

Bibliographic references

Books

Ben-Naim, Arieh, *A Farewell to Entropy: Statistical Thermodynamics Based on Information*, World Scientific (2008). ISBN 978-981-270-706-2

Bluestein, H. B., 2013: *Severe Convective Storms and Tornadoes: Observations and Dynamics*. Springer.

Cotton, William R., George H. Bryan, and Susan C. Van den Heever. 2011. *Storm and cloud dynamics: the dynamics of clouds and precipitating mesoscale systems*. Burlington, MA: Academic Press.

Dawkins, R. (1989). *The selfish gene*. Oxford University Press.

Doswell, C. III, 2001: *Severe convective storms*. Meteor. Monographs, American Meteorological Society, Boston.

Houze, R. A., Jr., 2014: *Cloud Dynamics*. Academic Press, 496pp

Emanuel 1994: *Atmospheric convection*. Oxford University Press.

Lovejoy, S., and D. Schertzer, 2013: *The Weather and Climate: Emergent Laws and Multifractal Cascades*. Cambridge University Press, 475 pp.

Markowski and Richardson 2010: *Mesoscale meteorology in midlatitudes*. Wiley-Blackwell, 430 pp. ISBN: 978-0470742136.

Mcgrayne, Sharon Bertsch. *The Theory That Would Not Die: How Bayes' Rule Cracked the Enigma Code, Hunted Down Russian Submarines, and Emerged Triumphant from Two Centuries of Controversy*. Yale University Press, 2011. JSTOR, www.jstor.org/stable/j.ctt1np76s.

Pearl, J., and D. Mackenzie, 2018: *The Book of Why: The New Science of Cause and Effect*. Basic Books, New York, 432 pages.

Plant, R., and J.-I. Yano, 2015: *Parameterization of Atmospheric Convection*. World Scientific Press, Singapore, 1172 pages (in 2 volumes). doi: <https://doi.org/10.1142/p1005>

Starr, V. I., 1968: *Physics of Negative Viscosity Phenomena*. McGraw-Hill, New York, 256 pp.

Sutherland, B. (2010). *Internal Gravity Waves*. Cambridge: Cambridge University Press. doi:10.1017/CBO9780511780318

Trapp, R. J., 2013: *Mesoscale-convective processes in the atmosphere*. Cambridge University Press, 377pp, ISBN: 9780521889421

Vallis, G. K., 2017. *Atmospheric and Oceanic Fluid Dynamics: Fundamentals and Large-scale Circulation*, 2nd edn. Cambridge University Press. 946 pp.

Wallace, J. M., & Hobbs, P. V. (2006). *Atmospheric science: An introductory survey*. Second edition. Amsterdam, Elsevier Academic Press.

Journal papers

Alexakis, A., and L. Biferale, 2018: Cascades and transitions in turbulent flows. *Physics Reports*, <https://doi.org/10.1016/j.physrep.2018.08.001>

Anber, U., S. Wang, and A. Sobel, 2014: Response of Atmospheric Convection to Vertical Wind Shear: Cloud-System-Resolving Simulations with Parameterized Large-Scale Circulation. Part I: Specified Radiative Cooling. *J. Atmos. Sci.*, **71**, 2976–2993, <https://doi.org/10.1175/JAS-D-13-0320.1>

André, J. C., G. DeMoor, P. Lacarrere, and R. DuVachat, 1976: Turbulence approximation for inhomogeneous flows: Part I. The clipping approximation. *J. Atmos. Sci.*, **33**, 476–481.

Arakawa, A., and W. H. Schubert, 1974: Interaction of a cumulus cloud ensemble with the large-scale environment, Part I. *J. Atmos. Sci.*, **31**, 674–701.

Arakawa, A., 2004: The cumulus parameterization problem: Past, present, and future. *J. Climate*, **17**, 2493–2525.

Arakawa, A. and C. Wu, 2013: A Unified Representation of Deep Moist Convection in Numerical Modeling of the Atmosphere. Part I. *J. Atmos. Sci.*, **70**, 1977–1992, <https://doi.org/10.1175/JAS-D-12-0330.1>

Betts, A. K., 1974: Further comments on "A comparison of the equivalent potential temperature and the static energy". *J. Atmos. Sci.*, **31**, 1713-1715.

Betts, A. K., and M. J. Miller, 1984: A new convective adjustment scheme, Pts. I and II. ECMWF technical Report No. 43, ECMWF, Reading, RG2 9AX, England, 68 pp. Available at <http://alanbetts.com/workspace/uploads/bettemiller84-ecmwf-tr43-1276986585.pdf>

Beucler, T. (P), M. Pritchard, S. Rasp, P. Gentine, J. Ott and P. Baldi, 2019: Enforcing Analytic Constraints in Neural-Networks Emulating Physical Systems, <https://arxiv.org/abs/1906.06622>

Böing, SJ, Dritschel, DG, Parker, DJ, Blyth, AM. Comparison of the Moist Parcel-in-Cell (MPIC) model with large-eddy simulation for an idealized cloud. *Q J R Meteorol Soc.* 2019; 1– 17. <https://doi.org/10.1002/qj.3532>

Bretherton, F. P. (1969), Waves and Turbulence in Stably Stratified Fluids, *Radio Sci.*, 4(12), 1279– 1287, doi:[10.1029/RS004i012p01279](https://doi.org/10.1029/RS004i012p01279).

Bretherton, C.S. and P.K. Smolarkiewicz, 1989: Gravity Waves, Compensating Subsidence and Detrainment around Cumulus Clouds. *J. Atmos. Sci.*, **46**, 740–759, [https://doi.org/10.1175/1520-0469\(1989\)046<0740:GWCSAD>2.0.CO;2](https://doi.org/10.1175/1520-0469(1989)046<0740:GWCSAD>2.0.CO;2)

Bretherton, C. S., 1993: The nature of adjustment in cumulus cloud fields. *Meteorological Monographs*, **24**, 63-74

Bretherton, C. S., J. R. McCaa, and H. Grenier, 2004: A new parameterization for shallow cumulus convection and its application to marine subtropical cloud-topped boundary layers, Part I: Description and 1-D results, *Mon. Weather Rev.*, **132**, 864–882, 2004.

Bretherton, C. S., and Khairoutdinov, M. F. (2015), Convective self-aggregation feedbacks in near-global cloud-resolving simulations of an aquaplanet, *J. Adv. Model. Earth Syst.*, **7**, 1765–1787, doi:10.1002/2015MS000499.

Bryan, G. H., and J. M. Fritsch, 2000: Moist absolute instability: The sixth static stability state. *Bull. Amer. Meteor. Soc.*, **81**, 1207–1230, [https://doi.org/10.1175/1520-0477\(2000\)081<1287:MAITSS>2.3.CO;2](https://doi.org/10.1175/1520-0477(2000)081<1287:MAITSS>2.3.CO;2).

Cheedela, S., and B. E. Mapes, 2018: Cumulus friction in the Asian monsoon of a global model with 7km mesh. Peer-reviewed chapter in INTROSPECT-2016, Elsevier, D. Randall, ed. Available at <https://weather.rsmas.miami.edu/bmapes/http/pagestuff/cumulus-friction-asian.pdf>

Crook, N.A. and M.W. Moncrieff, 1988: The Effect of Large-Scale Convergence on the Generation and Maintenance of Deep Moist Convection. *J. Atmos. Sci.*, **45**, 3606–3624, [https://doi.org/10.1175/1520-0469\(1988\)045<3606:TEOLSC>2.0.CO;2](https://doi.org/10.1175/1520-0469(1988)045<3606:TEOLSC>2.0.CO;2)

de Roode, S. R., A. P. Siebesma, H. J. J. Jonker, and Y. de Voogd, 2012: Parameterization of the vertical velocity equation for shallow cumulus clouds. *Mon. Wea. Rev.*, **140**, 2424–2436, doi:10.1175/MWR-D-11-00277.1.

de Rooy, W. C., Bechtold, P. , Fröhlich, K. , Hohenegger, C. , Jonker, H. , Mironov, D. , Pier Siebesma, A. , Teixeira, J. and Yano, J., 2013: Entrainment and detrainment in cumulus convection: an overview. *Q.J.R. Meteorol. Soc.*, **139**: 1-19. doi:[10.1002/qj.1959](https://doi.org/10.1002/qj.1959)

Emanuel, K.A., 1991: A Scheme for Representing Cumulus Convection in Large-Scale Models. *J. Atmos. Sci.*, **48**, 2313–2329, [https://doi.org/10.1175/1520-0469\(1991\)048<2313:ASFRCC>2.0.CO;2](https://doi.org/10.1175/1520-0469(1991)048<2313:ASFRCC>2.0.CO;2)

Fovell, R.G. and P. Tan, 1998: The Temporal Behavior of Numerically Simulated Multicell-Type Storms. Part II: The Convective Cell Life Cycle and Cell Regeneration. *Mon. Wea. Rev.*, **126**, 551–577, [https://doi.org/10.1175/1520-0493\(1998\)126<0551:TTBONS>2.0.CO;2](https://doi.org/10.1175/1520-0493(1998)126<0551:TTBONS>2.0.CO;2)

Fritts, D. C., and Alexander, M. J. (2003), Gravity wave dynamics and effects in the middle atmosphere, *Rev. Geophys.*, **41**, 1003, doi:[10.1029/2001RG000106](https://doi.org/10.1029/2001RG000106), 1.

Glenn, I. B., and Krueger, S. K. (2017), Connections matter: Updraft merging in organized tropical deep convection, *Geophys. Res. Lett.*, 44, 7087– 7094, doi:[10.1002/2017GL074162](https://doi.org/10.1002/2017GL074162).

Gross, M., H. Wan, P.J. Rasch, P.M. Caldwell, D.L. Williamson, D. Klocke, C. Jablonowski, D.R. Thatcher, N. Wood, M. Cullen, B. Beare, M. Willett, F. Lemarié, E. Blayo, S. Malardel, P. Termonia, A. Gassmann, P.H. Lauritzen, H. Johansen, C.M. Zarzycki, K. Sakaguchi, and R. Leung, 2018: Physics–Dynamics Coupling in Weather, Climate, and Earth System Models: Challenges and Recent Progress. *Mon. Wea. Rev.*, **146**, 3505–3544, <https://doi.org/10.1175/MWR-D-17-0345.1>

Hagos, S., Feng, Z., Plant, R. S., Houze, R. A., & Xiao, H. (2018). A stochastic framework for modeling the population dynamics of convective clouds. *Journal of Advances in Modeling Earth Systems*, 10, 448–465. <https://doi.org/10.1002/2017MS001214>

Han, J. and H. Pan, 2011: Revision of Convection and Vertical Diffusion Schemes in the NCEP Global Forecast System. *Wea. Forecasting*, **26**, 520–533, <https://doi.org/10.1175/WAF-D-10-05038.1>

Hannah, W.M., 2017: Entrainment versus Dilution in Tropical Deep Convection. *J. Atmos. Sci.*, **74**, 3725–3747, <https://doi.org/10.1175/JAS-D-16-0169.1>

Held, I.M., R.S. Hemler, and V. Ramaswamy, 1993: Radiative-Convective Equilibrium with Explicit Two-Dimensional Moist Convection. *J. Atmos. Sci.*, 50, 3909–3927, [https://doi.org/10.1175/1520-0469\(1993\)050<3909:RCEWET>2.0.CO;2](https://doi.org/10.1175/1520-0469(1993)050<3909:RCEWET>2.0.CO;2)

Herman, M. J., and Kuang, Z. (2013), Linear response functions of two convective parameterization schemes, *J. Adv. Model. Earth Syst.*, 5, 510– 541, doi:[10.1002/jame.20037](https://doi.org/10.1002/jame.20037).

Hoel, E.P. (2018) Agent Above, Atom Below: How Agents Causally Emerge from Their Underlying Microphysics. In: Aguirre A., Foster B., Merali Z. (eds) *Wandering Towards a Goal*. The Frontiers Collection. Springer, Cham. Available at https://uberty.org/wp-content/uploads/2017/05/Hoel_FQXi_EPH_wandering_goa.pdf

Houze, R. A., and Betts, A. K. (1981), Convection in GATE, *Rev. Geophys.*, 19(4),541– 576, doi:[10.1029/RG019i004p00541](https://doi.org/10.1029/RG019i004p00541).

Jaynes, E.T., 1957: Information theory and statistical mechanics. *Physical Review*. **106** (4): 620–630. [Bibcode:1957PhRv..106..620J. doi:10.1103/PhysRev.106.620](https://doi.org/10.1103/PhysRev.106.620).

Jevanjee, N. and D. M. Roms, 2015: Effective Buoyancy, Inertial Pressure, and the Mechanical Generation of Boundary Layer Mass Flux by Cold Pools. *J. Atmos. Sci.*, **72**, 3199–3213, <https://doi.org/10.1175/JAS-D-14-0349.1>

Liu, Y., C. Liu, and D. Wang, 2011: Understanding Atmospheric Behaviour in Terms of Entropy: A Review of Applications of the Second Law of Thermodynamics to Meteorology. *Entropy* **13**:1, 211-240.

Kain, J. S. and J. M. Fritsch. 1990. A one-dimensional entraining/detraining plume model and its application in convective parameterization. *J. Atmos. Sci.* 47:2784–2802.

Kato, S., Rose, F. G., Ham, S. H., Rutan, D. A., Radkevich, A., Caldwell, T. E., et al. (2019). Radiative heating rates computed with clouds derived from satellite-based passive and active sensors and their effects on generation of available potential energy. *Journal of Geophysical Research: Atmospheres*, 124, 1720– 1740. <https://doi.org/10.1029/2018JD028878>

Khairoutdinov, M. F., and D. A. Randall (2003), Cloud resolving modeling of the ARM summer 1997 IOP: Model formulation, results, uncertainties, and sensitivities, *J. Atmos. Sci.*, 60, 607–625.

Khairoutdinov, M. and D. Randall, 2006: High-Resolution Simulation of Shallow-to-Deep Convection Transition over Land. *J. Atmos. Sci.*, **63**, 3421–3436, <https://doi.org/10.1175/JAS3810.1>

Khairoutdinov, M. F., Krueger, S. K., Moeng, C.-H., Bogenschutz, P. A., and Randall, D. A. (2009), Large-Eddy Simulation of Maritime Deep Tropical Convection, *J. Adv. Model. Earth Syst.*, 1, 15, doi:[10.3894/JAMES.2009.1.15](https://doi.org/10.3894/JAMES.2009.1.15).

Kingsmill, D. E., and R. A. Houze, Jr, 1999: Thermodynamic characteristics of air flowing into and out of precipitating convection over the west Pacific warm pool. *Quarterly Journal of the Royal Meteorological Society* **125**:556, 1209-1229.

Kolmogorov, A. N., 1941: The Local Structure of Turbulence in Incompressible Viscous Fluid for Very Large Reynolds Numbers. in *Proceedings: Mathematical and Physical Sciences*, vol. 434, no. 1890, 1991, pp. 9–13. *JSTOR*, www.jstor.org/stable/51980.

Kuang, Z. and C.S. Bretherton, 2006: 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, <https://doi.org/10.1175/JAS3723.1>

Kuang, Z., 2008: A Moisture-Stratiform Instability for Convectively Coupled Waves. *J. Atmos. Sci.*, **65**, 834–854, <https://doi.org/10.1175/2007JAS2444.1>

Kuang, Z., 2010: Linear response functions of a cumulus ensemble to temperature and moisture perturbations and implications for the dynamics of convectively coupled waves. *J. Atmos. Sci.*, **67**, 941–962.

Kuang, Z., 2012: Weakly Forced Mock Walker Cells. *J. Atmos. Sci.*, **69**, 2759–2786, <https://doi.org/10.1175/JAS-D-11-0307.1>

Kuang, Z., 2018: Linear Stability of Moist Convecting Atmospheres. Part I: From Linear Response Functions to a Simple Model and Applications to Convectively Coupled Waves. *J. Atmos. Sci.*, **75**, 2889–2907, <https://doi.org/10.1175/JAS-D-18-0092.1>

Labbouz, L., Z. Kipling, P. Stier, and A. Protat, 2018: How Well Can We Represent the Spectrum of Convective Clouds in a Climate Model? Comparisons between Internal Parameterization Variables and Radar Observations. *J. Atmos. Sci.*, **75**, 1509–1524, <https://doi.org/10.1175/JAS-D-17-0191.1>

Levine, J., 1959: Spherical vortex theory of bubble-like motion in cumulus clouds. *J. Meteor.*, **16**, 653–662, doi:10.1175/1520-0469(1959)016<0653:SVTOBL>2.0.CO;2

Lord, S.J. and A. Arakawa, 1980: Interaction of a Cumulus Cloud Ensemble with the Large-Scale Environment. Part II. *J. Atmos. Sci.*, **37**, 2677–2692, [https://doi.org/10.1175/1520-0469\(1980\)037<2677:IOACCE>2.0.CO;2](https://doi.org/10.1175/1520-0469(1980)037<2677:IOACCE>2.0.CO;2)

Lord, S. J., 1982: Interaction of a cumulus cloud ensemble with the large-scale environment. Part III: Semi-prognostic test of the Arakawa–Schubert cumulus parameterization. *J. Atmos. Sci.*, **39**, 88–103.

Ludlam, F.H., and R.S. Scorer, 1953: Convection in the atmosphere. *QJRMS*, **79**, pp 317–341

Mapes, B.E., 1993: [Gregarious Tropical Convection](#). *J. Atmos. Sci.*, **50**, 2026–2037, [https://doi.org/10.1175/1520-0469\(1993\)050<2026:GTC>2.0.CO;2](https://doi.org/10.1175/1520-0469(1993)050<2026:GTC>2.0.CO;2)

Mapes, B.E. and R.A. Houze, 1995: [Diabatic Divergence Profiles in Western Pacific Mesoscale Convective Systems](#). *J. Atmos. Sci.*, **52**, 1807–1828, [https://doi.org/10.1175/1520-0469\(1995\)052<1807:DDPIWP>2.0.CO;2](https://doi.org/10.1175/1520-0469(1995)052<1807:DDPIWP>2.0.CO;2)

Mapes, B. E., and P. Zuidema, 1996: Radiative-dynamical consequences of dry tongues in the tropical troposphere. *J. Atmos. Sci.*, **53**, 620–638.

Mapes, B. E., 1997: Equilibrium versus activation control of large-scale variations of tropical deep convection. *The Physics and Parameterization of Moist Convection*, R. K. Smith, Ed., Kluwer Academic, 512 pp. Available at https://weather.rsmas.miami.edu/bmapes/http/pagestuff/Activation_control.pdf

Mapes, B. E., 1998: The Large-Scale Part of Tropical Mesoscale Convective System Circulations. *Journal of the Meteorological Society of Japan. Ser. II* **76**:1, 29–55.

Mapes, B. E., 2000: Convective inhibition, subgrid-scale triggering energy, and stratiform instability in a toy tropical wave model. *J. Atmos. Sci.*, **57**, 1515–1535.

Mapes, B. E. (2001), Water's two height scales: The moist adiabat and the radiative troposphere. *Q.J.R. Meteorol. Soc.*, 127: 2353-2366. doi:[10.1002/qj.49712757708](https://doi.org/10.1002/qj.49712757708)

Mapes, B.E. and X. Wu, 2001: NOTES AND CORRESPONDENCE Convective Eddy Momentum Tendencies in Long Cloud-Resolving Model Simulations. *J. Atmos. Sci.*, 58, 517–526, [https://doi.org/10.1175/1520-0469\(2001\)058i0517:NACCEM&2.0.CO;2](https://doi.org/10.1175/1520-0469(2001)058i0517:NACCEM&2.0.CO;2)

Mapes, B.E. and J. Lin, 2005: Doppler radar observations of mesoscale wind divergence in regions of tropical convection. *Mon. Wea. Rev.*, 133, 1808– 1824.

Mapes, B., S. Tulich, T. Nasuno, and M. Satoh, 2008: Predictability aspects of global aqua-planet simulations with explicit convection. *J. Meteor. Soc. Japan*, 86A, 175-185.

Mapes, B., and Neale, R. (2011), Parameterizing Convective Organization to Escape the Entrainment Dilemma, *J. Adv. Model. Earth Syst.*, 3, M06004, doi:[10.1029/2011MS000042](https://doi.org/10.1029/2011MS000042).

Mapes, B., Chandra, A.S., Kuang, Z. et al., 2017: Importance profiles for water vapor. *Surv. Geophys.* 38: 1355. <https://doi-org.access.library.miami.edu/10.1007/s10712-017-9427-1>

Mapes, B., A.S. Chandra, Z. Kuang, S. Song, and P. Zuidema, 2019: Estimating Convection's Moisture Sensitivity: An Observation–Model Synthesis Using AMIE-DYNAMO Field Data. *J. Atmos. Sci.*, **76**, 1505–1520, <https://doi.org/10.1175/JAS-D-18-0127.1>

Markowski, P., and Y. Richardson, 2010: Mesoscale Meteorology in Midlatitudes. Wiley-Blackwell, 430 pp.

Moncrieff, M. W., 1978: The dynamical structure of two-dimensional steady convection in constant vertical shear. *Quarterly Journal of the Royal Meteorological Society*, 104, 543-567.

Moncrieff, M. W., 2006: Organized Convective Systems: Archetypal Dynamical Models, Mass and Momentum Flux Theory, and Parametrization, *Quarterly Journal of the Royal Meteorological Society*, **118**, 819-850.

Moncrieff, M.W. and T.P. Lane, 2015: Long-Lived Mesoscale Systems in a Low–Convective Inhibition Environment. Part II: Downshear Propagation. *J. Atmos. Sci.*, **72**, 4319–4336, <https://doi.org/10.1175/JAS-D-15-0074.1>

Moorthi, S., and M. J. Suarez, 1992: Relaxed Arakawa–Schubert: A parameterization of moist convection for general circulation models. *Mon. Wea. Rev.*, **120**, 978–1002.

Morrison, H., 2017: [An Analytic Description of the Structure and Evolution of Growing Deep Cumulus Updrafts](https://doi.org/10.1175/JAS-D-16-0234.1). *J. Atmos. Sci.*, **74**, 809–834, <https://doi.org/10.1175/JAS-D-16-0234.1>

Morrison, H. and J.M. Peters, 2018: [Theoretical Expressions for the Ascent Rate of Moist Deep Convective Thermals](https://doi.org/10.1175/JAS-D-17-0295.1). *J. Atmos. Sci.*, **75**, 1699–1719, <https://doi.org/10.1175/JAS-D-17-0295.1>

Morrison, H., J. M. Peters, A. C. Varble, S. Giangrande, W. M. Hannah, 2019: Thermal chains and entrainment in cumulus updrafts, Part 1: Theoretical description. *J. Atmos. Sci.*, Submitted.

Morton, B. R., Taylor, G. I., and Turner, J. S., 1956: Turbulent gravitational convection from maintained and instantaneous sources, *P. Phys. Soc.*, **74**, 744–754.

Munk, W. H., 1980: [Affairs of the Sea](#). *Annual Review of Earth and Planetary Sciences* 8:1, 1-17

Nicholls, S., 1984: The dynamics of stratocumulus: aircraft observations and comparisons with a mixed layer model. *Quart. J. Roy. Meteor. Soc.*, **110**, pp. 783-820.

Nober, F. J., and H-F. Graf, 2005: A new convective cloud field model based on principles of self-organisation. *Atmos. Chem. Phys.*, **5**, 2749–2759.

Orville, H. D., Y.-H. Kuo, R. D. Farley, and C. S. Hwang, 1980: Numerical simulation of cloud interactions. *J. Rech. Atmos.*, **14**, 499-516.

Palmer, T. N., 2019: Stochastic weather and climate models. *Nature Reviews Physics*, volume 1, 463-471. Available at https://www.nature.com/articles/s42254-019-0062-2.epdf?shared_access_token=NTUP2o3zPRmrbYc3n_ct4tRgN0jAjWel9jnR3ZoTv0OYY1utT_3Qf75BoayYXiqirMhLELF4e50ASuCZROGu80BLY6qOdXk0Gy77vjtfwr9iEyH7M8ITQleCyejUHgxXL2H9cSURpdMQt55uX2lMA%3D%3D

Paluch, I. R.: The entrainment mechanism of Colorado cumuli, *J. Atmos. Sci.*, **36**, 2467–2478, 1979.

Pan, D. and Randall, D. A. (1998), A cumulus parameterization with a prognostic closure. *Q.J.R. Meteorol. Soc.*, **124**: 949-981. doi:[10.1002/qj.49712454714](https://doi.org/10.1002/qj.49712454714)

Park, S., 2014: A Unified Convection Scheme (UNICON). Part I: Formulation. *J. Atmos. Sci.*, **71**, 3902–3930, <https://doi.org/10.1175/JAS-D-13-0233.1>

Parsons, D.B., K.R. Haghi, K.T. Halbert, B. Elmer, and J. Wang, 2019: The Potential Role of Atmospheric Bores and Gravity Waves in the Initiation and Maintenance of Nocturnal Convection over the Southern Great Plains. *J. Atmos. Sci.*, **76**, 43–68, <https://doi.org/10.1175/JAS-D-17-0172.1>

Pauluis, O., and I. M. Held, 2002a: Entropy budget of an atmosphere in radiative–convective equilibrium. Part I: Maximum work and frictional dissipation. *J. Atmos. Sci.*, **59**, 125–139.

Pauluis, O., and I. M. Held, 2002b: Entropy budget of an atmosphere in radiative–convective equilibrium. Part II: Latent heat transport and moist processes. *J. Atmos. Sci.*, **59**, 140–149.

Perry, K.D. and P.V. Hobbs, 1996: Influences of Isolated Cumulus Clouds on the Humidity of Their Surroundings. *J. Atmos. Sci.*, **53**, 159–174, [https://doi.org/10.1175/1520-0469\(1996\)053<0159:IOICCO>2.0.CO;2](https://doi.org/10.1175/1520-0469(1996)053<0159:IOICCO>2.0.CO;2)

Peters, J.M., W. Hannah, and H. Morrison, 2019: The Influence of Vertical Wind Shear on Moist Thermals. *J. Atmos. Sci.*, **76**, 1645–1659, <https://doi.org/10.1175/JAS-D-18-0296.1>

Pincus, R., E. J. Mlawer, and J. S. Delamere, 2019: Balancing accuracy, efficiency, and flexibility in radiation calculations for dynamical models. JAMES, in review.

Plant, R. S.: A review of the theoretical basis for bulk mass flux convective parameterization, *Atmos. Chem. Phys.*, **10**, 3529–3544, doi:10.5194/acp-10-3529-2010, 2010.

Ramirez, J. A., and Bras, R. L. (1990), Clustered or regular cumulus cloud fields: The statistical character of observed and simulated cloud fields, *J. Geophys. Res.*, **95**(D3), 2035– 2045, doi:[10.1029/JD095iD03p02035](https://doi.org/10.1029/JD095iD03p02035).

Ramirez, J. A., Bras, R. L., and Emanuel, K. A. (1990), Stabilization functions of unforced cumulus clouds: Their nature and components, *J. Geophys. Res.*, **95**(D3), 2047– 2059, doi:[10.1029/JD095iD03p02047](https://doi.org/10.1029/JD095iD03p02047).

Randall, D.A. and G.J. Huffman, 1980: [A Stochastic Model of Cumulus Clumping](https://doi.org/10.1175/1520-0469(1980)037<2068:ASMOCC>2.0.CO;2). *J. Atmos. Sci.*, **37**, 2068–2078, [https://doi.org/10.1175/1520-0469\(1980\)037<2068:ASMOCC>2.0.CO;2](https://doi.org/10.1175/1520-0469(1980)037<2068:ASMOCC>2.0.CO;2)

Randall, D. A., M. Khairoutdinov, A. Arakawa, and W. Grabowski, 2003: Breaking the Cloud Parameterization Deadlock. *Bull. Amer. Meteor. Soc.*, **84**, 1547–1564.

Rasp, S, H. Schulz, S. Bony and B. Stevens, 2019: Combining crowd-sourcing and deep learning to understand meso-scale organization of shallow convection. <https://arxiv.org/abs/1906.01906>

Raymond, D.J. and A.M. Blyth, 1986: A Stochastic Mixing Model for Nonprecipitating Cumulus Clouds. *J. Atmos. Sci.*, **43**, 2708–2718, [https://doi.org/10.1175/1520-0469\(1986\)043<2708:ASMMFN>2.0.CO;2](https://doi.org/10.1175/1520-0469(1986)043<2708:ASMMFN>2.0.CO;2)

Raymond, D. J., Sessions, S. L., Sobel, A. H., and Fuchs, Ž. (2009), The Mechanics of Gross Moist Stability, *J. Adv. Model. Earth Syst.*, **1**, 9, doi:[10.3894/JAMES.2009.1.9](https://doi.org/10.3894/JAMES.2009.1.9).

Reynolds, O., 1876: On the resistance encountered by vortex rings, and the relation between the vortex rings and the streamlines of a disc. *Nature*, 14, 477–479.

Riehl, H., Malkus, J. S., 1958: On the heat balance of the equatorial trough zone. *Geophysica* (Helsinki), 6, (3–4), 503–538.

Riehl, H., Simpson, J., 1979: The heat balance of the equatorial trough zone, revisited. *Contrib. Atmos. Phys.*, 52, 287–305.

Riley, E. M., 2013: *Examining the Form-Function Relationship of Convective Organization and the Larger Scale with Observations and Models*. Coral Gables, Florida]: PhD dissertation, University of Miami, https://scholarlyrepository.miami.edu/cgi/viewcontent.cgi?article=2072&context=oa_dissertations

Robe, F.R. and K.A. Emanuel, 2001: The Effect of Vertical Wind Shear on Radiative–Convective Equilibrium States. *J. Atmos. Sci.*, 58, 1427–1445, [https://doi.org/10.1175/1520-0469\(2001\)058<1427:TEOVWS>2.0.CO;2](https://doi.org/10.1175/1520-0469(2001)058<1427:TEOVWS>2.0.CO;2)

Romps, D.M., 2008: The Dry-Entropy Budget of a Moist Atmosphere. *J. Atmos. Sci.*, 65, 3779–3799, <https://doi.org/10.1175/2008JAS2679.1>

Romps, D. M., 2010: A Direct Measure of Entrainment. *Journal of the Atmospheric Sciences* 67:6, 1908-1927.

Romps, D.M. and Z. Kuang, 2011: A Transilient Matrix for Moist Convection. *J. Atmos. Sci.*, 68, 2009–2025, <https://doi.org/10.1175/2011JAS3712.1>

Romps, D.M., 2015: MSE Minus CAPE is the True Conserved Variable for an Adiabatically Lifted Parcel. *J. Atmos. Sci.*, 72, 3639–3646,

Romps, et al. (2015), Projected increase in lightning strikes in the United States due to global warming, *Science*, doi:10.1126/science.1259100.

Romps, D. M., and A. B. Charn, 2015: Sticky thermals: Evidence for a dominant balance between buoyancy and drag in cloud updrafts, *JAS* 72, 2890-2901.

Romps, D. M. (2016), The Stochastic Parcel Model: A deterministic parameterization of stochastically entraining convection, *J. Adv. Model. Earth Syst.*, 8, 319– 344, doi:[10.1002/2015MS000537](https://doi.org/10.1002/2015MS000537).

Rotunno, R., J. B. Klemp, and M. L. Weisman, 1988: A theory for strong, long-lived squall lines. *J. Atmos. Sci.*, 45, 463–485.

Sánchez, O., D.J. Raymond, L. Libersky, and A.G. Petschek, 1989: The Development of Thermals from Rest. *J. Atmos. Sci.*, **46**, 2280–2292, [https://doi.org/10.1175/1520-0469\(1989\)046<2280:TDOTFR>2.0.CO;2](https://doi.org/10.1175/1520-0469(1989)046<2280:TDOTFR>2.0.CO;2)

Schlemmer, L., Bechtold, P., Sandu, I., and Ahlgrim, M. (2017), Uncertainties related to the representation of momentum transport in shallow convection, *J. Adv. Model. Earth Syst.*, **9**, 1269– 1291, doi:[10.1002/2017MS000915](https://doi.org/10.1002/2017MS000915).

Schultz, D.M., P.N. Schumacher, and C.A. Doswell, 2000: The Intricacies of Instabilities. *Mon. Wea. Rev.*, **128**, 4143–4148, [https://doi.org/10.1175/1520-0493\(2000\)129<4143:TIOI>2.0.CO;2](https://doi.org/10.1175/1520-0493(2000)129<4143:TIOI>2.0.CO;2)

Schultz, D. M., et al. (2006), The mysteries of mammatus clouds: Observations and formation mechanisms, *J. Atmos. Sci.*, **63**(10), 2409 – 2435, doi:10.1175/JAS3758.1.

Scorer, R. S. and Ludlam, F. H.: Bubble theory of penetrative convection, *Q. J. Roy. Meteor. Soc.*, **79**, 94–103, 1953.

Shannon, C. E. , 1948: A Mathematical Theory of Communication. *Bell System Technical Journal*. **27** (4): 623–666.

Sherwood, S.C., 2000: [On Moist Instability](https://doi.org/10.1175/1520-0493(2000)129<4139:OMI>2.0.CO;2). *Mon. Wea. Rev.*, **128**, 4139-4142, [https://doi.org/10.1175/1520-0493\(2000\)129<4139:OMI>2.0.CO;2](https://doi.org/10.1175/1520-0493(2000)129<4139:OMI>2.0.CO;2)

Sherwood, S. C., D. Hernandez-Deckers, M. Colin, and F. Robinson, 2013: Slippery thermals and the cumulus entrainment paradox. *J. Atmos. Sci.*, **70**, 2426–2442, doi:10.1175/JAS-D-12-0220.1.

Simpson, J.: On cumulus entrainment and one-dimensional models, *J. Atmos. Sci.*, **28**, 449–455, 1971.

Simpson, J.: Reply, *J. Atmos. Sci.*, **29**, 220–225, 1972.

Singh & O'Gorman (2015), [Increases in moist-convective updraft velocities with warming in radiative-convective equilibrium](https://doi.org/10.1002/qj.2567). *Q. J. R. Meteorol. Soc.*, doi:10.1002/qj.2567.

Stevens, B., 2005: [ATMOSPHERIC MOIST CONVECTION](#). *Annual Review of Earth and Planetary Sciences* **33**:1, 605-643.

Stommel, H., 1947: Entrainment of air into a cumulus cloud, *J. Meteorol.*, **4**, 91–94.

Stommel, H., 1951: Entrainment of air into a cumulus cloud II, *J. Meteorol.*, **8**, 127–129.

Squires, P., 1958: Penetrative downdraughts in cumuli, *Tellus*, **10**, 381– 389.

Sun, Y.Q., R. Rotunno, and F. Zhang, 2017: [Contributions of Moist Convection and Internal Gravity Waves to Building the Atmospheric –5/3 Kinetic Energy Spectra](https://doi.org/10.1175/JAS-D-16-0097.1). *J. Atmos. Sci.*, **74**, 185–201, <https://doi.org/10.1175/JAS-D-16-0097.1>

Tan, Z., Kaul, C. M., Pressel, K. G., Cohen, Y., Schneider, T., & Teixeira, J. (2018). An extended eddy-diffusivity mass-flux scheme for unified representation of subgrid-scale turbulence and convection. *Journal of Advances in Modeling Earth Systems*, 10, 770– 800.

<https://doi.org/10.1002/2017MS001162>

Thorpe, A. J., M. J. Miller, and M. W. Moncrieff, 1982: Two-dimensional convection in non-constant shear: A model of mid-latitude squall lines. *Quart. J. Roy. Meteor. Soc.*, **108**, 739–762.

Thuburn, J., H. Weller, G. K. Vallis, R. J. Beare, and M. Whittall, 2018: A framework for convection and boundary-layer parameterization derived from conditional filtering. *Journal of the Atmospheric Sciences*, **75**, 965–981, <https://doi.org/10.1175/JAS-D-17-0130.1>

Tian, Y. and Z. Kuang, 2019: Why Does Deep Convection Have Different Sensitivities to Temperature Perturbations in the Lower versus Upper Troposphere?. *J. Atmos. Sci.*, **76**, 27–41, <https://doi.org/10.1175/JAS-D-18-0023.1>

Tian, Y., Kuang, Z., Singh, M., & Nie, J. (2019). The vertical momentum budget of shallow cumulus convection: Insights from a Lagrangian perspective. *Journal of Advances in Modeling Earth Systems*, 11,113– 126. <https://doi.org/10.1029/2018MS001451>

Tomassini, L., Voigt, A. and Stevens, B. (2015), On the connection between tropical circulation, convective mixing, and climate sensitivity. *Q.J.R. Meteorol. Soc.*, 141: 1404-1416.
doi:[10.1002/qj.2450](https://doi.org/10.1002/qj.2450)

Tulich, S. N., D. A. Randall, and B. E. Mapes, 2007: Vertical-mode and cloud decomposition of large-scale convectively coupled gravity waves in a two-dimensional cloud-resolving model. *J. Atmos. Sci.*, **64**, 1210–1229, <https://doi.org/10.1175/JAS3884.1>.

Tulich, S., and B. E. Mapes, 2010: Transient environmental sensitivities of explicitly simulated tropical convection. *J. Atmos. Sci.*, **67**, 923–940.

Turner, J. S., 1962: The “starting plume” in neutral surroundings. *J. Fluid Mech.*, 13, 356–368, <https://doi.org/10.1017/S0022112062000762>.

Turner, J. S.: Turbulent entrainment: the development of the entrainment assumption, and its application to geophysical flows, *J. Fluid Mech.*, 173, 431–471, 1986.

Telford, J. W.: Turbulence, entrainment and mixing in cloud dynamics, *Pure Appl. Geophys.*, 113, 1067–1084, 1975.

Taylor, G. R. and Baker, M. B.: Entrainment and detrainment in cumulus clouds, *J. Atmos. Sci.*, 48, 112–121, 1991.

Vallis, G. K., Colyer, G., Geen, R., Gerber, E., Jucker, M., Maher, P., Paterson, A., Pietschnig, M., Penn, J., and Thomson, S. I.: Isca, v1.0: a framework for the global modelling of the atmospheres of Earth and other planets at varying levels of complexity, *Geosci. Model Dev.*, **11**, 843–859, <https://doi.org/10.5194/gmd-11-843-2018>, 2018.

Vallis, G., Parker, D., & Tobias, S. (2019). A simple system for moist convection: The Rainy–Bénard model. *Journal of Fluid Mechanics*, **862**, 162–199. doi:10.1017/jfm.2018.954

Virman, K., M. Bister, V. A. Sinclair, J. Räisänen, and H. Järvinen, 2019: Vertical temperature structure associated with evaporation of stratiform precipitation in idealized WRF simulations.

Wagner, T. M., and H.-F. Graf, 2010: An ensemble cumulus convection parameterization with explicit cloud treatment. *J. Atmos. Sci.*, **67**, 3854–3869.

Wagner, T. M., H.-F. Graf, and M. Herzog, 2011: Reply. *J. Atmos. Sci.*, **68**, 1545–1546.

Wang, B., and T. Li (1994), Convective interaction with boundary-layer dynamics in the development of a tropical intraseasonal system, *J. Atmos. Sci.*, **51**, 1386–1400.

Warner, J.: On steady-state one-dimensional models of cumulus convection, *J. Atmos. Sci.*, **27**, 1035–1040, 1970.

Warner, J.: Comments “On cumulus entrainment and one–dimensional models”, *J. Atmos. Sci.*, **29**, 218–219, 1972.

Wikle, C.K., R.F. Milliff, and W.G. Large, 1999: [Surface Wind Variability on Spatial Scales from 1 to 1000 km Observed during TOGA COARE](https://doi.org/10.1175/1520-0469(1999)056<2222:SWVOSS>2.0.CO;2). *J. Atmos. Sci.*, **56**, 2222–2231, [https://doi.org/10.1175/1520-0469\(1999\)056<2222:SWVOSS>2.0.CO;2](https://doi.org/10.1175/1520-0469(1999)056<2222:SWVOSS>2.0.CO;2)

Wilkins, E.M., Y.K Sasaki, G.E. Gerber, and W. H. Chaplin, Jr. (1976): Numerical simulation of the lateral interaction between buoyant clouds. *J. Atmos. Sci.*, **33**, 1321–1329.

Yanai, M., S. Esbensen, and J. Chu, 1973: Determination of Bulk Properties of Tropical Cloud Clusters from Large-Scale Heat and Moisture Budgets. *J. Atmos. Sci.*, **30**, 611–627, [https://doi.org/10.1175/1520-0469\(1973\)030<0611:DOBPOT>2.0.CO;2](https://doi.org/10.1175/1520-0469(1973)030<0611:DOBPOT>2.0.CO;2)

Yuter, S.E. and R.A. Houze, 1995: Three-Dimensional Kinematic and Microphysical Evolution of Florida Cumulonimbus. Part III: Vertical Mass Transport, Mass Divergence, and Synthesis. *Mon. Wea. Rev.*, **123**, 1964–1983, [https://doi.org/10.1175/1520-0493\(1995\)123<1964:TDKAME>2.0.CO;2](https://doi.org/10.1175/1520-0493(1995)123<1964:TDKAME>2.0.CO;2)

Zhang, G.J., J. Fan, and K. Xu, 2015: [Comments on “A Unified Representation of Deep Moist Convection in Numerical Modeling of the Atmosphere. Part I”](https://doi.org/10.1175/JAS-D-14-0246.1). *J. Atmos. Sci.*, **72**, 2562–2565, <https://doi.org/10.1175/JAS-D-14-0246.1>

Zhao, M., I.M. Held, and S. Lin, 2012: Some Counterintuitive Dependencies of Tropical Cyclone Frequency on Parameters in a GCM. *J. Atmos. Sci.*, **69**, 2272–2283, <https://doi.org/10.1175/JAS-D-11-0238.1>

Zhu, T., Lee, J., Weger, R. C., and Welch, R. M. (1992), Clustering, randomness, and regularity in cloud fields: 2. Cumulus cloud fields, *J. Geophys. Res.*, 97(D18), 20537– 20558, doi:[10.1029/92JD02022](https://doi.org/10.1029/92JD02022).

Zuidema, P., B. Mapes, J. Lin, C. Fairall, and G. Wick, 2006: The Interaction of Clouds and Dry Air in the Eastern Tropical Pacific. *J. Climate*, **19**, 4531–4544, <https://doi.org/10.1175/JCLI3836.1>

Zuidema P, Mapes B (2008) Cloud vertical structure observed from space and ship over the Bay of Bengal and eastern tropical Pacific. *J Meteorol Soc Japan* 86A:205–218.