

David Medvigy

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a. Professional Preparation

Duke University	Civil and Environmental Engineering	Postdoc	2007-2009
Harvard University	Applied Physics	Postdoc	2006, 2009
Harvard University	Applied Physics	Ph.D.	2006
Rutgers University	Physics	B.S.	1998

b. Appointments

2017 – Present	Concurrent Associate Professor, Department of Civil & Environmental Engineering & Earth Sciences, University of Notre Dame
2016 – Present	Associate Professor, Department of Biological Sciences, University of Notre Dame
2009 – 2016	Assistant Professor, Department of Geosciences and Program in Atmospheric and Oceanic Sciences, Princeton University

c. Publications

Khanna, J., D. Medvigy, G. Fisch, T.T.A.T. Neves (2018) Regional hydroclimate variability due to contemporary deforestation in southern Amazonia and associated boundary layer characteristics. *Journal of Geophysical Research – Atmospheres*, in press, <https://doi.org/10.1002/2017JD027888>.

Guan, K., S. Good, K. Caylor, D. Medvigy, M. Pan, E. Wood, H. Sato, M. Biasutti, M. Chen, A. Ahlström, X. Xu (2018) Simulated sensitivity of African terrestrial ecosystem photosynthesis to rainfall frequency, intensity, and rainy season length. *Environmental Research Letters*, **13**, 025013, <https://doi.org/10.1088/1748-9326/aa9f30>.

Xu, X., D. Medvigy, A.T. Trugman, K. Guan, S.P. Good, I. Rodriguez-Iturbe (2018) Tree cover shows strong sensitivity to precipitation variability across the global tropics. *Global Ecology and Biogeography*, **27**, 450-460, doi:10.1111/geb.12707.

Trugman, A.T., D. Medvigy, W.R.L. Anderegg, S.W. Pacala (2018) Differential declines in Alaskan boreal forest vitality related to climate and competition. *Global Change Biology*, **24**, 1097-1107, doi:10.1111/geb.13952.

Trugman, A.T., D. Medvigy, W.A. Hoffmann, A.F.A. Pellegrini (2018) Sensitivity of woody carbon stocks to bark investment strategy in Neotropical savannas and forests. *Biogeosciences*, **15**, 233-243, <https://doi.org/10.5194/bg-15-233-2018>.

- Fisher, R.A., C.D. Koven, W.R.L. Anderegg, B.O. Christoffersen, M.C. Dietze, C. Farrior, J.A. Holm, G. Hurtt, R.G. Knox, P.J. Lawrence, J.W. Lichstein, M. Longo, A.M. Matheny, D. Medvigy, H.C. Muller-Landau, T.L. Powell, S.P. Serbin, H. Sato, J. Shuman, B. Smith, A.T. Trugman, T. Viskari, H. Verbeeck, E. Wang, C. Xu, X. Xu, T. Zhang, P. Moorcroft (2018) Vegetation dynamics in Earth system models: a review of progress and priorities. *Global Change Biology*, **24**, 35-54, doi:10.1111/gcb.13910.
- Xu, X., D. Medvigy, S.J. Wright, K. Kitajima, J. Wu, L.P. Albert, G.A. Martins, S.R. Saleska, and S.W. Pacala (2017) Variations of leaf longevity in tropical moist forests predicted by a trait-driven carbon optimality model. *Ecology Letters*, **20**, 1097-1106, doi:10.1111/ele12804.
- Allen, K., J.M. Dupuy, M.G. Gei, C. Hulshof, D. Medvigy, C. Pizano, B. Salgado-Negret, C.M. Smith, A. Trierweiler, S.J. Van Bloem, B.G. Waring, X. Xu, and J.S. Powers (2017) Will seasonally dry tropical forests be sensitive or resistant to future changes in rainfall regimes? *Environmental Research Letters*, **12**, 023001, <https://doi.org/10.1088/1748-9326/aa5968>.
- Khanna, J., D. Medvigy, S. Fueglistaler, and R. Walko (2017) Regional dry-season climate changes due to three decades of Amazonian deforestation. *Nature Climate Change*, **7**, 200-204, doi:10.1038/nclimate3226.
- Trugman, A.T., N.J. Fenton, Y. Bergeron, X. Xu, L.R. Welp, and D. Medvigy (2016) Climate, soil organic layer, and nitrogen jointly drive forest development after fire in the North American boreal zone. *Journal of Advances in Modeling Earth Systems*, **8**, 1180-1209, doi:[10.1002/2015MS000576](https://doi.org/10.1002/2015MS000576).
- Xu, X., D. Medvigy, J.S. Powers, J.M. Becknell, and K. Guan (2016) Diversity in plant hydraulic traits explains seasonal and inter-annual variations of vegetation dynamics in seasonally dry tropical forests. *New Phytologist*, **212**, 80-95, doi:10.1111/nph14009.
- Oh, Y., B. Stackhouse, M.C.Y. Lau, X. Xu, A.T. Trugman, J. Moch, T.C. Onstott, C.J. Jørgensen, L. D'Imperio, B. Elberling, C.A. Emmerton, V.L. St. Louis, and D. Medvigy (2016) A scalable model for methane consumption in arctic mineral soils. *Geophysical Research Letters*, **43**, 5143-5150, doi:10.1002/2016GL069049.
- Medvigy, D., S.-H. Kim, J. Kim, and M.C. Kafatos (2016) Dynamically downscaling predictions for deciduous tree leaf emergence in California under current and future climate. *International Journal of Biometeorology*, **60**, 935-944, doi:10.1007/s00484-015-1086-7.
- Buermann, W., C. Beaulieu, B. Parida, D. Medvigy, G.J. Collatz, J. Sheffield, and J.L. Sarmiento (2016) Climate-driven shifts in continental net primary production implicated as a driver of recent abrupt increase in the land carbon sink. *Biogeosciences*, **13**, 1597-1607, doi:10.5194/bgd-13-1597-2016.
- Frasson, R.P.M., G. Bohrer, D. Medvigy, A.M. Matheny, T.H. Morin, C.S. Vogel, C.M. Gough, K.D. Maurer, and P.S. Curtis (2015) Modeling forest carbon cycle response to tree mortality: effects of plant functional type and disturbance intensity. *Journal of Geophysical Research – Biogeosciences*, **120**, 2178-2193, doi:10.1002/2015JG003035.
- Xu, X., D. Medvigy, I. Rodriguez-Iturbe (2015) Relation between rainfall intensity and savanna tree abundance explained by water use strategies. *Proceedings of the National Academy of Sciences USA*, **112**, 12992-12996, doi:10.1073/pnas.1517382112.
- Guan, K., M. Pan, H. Li, A. Wolf, J. Wu, D. Medvigy, K.K. Caylor, J. Sheffield, E.F. Wood, Y.

- Malhi, M. Liang, J. Kimball, S. Saleska, J. Berry, J. Joiner, and A.I. Lyapustin (2015) Photosynthetic seasonality of global tropical forests constrained by hydroclimate. *Nature Geoscience*, **8**, 284-289, doi:10.1038/ngeo2382.
- Lau, M.C.Y., B.T. Stackhouse, A.C. Layton, A. Chauhan, T.A. Vishnivetskaya, K. Chourey, N.C.S. Mykytczuk, P. Bennett, G. Lamarche-Gagnon, N. Burton, J. Ronholm, W. Pollard, C.C. Omelon, D. Medvigy, R. Hettich, S. Pfiffner, L.G. Whyte, and T.C. Onstott (2015) An active atmospheric methane sink in high Arctic mineral cryosols. *ISME Journal*, **9**, 1880-1891, doi:10.1038/ismej.2015.13.
- Khanna, J., and D. Medvigy (2014) Surface roughness variations control the regional atmospheric response to contemporary deforestation in Rondonia, Brazil. *Journal of Geophysical Research – Atmospheres*, **119**, 13067-13078, doi:10.1002/2014JD022278.
- Schäfer, K.V.R., H.J. Renninger, K.L. Clark, and D. Medvigy (2014) Hydrological response of an upland oak/pine forest on the Atlantic Coastal Plain to drought and disturbance. *Hydrological Processes*, **28**, 6113-6123, doi:10.1002/hyp.10104.
- Jeong, S.-J., and D. Medvigy (2014) Macro-scale prediction of autumn leaf coloration throughout the continental United States. *Global Ecology and Biogeography*, **23**, 1245-1254, doi:10.1111/geb.12206.
- Guan, K., E.F. Wood, D. Medvigy, J. Kimball, M. Pan, K.K. Caylor, J. Sheffield, X. Xu, and M.O. Jones (2014) Terrestrial hydrological controls on land surface phenology of African savannas and woodlands. *Journal of Geophysical Research - Biogeosciences*, **119**, 1652-1669, doi:10.1002/2013JG002572.
- Guan, K., D. Medvigy, E.F. Wood, K.K. Caylor, S. Li, and S.-J. Jeong (2014) Deriving vegetation phenological time and trajectory information over Africa using SEVIRI daily LAI. *IEEE Transactions on Geoscience and Remote Sensing*, **52**, 1113-1130.
- Medvigy, D., R.L. Walko, M.J. Otte, and R. Avissar (2013) Simulated changes in Northwest US climate in response to Amazon deforestation. *Journal of Climate*, **26**, 9115-9136. doi:10.1175/JCLI-D-12-00775.1.
- Medvigy, D., S.-J. Jeong, K.L. Clark, N.S. Skowronski, and K.V.R. Schäfer (2013) Effects of seasonal variation of photosynthetic capacity on the carbon fluxes of a temperate deciduous forest. *Journal of Geophysical Research - Biogeosciences*, **118**, 1703-1714, doi:10.1002/2013JG002421
- Guan, K., A. Wolf, D. Medvigy, K.K. Caylor, M. Pan, and E.F. Wood (2013) Seasonality coupling/decoupling of canopy functions and structure in African tropical forests and their environmental controls. *Ecosphere*, **4**(3):35. <http://dx.doi.org/10.1890/ES12-00232.1>.
- Jeong, S.-J., D. Medvigy, E. Shevliakova, and S. Malyshev (2013) Predicting changes in temperate forest budburst using continental-scale observations and models. *Geophysical Research Letters*, **40**, 359-364, doi:10.1029/2012GL054431.
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- insect defoliation on forest carbon dynamics. *Environmental Research Letters*, **7**, 045703, doi:10.1088/1748-9326/7/4/045703.
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- Medvigy, D., and P.R. Moorcroft (2012) Predicting ecosystem dynamics at regional scales: an evaluation of a terrestrial biosphere model for the forests of northeastern North America. *Philosophical Transactions of the Royal Society B*, **367**, 222-235, doi:10.1098/rstb.2011.0253.
- Kim, Y., R.G. Knox, M. Longo, D. Medvigy, L.R. Hutyra, E.H. Pyle, S.C. Wofsy, R.L. Bras, and P.R. Moorcroft (2012) Seasonal carbon dynamics and water fluxes in an Amazon rainforest. *Global Change Biology*, **18**, 1322-1334, doi:10.1111/j.1365-2486.2011.02629.x.
- Medvigy, D., and C. Beaulieu (2012) Changes in daily solar radiation and precipitation coefficients of variation since 1984. *Journal of Climate*, **25**, 1330-1339.
- Jeong, S.-J., C.-H. Ho, B.-M. Kim, S. Feng, and D. Medvigy (2012) Nonlinear response of vegetation to coherent warming over northern high latitudes. *Remote Sensing Letters*, **4**, 123-130, doi:10.1080/2150704X.2012.703790.
- Medvigy, D., R.L. Walko, R. Avissar (2012) Simulated links between deforestation and extreme cold events in South America. *Journal of Climate*, **25**, 3851-3866.
- Jeong, S.-J., D. Medvigy, E. Shevliakova, and S. Malyshev (2012) Uncertainties in terrestrial carbon budgets related to spring phenology. *Journal of Geophysical Research - Biogeosciences*, **117**, G01030, doi:10.1029/2011JG001868.
- Medvigy, D., R.L. Walko, and R. Avissar (2011) Effects of deforestation on spatiotemporal distributions of precipitation in South America. *Journal of Climate*, **24**, 2147-2163.
- Medvigy, D., S.C. Wofsy, J.W. Munger, and P.R. Moorcroft (2010) Responses of terrestrial ecosystems and carbon budgets to current and future environmental variability. *Proceedings of the National Academy of Sciences USA*, **107** (18), 8275-8280.
- Medvigy, D., R.L. Walko, M. Otte, and R. Avissar (2010) The Ocean-Land-Atmosphere Model (OLAM): evaluation of the objectively optimized radiation parameterization. *Monthly Weather Review*, **138**(5), 1923-1939.
- Medvigy, D., S. C. Wofsy, J. W. Munger, D. Y. Hollinger, and P. R. Moorcroft (2009) Mechanistic scaling of ecosystem function and dynamics in space and time: Ecosystem Demography model version 2. *Journal of Geophysical Research - Biogeosciences*, **114**, G01002, doi:10.1029/2008JG000812.
- Medvigy, D., R.L. Walko, and R. Avissar (2008) Modeling interannual variability of the Amazon hydroclimate. *Geophysical Research Letters*, **35**, L15817, doi:10.1029/2008GL034941.
- Albani, M., D. Medvigy, G. C. Hurtt and P. R. Moorcroft (2006) The contributions of landuse change, CO₂ fertilization, and climate variability to the Eastern US carbon sink. *Global Change Biology*, **12**, 2370-2390.
- Medvigy, D., P.R. Moorcroft, R. Avissar and R.L. Walko (2005) Mass conservation and

atmospheric dynamics in the Regional Atmospheric Modeling System (RAMS).
Environmental Fluid Mechanics, **5**, 109-134.

Alavi-Harati, A., ..., D. Medvigy, et al. (The KTeV Collaboration) (2002) Radiative decay width measurements of neutral kaon excitations using the Primakoff Effect. *Physical Review Letters*, **89**, 072001.

d. Seminars and Conference Presentations (last 5 years)

“Variation in the Soil Template Drives Large Variation in Forest Functioning, Composition, and Structure During Tropical Dry Forest Secondary Succession”. European Geophysical Union Annual Meeting, Vienna, Austria. April 2018.

“Emergence of Nutrient Limitation in Tropical Dry Forests: Hypotheses from Simulation Models”. American Geophysical Union Annual Meeting, New Orleans, LA. December 2017.

“Nutrient Limitation in Recovering Tropical Forests”. Oak Ridge National Laboratory, Oak Ridge, TN. August 2017. (Invited)

“Processes influencing tropical dry forest response to nutrient fertilization”. Ecological Society of America, Portland, OR. August 2017.

“Extrapolating carbon dynamics of tropical dry forests into future climates: improving simulation models with empirical observations”. European Geophysical Union, Vienna, Austria. April 2017.

“Regional climate changes due to three decades of Amazonian deforestation”. Max Planck Institute for Meteorology, Hamburg, Germany. March 2017. (Invited)

"Observed effects of an exceptional drought on tree mortality in a tropical dry forest". American Geophysical Union Fall Meeting. San Francisco, CA. December 15, 2016.

"Regional Hydroclimatic Impacts of Contemporary Amazonian Deforestation and Their Spatiotemporal Variability – An Integrated Study Using Remotely Sensed Data and Numerical Tools". American Geophysical Union Fall Meeting. San Francisco. December 14, 2016.

Ecological Society of America Annual Meeting, Fort Lauderdale, FL, 2016: “Role of Community Composition in Determining Tropical Dry Forest Ecosystem Responses to Altered Water and Nutrient Regimes” (Invited)

INTERFACE-ClimMani Joint Meeting, Florence, Italy, 2016: “Dry Forest Ecosystem Responses to Extreme Droughts: Lessons from Models” (Invited)

US International Association of Landscape Ecology Annual Meeting, Asheville, NC, 2016: “Tropical Dry Forest Phenology: Linkages to Plant Traits and Sensitivity to Climate” (Invited)

Organization for Tropical Studies, La Selva, Costa Rica, 2016: “Tropical Ecosystems and Climate in the Anthropocene” (Invited)

Florida International University Departmental Seminar, Miami, FL, 2016: “Tropical Ecosystem Productivity in the Anthropocene” (Invited)

Ohio State University Departmental Seminar, Columbus, OH, 2016: “Regional Climate Changes Due to Three Decades of Amazonian Deforestation” (Invited)

American Geophysical Union Fall Meeting, San Francisco, CA, 2015: “Potential Precipitation Reductions in the Northwest U.S. in Response to the Large-Scale Deforestation of the Amazon” (Invited)

American Geophysical Union Fall Meeting, San Francisco, CA, 2015: “Modeling Multiple Resource Limitation in Tropical Dry Forests”.

University of Notre Dame Departmental Seminar, Notre Dame, IN, 2015: “Water and Nutrient Limitation in Tropical Ecosystems” (Invited)

Department of Energy Traits Modeling Workshop, Rockville, MD, 2015: “Trait-Driven Hydrological Niche Separation in Tropical Dry Forests” (Invited)

University of Minnesota Departmental Seminar, St. Paul, MN, 2015: “Water and Nutrient Limitation in Tropical Ecosystems” (Invited)

Rutgers University Departmental Seminar, New Brunswick, NJ, 2015, “An Atmospheric Signature of Contemporary Deforestation in the Brazilian Amazon” (Invited)

University of Alabama Huntsville Departmental Seminar, Huntsville, AL, 2015: “An Atmospheric Signature of Contemporary Deforestation in the Brazilian Amazon” (Invited)

Ecological Society of America Annual Meeting, Baltimore, MD, 2015: “Missing Forests: Including Seasonally Dry Tropical Forests in Models” (Invited)

US International Association of Landscape Ecology Annual Meeting, Anchorage, AK, 2014: “Spatial Scaling and Prediction of Vegetation Phenology on Local to Continental Scales” (Invited)

Stony Brook University Departmental Seminar, Stony Brook, NY, 2014: “Resolving the Local and Global Atmospheric Signatures of Amazon Deforestation” (Invited)

American Geophysical Union Fall Meeting, San Francisco, CA, 2013: “Ecosystem Responses to Changes in Daily-Scale Atmospheric Variability” (Invited)

American Geophysical Union Fall Meeting, San Francisco, CA, 2013: “Simulating Changes in Ecosystem Structure and Composition in Response to Climate Change: a Case Study Focused on Tropical Nitrogen-Fixing Trees” (Invited)

Tropi-Dry Annual Meeting, University of Alberta, Edmonton, AB, Canada, 2013: “Factors Limiting the Productivity of Seasonally Dry Tropical Forests” (Invited)

e. Current and Past Funding

Current Funding

Title: Extrapolating carbon dynamics of seasonally dry tropical forests across geographic scales and into future climates: improving simulation models with empirical observations

Agency/Program: DOE Terrestrial Ecosystems Science (primary)/University of Minnesota

Amount to ND: \$569,214

Role: Institutional PI

Dates: 8/1/2015 – 7/31/2018

Title: Impacts of Amazon deforestation on Earth's climate, water, and ecosystems: the ebb of the green ocean?

Agency/Program: NSF (CAREER)

Total Amount and Amount to ND: \$555,824

Role: Lead (and sole) PI

Dates: 2/1/2012-4/30/2018

Past funding

Title: Climate Syndromes of Seasonality (Climate SoS): Perspectives on Future Climate Change

Agency/Program: Princeton Environmental Institute

Amount: \$100,000

Title: Multi-Model Regional Simulation of Climate Change Impacts on Agriculture and Ecosystems in the Southwestern United States

Agency/Program: National Institute of Food and Agriculture/USDA (EaSM program)

Amount: \$90,993

Title: A Princeton Institute for Rainforests and the Amazon including their Nutrients, Hydrology, and the Atmosphere (PIRANHA)

Agency/Program: Princeton Grand Challenges

Amount: \$100,000

Title: Coordinated biological, chemical, and atmospheric investigations of the Amazon as a carbon sink

Agency/Program: Princeton Carbon Mitigation Initiative

Amount: \$100,000

Title: Seasonal variability in forest leaf area and its consequences for terrestrial carbon budgets and ecosystem structure

Agency/Program: NOAA/CICS

Amount: \$211,177

Title: Detection and attribution of rapid large-scale shifts in the terrestrial carbon cycle

Agency/Program: NASA

Amount: \$287,788

f. Supervision of research personnel

(i) Postdoctoral Scholars

Dr. Xiangtao Xu (tropical forest carbon sink), 10/2017-present, joint appointment between ND (25%) and Harvard (75%)

Dr. Dohyoung Kim (plant hydraulics modeling), 11/2016-present, currently at ND.

Dr. Annette Trierweiler (Nutrient limitation and biogeochemical cycling in tropical dry forests), 2/2016-present, currently at ND.

Dr. Jennifer Levy (Climate-carbon-nutrient feedbacks in tropical forests), 7/2012-1/2015. Now a Research Scientist at the New Jersey Department of Environmental Protection.

Dr. Su-Jong Jeong (Environmental controls on North American forest seasonality), 10/2010-9/2013. Now an Assistant Professor at the South University of Science and Technology of China.

(ii) Graduate Students

Xiangtao Xu, Fall 2012-2017. Ecohydrology of savannas and seasonally dry tropical forests.

Ph.D. from Princeton University. Now joint postdoc with ND (25%) and Harvard (75%)

Anna Trugman, Fall 2012-2017. Boreal forest hydroclimate-vegetation-soil interactions. Ph.D. in 2017 from Princeton University. Now postdoc at University of Utah.

Jaya Khanna, Fall 2011-2016. Impacts of Amazon deforestation on regional hydroclimate. Ph.D. granted in 2016 from Princeton University. Now a postdoc at Rutgers University.

Youmi Oh, Fall 2013-Spring 2015. Environmental controls on Arctic methane fluxes. Masters in 2016 from Princeton University. Currently a Ph.D. student at Purdue University.

Mercel dos Santos (Visiting Student Research Collaborator from the University of São Paulo), 2/2015-12/2015. Interactions between the Manaus, Brazil urban heat island and the Amazon River breeze. Ph.D. in 2017 from University of São Paulo.

(iii) Undergraduate Students

Logan Arnold (ACMS major with concentration in biology). Soil biogeochemistry modeling. During seven years as an assistant professor at Princeton University, Medvigy advised 12 undergraduate senior theses and 17 junior projects.

(iv) Accomplishments of Lab Personnel

In 2016, lab personnel gave a total of 8 external presentations.

g. Teaching

1. Introduction to Dynamic Models in Biology

BIOS 30350/60650

Taught in Spring 2017 and 2018

2. Topics in Ecology

BIOS 60552

Taught in Fall 2016 and 2017

3. Dr. Medvigy has also taught three courses at Princeton University, including Climate and the Terrestrial Biosphere (4 times), Inverse Methods (3 times), and Dynamic Meteorology (4 times).

h. Outside Service Activities and Outreach

1. Guest Editor, *Environmental Research Letters* focus issue on Tropical Dry Forest Ecosystems and Ecosystem Services in the Face of Global Change (2016)
2. In the past 3 years, served on review panels for NSF, DOE (2), USGS
3. Journal Reviewer: *Ecological Applications*, *Ecological Modelling*, *Ecosphere*, *Climatic Change Letters*, *Environmental Research Letters*, *Forests*, *Geophysical Research Letters*, *Global Biogeochemical Cycles*, *Global Change Biology*, *Journal of Applied Meteorology and Climatology*, *Journal of Climate*, *Journal of Geophysical Research – Atmospheres*, *Journal of Geophysical Research – Biogeosciences*, *Journal of Hydrometeorology*, *Nature Climate Change*, *Nature Geoscience*, *PLOS ONE*, *Proceedings of the National Academy of Sciences USA*, *Remote Sensing*
4. Session Chair, American Geophysical Union Fall Meeting, San Francisco, CA, 2011 and 2015
5. Outreach with Greene Intermediate Center, South Bend, Indiana. Students are making measurements assessing ecosystem responses to climate. (2016-present)
6. Outreach with 5-8th grade students at a New Jersey middle school. Students have made phenological and other ecological measurements. (2012-2016)
7. Leader of a summer institute with 5-12th grade teachers administered by Princeton University's Program in Teacher Preparation. This 30-hour institute focuses on water, vegetation, and climate in New Jersey and in the Amazon. (2013-2015)

i. Internal Service Activities

1. Center for Research Computing faculty advisory committee (2017-present)
2. Steering committee, Center for Informatics and Computational Science (2017-present)
3. Graduate studies and admissions committee (2017-present)
4. Undergraduate curriculum/Big Questions committee (2017-present)
5. Graduate recruitment committee (2016-2017)
6. Graduate curriculum committee (2016-2017)
7. Biocomputing committee (2016-2017)