).

Blossey, P. N., Z. Kuang, D. M. Romps, Isotopic composition of water in the tropical tropopause layer in cloud-resolving simulations of an idealized tropical circulation, *J. Geophys. Res.*, 115, D24309, (2010) doi:10.1029/2010JD014554

Boos, W. R. and Z. Kuang, Mechanisms of poleward-propagating, intraseasonal convective anomalies in cloud-system resolving models, *J. Atmos. Sci.*, 67, 3673-3691 (2010).

Nie, J., W. R. Boos, Z. Kuang, Observational evaluation of a convective quasi-equilibrium view of monsoons, *J. Climate*, 23, 4416-4428, (2010).

Romps, D. M. and Z. Kuang, Nature versus nurture in shallow convection, *J. Atmos. Sci.*, 67, 1655-1666, (2010).

Kuang, Z., Linear response functions of a cumulus ensemble to temperature and moisture perturbations and implication to the dynamics of convectively coupled waves, *J. Atmos. Sci.*, 67, 941-962, (2010).

Romps, D. M. and Z. Kuang, Do undiluted convective plumes exist in the upper tropical troposphere? *J. Atmos. Sci.*, 67, 468-483, (2010).

Boos, W. R. and Z. Kuang, Dominant control of South Asian monsoon by orographic insulation versus plateau heating, *Nature*, 463, 218-222, (2010).

Romps, D. M. and Z. Kuang, Overshooting convection in tropical cyclones, *Geophys. Res. Letts.*, 36, L09804, doi:10.1029/2009GL037396. (2009).

Waliser, D. E., J. F. Li, C. P. Woods, R. T. Austin, J. Bacmeister, J. Chern, A. Del Genio, J. H. Jiang, Z. Kuang, H. Meng, P. Minnis, S. Platnick, W. B. Rossow, G. L. Stephens, S. Sun-Mack, W. Tao, A. M. Tompkins, D. G. Vane, C. Walker, and D. Wu (2009), Cloud ice: A climate model challenge with signs and expectations of progress, *J. Geophys. Res.*, 114, D00A21, doi:10.1029/2008JD010015 (2009)

Andersen, J. A., Z. Kuang, A toy model of the instability in the equatorially trapped convectively coupled waves on the equatorial beta plane, *J. Atmos. Sci.*, 65, 3736-3757, (2008).

Peters, M. E., Z. Kuang, C. Walker, Analysis of atmospheric energy transport in ERA40 and implications for simple models of the mean tropical circulation, *J. Climate*, 21, 5229-5241, (2008).

Kuang, Z., A moisture-stratiform instability for convectively coupled waves, *J. Atmos. Sci.*, 65, 834-854, (2008).

Kuang, Z., Modeling the interaction between cumulus convection and linear gravity waves using a limited-domain cloud system-resolving model, *J. Atmos. Sci.*, 65, 576-591, (2008).

Kuang, Z., and D. L. Hartmann, Testing the Fix Anvil Temperature hypothesis in a cloud-resolving model, *J. Climate*, 20, 2051-2057, (2007).

Kuang, Z. and C. S. Bretherton, A mass-flux scheme view of a high-resolution simulation of a transition from shallow to deep cumulus convection, *J. Atmos. Sci.*, 63, 1895-1909, (2006).

Kuang, Z., P. N. Blossey, C. S. Bretherton, A new approach for 3D cloud resolving simulations of large scale atmospheric circulation, *Geophys. Res. Lett.*, 32, L02809, doi:10.1029/2004GL021024 (2005).

Kuang, Z. and C. S. Bretherton, Convective influence on the heat balance of the tropical tropopause layer: A cloud-resolving model study, *J. Atmos. Sci.*, 61, 2919-2927, (2004).

Kuang, Z., The norm dependence of singular vectors, *J. Atmos. Sci.*, 61, 2943-2949, (2004).

Crisp D., R.M. Atlas, F.-M. Breon, L.R. Brown, J.P. Burrows, P. Ciais, B.J. Connor, S.C. Doney, I.Y. Fung, D.J. Jacob, C.E. Miller, D. O'Brien, S. Pawson, J.T. Randerson, P. Rayner, R.J.

Salawitch, S.P. Sander, B. Sen, G.L. Stephens, P.P. Tans, G.C. Toon, P.O. Wennberg, S.C. Wofsy, Y.L. Yung, Z. Kuang, B. Chudasama, G. Sprague, B. Weiss, R. Pollock, D. Kenyon, S. Schroll, The Orbiting Carbon Observatory (OCO) mission, *Advances in Space Research*, **34**, 700-709, (2004).

Notholt, J., Z. Kuang, C. P. Rinsland, G. C. Toon, M. Rex, N. Jones, T. Albrecht, H. Deckelmann, J. Krieg, C. Weinzierl, H. Bingemer, R. Weller, and O. Schrems, Enhanced Upper Tropical Tropospheric COS: Impact on the Stratospheric Aerosol Layer, *Science*, **300**, 307-310, (2003).

Kuang, Z., G. C. Toon, P. O. Wennberg, Y. L. Yung, Measured HDO/H₂O ratios across the tropical tropopause, *Geophys. Res. Lett.*, **30**, No. 7, 10.1029/2003GL017023, (2003).

Kuang, Z., J. S. Margolis, G. C. Toon, D. Crisp, Yuk. L. Yung, Spaceborne measurements of atmospheric CO₂ by high-resolution NIR spectrometry of reflected sunlight: an introductory study, *Geophys. Res. Lett.*, **29**, 1716-1720, (2002).

Kuang, Z. and Y. L. Yung, Reflectivity variations off the Peru Coast: evidence for indirect effect of anthropogenic sulfate aerosols on clouds, *Geophys. Res. Lett.*, **27**, 2501-2504, (2000).

Kuang, Z. and Y. L. Yung, Observed albedo decrease related to the spring snow retreat, *Geophys. Res. Lett.*, **27**, 1299-1302, (2000).

Kuang, Z., Y. Jiang, Y. L. Yung, Cloud optical thickness variations during 1983-1991: Solar cycle or ENSO? *Geophys. Res. Lett.*, **25**, 1415-1417, (1998).