MICHAEL T. COE

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Curriculum Vitae

Research Interests

I am an earth system scientist who works through scientific research and discovery to provide a clearer understanding of how nearly 50 years of deforestation in the rainforest and savanna biomes of South America alter climate and affect the environment. I use a diverse set of tools, including field research campaigns, remotely sensed data, and numerical models to understand these changes and to search for mitigation and avoidance options.

Education

- Ph.D. *Atmospheric and Oceanic Sciences*, University of Wisconsin-Madison, 1997; Advisor, John Kutzbach
- M.S. *Atmospheric and Oceanic Sciences,* University of Wisconsin-Madison, 1992; Advisor, John Kutzbach
- B.A. *Geology*, Miami University, Oxford, OH, 1985
- NASA Earth Science Summer School: *Processes of Global Change*; Jet Propulsion Laboratory, Pasadena, CA; July 1995
- Field Study: *Geology of the Wind River Range*, Dubois, WY; July-August 1984

Professional Experience

- Woodwell Climate Research Center (formerly Woods Hole Research Center), Falmouth, MA, Senior Scientist; 2011-present, Associate Scientist; 2005-2011
- Associate Scientist, 2003-2004, Assistant Scientist, 1999-2003
- Climate, People, and Environment Program-Institute for Environmental Studies, University of Wisconsin-Madison, Postdoctoral Fellow; 1997-1999; Advisor, Jonathan Foley

Additional Appointments

- Associate Research Scientist, Amazon Environmental Research Institute, Brasília, Brazil, 2010-present
- Adjunct Associate Research Scientist, Department of Ecology, Evolution, and Environmental Biology, Columbia University, New York; 2012-present
- Affiliate, The Gund Institute for Ecological Economics, University of Vermont, Burlington VT; 2013-present
- Visiting Scientist, Max-Planck Institute for Biogeochemistry, Jena, Germany; 2000
- Visiting Scientist, Dynamic Palaeoclimatology Unit, Lund University, Sweden; 1997
- Graduate Research Assistant, Center for Climatic Research-Institute for Environmental Studies, University of Wisconsin-Madison; 1990-1997

Teaching Experience

- Co-Instructor, Environmental consequences of tropical land cover change, State University of Mato Grosso - Nova Xavantina, Mato Grosso, Brazil, November 9-18, 2015
- Instructor, Feedbacks between water, energy, and land cover change — Topics in remote sensing of the environment, Graduate seminar, Federal University of Goiâs, Goiânia, Brazil; March-June 2014

- Instructor, Numerical modeling of continental scale surface hydrology, Short course, São Paulo Summer School on Global Climate Modeling, Brazilian National Space Agency, Ubatuba, Brazil; October 10-13 2012
- Adjunct Instructor, Madison Area Technical College, Madison, WI, 1998-1999
- Teaching Assistant, Global change: Atmospheric issues and problems, University of Wisconsin-Madison; 1991-96

Professional Activities

- Awarded J William Fulbright Brazil Scientific Mobility Program Distinguished Chair Scholarship, 2014
- Awarded Brazilian National Science Foundation, Sciences without Borders, Special Visiting Scientist Scholarship, 2015-2018
- Member of Science Advisory Committee, Tanguro Ranch Research Program, 2014-present
- Host Brazilian students and post-doctoral fellows at Woods Hole Research Center as part of educational program; 14 since 2009
- Editor, *Journal of Climate*, 2011-2017
- Serve on PhD and master's committees of students at Columbia University, University of British Columbia, Federal University of Minas Gerais
- Mentor master's and doctoral level students and post-doctoral fellows at The University of Wisconsin-Madison, Columbia University, The University of Minnesota, Duke University, Boston University, The University of British Columbia, The Federal University of Viçosa, Brazil, The Federal University of Minas Gerais, Brazil, The Federal University of Brasilia, Brazil, and The University of Florida
- Member of the American Geophysical Union and American Meteorological Society
- Member of Science Advisory board of The Nature Conservancy Upper Mississippi River group (2003-2004)
- Elected member of Sigma Xi Scientific Research Society, 1997

Publications

2020 ——————————————————————

Brando P.M., B.S. Soares-Filho, L. Rodrigues, A. Assunção, D. Morton, D. Tuchschneider, E.C.M. Fernandes, M.N. Macedo, U. Oliveira, and M.T. Coe, 2020, The gathering firestorm in southern Amazonia, *Science Advances,* 6, 9pp., doi: 10.1126/sciadv.aay1632.

Brando P.M., M.N. Macedo, D.V. Silvério, L. Rattis, L. Paolucci, A. Alencar, M.T. Coe, and C. Amorim, 2020, Amazon wildfires: Scenes from a foreseeable disaster, *Flora*, https://doi.org/10.1016/j.flora.2020.151609

Caioni, C., D.V. Silvério, M.N. Macedo, M.T. Coe, and P.M. Brando, 2020, Droughts amplify differences in the energy balance components between croplands and Amazon forest, *Remote Sens.,* 12, 525, 18pp., doi:10.3390/rs12030525.

Castanho A.D.A, M.T. Coe, P.M. Brando, M.N. Macedo, A. Baccini, W. Walker, E.M. Andrade, 2020, Potential shifts in the aboveground biomass and physiognomy of a seasonally dry tropical forest in a changing climate, *Environ. Res. Lett.,* 15, 034053, 11pp., https://doi.org/10.1088/1748-9326/ab7394.

Castanho A.D.A, M.T. Coe, E.M. Andrade, W. Walker, A. Baccini, D.A Campos, and M. Farina, 2020, A close look at above ground biomass of a large and heterogeneous Seasonally Dry Tropical Forest - *Caatinga* in North East of Brazil, *Anais da Academia Brasileira de Ciências : Earth Sciences,* 92, 1, 18pp., e20190282 DOI 10.1590/0001-3765202020190282.

Lee, J., J.A. Cardille, and M.T. Coe, 2020, Agricultural expansion in Mato Grosso from 1986-2000: A Bayesian time series approach to tracking land cover change, 2020, *Remote Sens.,* 12, 688, 18pp., doi:10.3390/rs12040688.

Rizzo, R., A.S. Garcia, V.M.F.N. Vilela, M.V.R. Ballester, C.Neill, D.C. Victoria, H.R. da Rocha, and M.T. Coe, 2020, Land use changes in southeastern Amazon and trends in rainfall and water yield of Xingu River during 1976-2015, *Clim. Change, https://doi.org/10.1007/s10584-020-02736-z.*

Castanho, A.D.A., M.T. Coe, P.M. Brando, et al. The historical and future climatic vulnerability of vegetation within indigenous lands and protected areas of the Amazon, *in prep.*

Coe, M.T., et al., Tropical forests and regional climate, *in prep*.

Coe, M.T., A.D.A. Castanho, M.N. Macedo et al., The discharge and flood regime of the Amazon in a changing climate, *in prep*

Costa C. Jr, G.L. Galford, M.T Coe, M.N. Macedo, K. Jankowski, C. O'Connell, and C. Neill, Modeling nitrous oxide emissions from large-scale intensive cropping systems in the southern Amazon, *in prep.*

Galford, G.L., S. Spera, M.T. Coe, B.S. Soares-Filho, S Grubinder, H Boudreau, L.G. Ferreira, and M. Ferriera, Greenhouse gas emissions from conversion of the Cerrado environment, Brazil to agriculture, *in prep.*

Heerspink, B.P., A.D. Kendall, M.T. Coe, and D.W. Hyndman, Investigating the effects of changing climate and land cover on the hydrologic cycle in the Brazilian Amazon Basin, *J. Hydrol. Reg. Studies, in review.*

Koriche, S.A. et al., The fate of the Caspian Sea with future climate change and water use, in prep.

Lawrence, D., M.T. Coe, W. Walker, L. Verchot, and K. Vandecar, Biophysical effects of forests on climate: toward a more complete view of climate mitigation, *PNAS, subm.*

Melack, J.M., and M.T. Coe, Amazon floodplain hydrology and implications for aquatic conservation, Aquatic Conservation: Marine and Freshwater Ecosystems, *in review.*

Nandini, S., S.A. Koriche, M. Prange, J. S. Singarayer, K. Arpe, H. L. Cloke, M. Schulz, P. Bakker, S.A.G. Leroy, and M.T. Coe, Impacts of variations in Caspian Sea surface area on catchment-scale and large-scale climate, *in prep*.

Neill, C., S.E. Spitzer, M.N. Macedo, and S.H. Riskin, A.V. Krusche, D. Nunes Costa, and M.T. Coe, Land use and impoundment effects on temperature and water chemistry of lowland Amazonian headwater streams, *Biotropica, in prep*.

Rattis. L., P.M Brando, M.N. Macedo, S. Spera, A. Castanho, E. Marques, N. Queiroz, D. Silverio, and M.T. Coe, When Brazil will reach the limit of rainfed agriculture? *Nature Climate Change, in review*.

2019

Brando, P.M., D. Silvério, L. Maracahipes-Santos, C. Oliveira-Santos, S.R. Levick, M.T. Coe, M. Migliavacca, J. Balch, M. Macedo, D. Nepstad, L. Maracahipes, E. Davidson, G. Asner, O. Kolle, and S. Trumbore, 2019, Prolonged tropical forest degradation due to compounding disturbances: Implications for CO_2 and H_2O fluxes*, Glob. Change Biol.*, 25, 2855–2868, doi:10.1111/gcb.14659.

Brando P.M., L. Paolucci, E. Ordway, C. Ummenhofer, H. Hartmann, M. Cattau, L. Rattis, V. Medjibe, M.T. Coe, and J. Balch, 2019, Droughts, wildfires, and forest carbon stocks: A pantropical synthesis, 2019, *Annu. Rev. Earth Planet. Sci.,* 47, 555–581, https://doi.org/10.1146/annurev-earth-082517-010235

Costa, M.H., L.C. Fleck, A.S. Cohn, G.M. Abrahão, P.M. Brando, M.T. Coe, R. Fu, D. Lawrence, G.F. Pires, R. Pousa, and B.S. Soares-Filho, 2019, Climate risks to agriculture in Amazonia create an incentive to conserve local ecosystems, *Front. in Ecol. and the Environ.,* 7pp., doi:10.1002/fee.2124.

Ramirez-Reyes, C., K.A., Brauman, R. Chaplin-Kramer, G.L. Galford, S.B. Adamo, C.B. Anderson, C. Anderson, G.R. Allington, K.J. Bagstad, M.T. Coe, A.F. Cord, L.E. Dee, R.K. Gould, M. Jain, V.A. Kowal, F. Muller-Karger, J. Norriss, P. Potapov, J. Qiu, J.T. Rieb, B.E. Robinson, L.H. Samberg, N. Singh, S.H. Szeto, B. Voigt, K. Watson, and T.M. Wright, 2019, Reimagining the potential of Earth observations for ecosystem services assessments, *Sci. of Tot. Env.*, 65, 1053-1063, https://doi.org/10.1016/j.scitotenv.2019.02.150.

Stabile, M.C.C. , A. Guimarães, D.S. Silva, V. Ribeiro, M.N. Macedo, M.T. Coe, E. Pinto, A. Alencar, and P.R.S. Moutinho, 2019, Solving Brazil's land use puzzle: Increasing production and slowing Amazon deforestation*, Land Use Policy,* 91, 6pp., https://doi.org/10.1016/j.landusepol.2019.104362.

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Anderson de Castro, A., L.A. Cuartas, M.T. Coe, C. Von Randow, A. Castanho, A. Ovando, A.D. Nobre, A. Koumrouyan, G. Sampaio, and M.H. Costa, 2018, Coupling the Terrestrial Hydrology Model with Biogeochemistry to the Integrated LAND Surface Model: Amazon Basin applications, *Hydrol. Sci. J.,* doi:10.1080/02626667.2018.1538592.

Jankowski, K.J. C. Neill, E.A. Davidson, M.N. Macedo, C. Costa, G.L. Galford, L. Maracahipes Santos, P. Lefebvre, D. Nunes, C.E.P. Cerri, Jr, R.M. McHorney , C.S. O'Connell, and M.T. Coe, 2018, Deep soils reduce environmental consequences of increased nitrogen fertilizer use in intensifying Amazon agriculture, *Sci. Reports,* doi:10.1038/s41598-018-31175-1.

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Lee, J.H., J.A., Cardille, and M.T. Coe, 2018, BULC-U: Sharpening resolution and improving accuracy of land-use/land-cover classifications in Google Earth Engine*, Remote Sens.,* 10, 1455*,* doi:10.3390/rs10091455.

Simmons, C.S., L. Famolare, M. Macedo, R.T. Walker, M.T. Coe, B. Scheffers, E. Arima, R. Munoz-Carpena, D. Valle, C. Fraisee, P. Moorecroft , M. Diniz, M. Diniz, C. Szlafsztein, R. Pereira, C. Ruiz, G. Rocha, D. Juhn, L.O. do Canto Lopes, M. Waylen, and A. Antunes., 2018, Science in Support of Amazonian Conservation in the 21st Century, *Biotropica,* doi:10.1111/btp.12610*.*

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Coe, M.T., P.M. Brando, L.A. Deegan, M.N. Macedo, C. Neill, and D.V. Silvério, 2017, The forests of the Amazon and Cerrado moderate regional climate and are the key to the future of the region, *Trop. Consv. Sci.,* 10, 6pp., doi:10.1177/1940082917720671.

Neill, C., J. Jankowski, P.M. Brando, M.T. Coe, L.A. Deegan, M.N. Macedo., S.H. Riskin, S. Porder, H. Elsenbeer and A.V. Krusche, 2017, Surprisingly modest water quality impacts from expansion and intensification of large-scale commercial agriculture in the Brazilian Amazon-Cerrado region. *Trop. Consv. Sci.,* 10, doi: 10.1177/1940082917720669

De Faria, B., P.M. Brando, M.N. Macedo, P. Panday, B.S. Soares-Filho, and M.T. Coe, 2017, Current and future patterns of fire-induced forest degradation in Amazonia, *Envir. Res. Lett., at press,* https://doi.org/10.1088/1748-9326/aa69ce

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Arantes, A.E., L.G. Ferreira, and M.T. Coe, 2016: The seasonal carbon and water balances of the Cerrado environment of Brazil: Past, present, and future influences of land cover and land use, *J. Photogram. Remote Sens,* 117, pp 66-78, doi:10.1016/j.isprsjprs.2016.02.008.

Brando, P.M., C. Oliveria-Santos, W. Rocha, R. Cury, and M. Coe, 2016: Effects of experimental fuel additions on fire intensity and severity: unexpected carbon resilience of a neotropical forest, *Glob. Change Bio.,* doi: 10.1111/gcb.13172.

Castanho, A.D.A, D. Galbraith, K. Zhang, M.T. Coe, M.H Costa, and P. Moorcroft, 2016: Changing Amazon biomass and the role of atmospheric CO_2 concentration, climate, and land use, *Glob. Biogeochem. Cycles*, doi: 10.1002/2015GB005135.

Coe, M.T., M.N. Macedo, P.M. Brando, P. Lefebvre, P. Panday, and D Silvério, 2016: Hydrology and energy balance of the Amazon, L. Nagy, B. Forsberg, and P. Artaxo (eds.), *Interactions between Biosphere, Atmosphere, and Human Land Use in the Amazon Basin.* 41-53, Springer Verlag, Berlin, Ecological Studies: Analysis and Synthesis 227, DOI: 10.1007/978-3-662-49902-3.

Costa, M.H., M.T. Coe, and D. Galbraith, 2016: Land-atmosphere interactions, *Advances in Met.*, doi: 10.1155/2016/2362398

Lathuillière, M.J., M.T. Coe and M.S. Johnson, 2016: A review of green and blue water resources and their trade-offs for future agricultural production in the Amazon Basin. What could irrigated agriculture mean for Amazonia?, *Hydrol. Earth Sys. Sciences,* doi: 10.5194/hess-2016-71.

Soares-Filho, B.S., R. Rajão, F. Merry, H. Rodrigues, J. Leroy, L. Lima, M. Macedo, M.T. Coe, A. Carneiro, and L. Santiago, 2016: Brazil's market for trading forest certificates, *PLoS ONE,* 11(4): e0152311*,* doi:10.1371/journal.pone.0152311.

Spera, S. G.L. Galford, M.T. Coe, M.N. Macedo, and J.F. Mustard, 2016: Land-Use Change Affects Water Recycling in Brazil's Last Agricultural Frontier, *Glob. Change Bio.,* doi: 10.1111/gcb.13298.

2015

Balch, J.K., P.M. Brando, D.C. Nepstad, M.T. Coe, D. Silvério, T.J. Massad, E.A. Davidson, P.A. Lefebvre, C. Oliveira-Santos, W. Rocha, R.T.S. Cury, A. Parsons, and K. Carvalho, 2015: The susceptibility of southeastern Amazon forests to fire: Insights from a large-scale burning experiment, *Bioscience, doi:10.1093/biosci/biv106*.

Diás, L.C.P., M.N. Macedo, M.H. Costa, M.T. Coe, and C. Neill, 2015: Effects of land cover change on evapotranspiration and streamflow of small catchments in the Upper Xingu River Basin, Central Brazil*, J Hydrol., Regional Studies, 4B, 108–122,* doi:10.1016/j.ejrh.2015.05.010*.*

Panday, P., M.T. Coe, M.N. Macedo, D.V. Silvério, and P.M. Brando, 2015: Deforestation offsets water balance changes due to climate variability in the Xingu River in eastern Amazonia, Brazil, *J Hydrol.,* 523, 822-829, doi: 10.1016/j.jhydrol.2015.02.018

Penatti, N.C., T.I.R. De Almeida, L.G. Ferreira, A.E. Arantes, and M.T. Coe, 2015: Satellite-based hydrological dynamics of the world's largest continuous wetland, *Remote Sens. Env.,* 10.1016/j.rse.2015.08.031*.*

Silvério, D.V., P.M. Brando, M.N. Macedo, P.S.A. Beck, M. Bustamante, and M.T. Coe, 2015: Agricultural expansion dominates climate changes in southeastern Amazonia: The overlooked non-GHG forcing, *Env. Res. Lett.,* 10, 104105, doi: 10.1088/1748-9326/10/10/104015

Zhang, K., A.D.A. Castanho, D.R. Galbraith, S. Moghim, N. Levine, R. Bras, M.T. Coe, M.H. Costa, Y. Malhi, M. Longo, R.G. Knox, S. McKnight, J. Wang, and P.R. Moorcroft, 2015: The fate of Amazonian ecosystems over the coming century arising from changes in climate, land-use and CO_2, *Glob. Change Bio., doi: 10.1111/gcb.12903*

2014

Brando, P.M., J. Balch, D.C Nepstad, D. Morton, F.E. Putz, M.T. Coe, D. Silvério, M.N. Macedo, E. Davidson, C. Nóbrega, A. Alencar, and B.S. Soares-Filho, 2014: Abrupt increases in Amazonian tree mortality due to drought-fire interactions, *Proc. Nat. Acad. Sci.*, doi/10.1073/pnas.1305499111.

Lima, L.S., M.T. Coe, B.S. Soares-Filho, S.V. Cuadra, L.C. Dias, M.H. Costa, L.S. Lima, and H.O. Rodrigues, 2014: Feedbacks between deforestation, climate, and hydrology in the Southwestern Amazon: Implications for the provision of ecosystem services, *Landscape Ecology*, 29, 261-274, DOI: 10.1007/s10980-013-9962-1.

Soares-Filho, B., R. Rajão, M.N. Macedo, A. Carneiro, W. Costa, M.T. Coe, H. Rodrigues, and A. Alencar, 2014: Cracking Brazil's Forest Code, *Science,* 344(6182), 363-364, DOI: 10.1126/science.1246663

2013 ——————————————————————————

Brando, P.M., M.T. Coe, R DeFries, and A.A. Azevedo, 2013: Ecology, economy, and management of an agroindustrial frontier landscape in the southeast Amazon, *Phil. Trans. Royal Soc., B,* 368, 20120152. http://dx.doi.org/10.1098/rstb.2012.0152.

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2012

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2011

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