

8. Balsamo G., ..., **Gentine P.**, et al., (2018), Satellite and in situ observations for advancing global Earth surface modelling: a review, *Remote Sensing*, doi:10.3390/rs10122038
9. Li Q., **Gentine P.**, Mellado JP., McColl K., (2018), Implications of non-local transport and coherent structures on Monin-Obukhov Similarity Theory and Townsend's attached eddy hypothesis, *J Atm Sci*, doi: [10.1175/JAS-D-17-0301.1](https://doi.org/10.1175/JAS-D-17-0301.1)
10. Santanello, J.A., Dirmeyer P.A., Ferguson C., Findell K., Tawfik A., Berg A., Ek M., **Gentine P.**, Guillod B., van Heerwaarden C., Roundy J., Wulfmeyer V., (2017), Land-Atmosphere Interactions: The LoCo Perspective, *BAMS*, doi: [10.1175/BAMS-D-17-0001.1](https://doi.org/10.1175/BAMS-D-17-0001.1)

d. Synergistic activities.

1. Gentine is elected member of the new US Clivar group: Emerging Data Science Tools for Climate Variability and Predictability
2. Gentine is elected member of the NOAA drought task force
3. Gentine is involved in the LoCo (Local land-atmosphere Coupling) and LandFlux GEWEX international working groups.
4. Gentine is an elected member of the WCRP group on seasonal and subseasonal prediction. His contributions are on the role of the land surface on subseasonal to seasonal prediction skills.
5. Gentine is developing a new class on land-atmosphere interactions at the graduate level at Columbia University and is currently developing a new class on turbulence. Gentine is mentoring students interested in global water problems through the Columbia University Aquanaut network. Gentine is mentoring and advising incoming undergraduate students (Egleston scholars).

Ryan Abernathey

1 Professional Preparation

Middlebury College	Middlebury, VT	Physics	B.A. 2004
Massachusetts Institute of Technology	Cambridge, MA	Climate Physics and Chemistry	Ph.D. 2012
Scripps Institution of Oceanography	San Diego, CA	Physical Oceanography	2012-2013

2 Appointments

July 2013 - present: Assistant Professor, Department of Earth and Environmental Sciences, Columbia University, New York, NY

2012 - 2013: Postdoctoral Scholar, Scripps Institution of Oceanography Institution of Oceanography, La Jolla, CA

2012: Postdoctoral Scholar, Massachusetts Institution of Technology, Cambridge, MA

2006 - 2012: Graduate Research Assistant, Massachusetts Institution of Technology, Cambridge, MA

3 Products

Products related to proposal

1. Abernathey, R., A. Cimadoribus, L. Brannigan, and G. Sérazin, 2017: xgcm/xmitgcm: v0.2.0 [Python software]. Zenodo. doi:10.5281/zenodo.291785
2. Abernathey, R, C. B. Rocha, F. J. Poulin, M. Jansen and J. Penn, 2016: pyqg: v0.2.0 [Python software]. Zenodo. doi:10.5281/zenodo.50569
3. Tamsitt, V., Abernathey, R. P., Mazloff, M. R., Wang, J., and Talley, L. D., 2018: Transformation of deep water masses along Lagrangian upwelling pathways in the Southern Ocean. *Journal of Geophysical Research: Oceans*, 123. doi:10.1002/2017JC013409
4. Abernathey, R, and G. Haller. 2018: Transport by lagrangian vortices in the eastern pacific. *J. Phys. Oceanogr.*, 48, 667–685. doi:10.1175/JPO-D-17-0102.1
5. Uchida, T., R. P. Abernathey, and K. S. Smith, 2017: Seasonality in Ocean Mesoscale Turbulence in a High Resolution Climate Model. *Ocean Modelling*, 118, 41–58, doi:10.1016/j.ocemod.2017.08.006.

Other Products

1. Abernathey, R., I. Cerovecki, P. R. Holland, E. Newsom, M. Mazloff, and L. D. Talley, 2016: Southern ocean water mass transformation driven by sea ice. *Nature Geoscience*, 9 (8), 596–601, doi:10.1038/ngeo2749.
2. Abernathey, R. and C. Wortham, 2015: Phase speed cross spectra of eddy heat fluxes in the pacific. *J. Phys. Oceanogr.*, 45, 1285–1301.
3. Gnanadesikan, A., M.-A. Pradal, and R. Abernathey, 2015: Isopycnal mixing by mesoscale eddies significantly impacts oceanic anthropogenic carbon uptake. *Geophysical Research Letters*, 42 (11), 4249–4255, doi:10.1002/2015GL064100.
4. Abernathey, R. and D. Ferreira, 2015: Southern ocean isopycnal mixing and ventilation changes driven by winds. *Geophysical Res. Lett.*, 42, 10,357–10,365.
5. Klocker, A. and R. Abernathey, 2014: Global patterns of mesoscale eddy properties and diffusivities. *J. Phys. Oceanogr.*, 44, 1030–1047.

4 Synergistic Activities

1) Visiting faculty member, Woods Hole Geophysical Fluid Dynamics Summer School, Summer 2015. 2) Public demonstration of *Climate Data Visualization* to approx. 100 K-12 students, Lamont-Doherty Earth Observatory Open House, October 2016, 2014. 3) Instructor, informal class on *Scientific Computing with Python*, Fall 2014. Five 2-hour sessions with over 100 students from across Columbia (not part of dept. teaching responsibilities). 4) Session convener, 2014 Ocean Science Meeting, Honolulu, HI: *The Southern Ocean and Its Role in the Climate System: Observations and Modeling of Physical and Biogeochemical Processes*. 5) Reviewer for: Journal of Physical Oceanography, Ocean Modelling, Geophysical Research Letters, Journal of Geophysical Research, Nature Scientific Reports, National Science Foundation.

Courtney Cogburn

Associate Professor of Social Work
Columbia University
1255 Amsterdam Avenue, New York, NY 10027
(212) 851-2101
cc3803@columbia.edu

(a) Professional Preparation

University of Virginia	Charlottesville, VA	Psychology	BA, 2001
University of Michigan	Ann Arbor, MI	Interpersonal Practice	MSW, 2002
University of Michigan	Ann Arbor, MI	Education & Psychology	PhD, 2010
University of Michigan	Ann Arbor, MI	Inst. for Social Research	Postdoc, 2011-12

(b) Appointments

Associate Professor of Social Work, Columbia University, 2019-Present
Affiliate, Data Science Institute, Columbia University, 2016-Present
Affiliate, Center on African American Politics and Society, Columbia University, 2015-Present
Assistant Professor of Social Work, Columbia University, 2014-2019
Visiting Scientist, T.H. Chan School of Public Health, Harvard University, 2014-2016
Health & Society Scholar, Center for Population and Development Studies, 2012-2014

(c) Products *[this section may be titled Publications if only publications are listed]*

(i) Five (5) publications/products most closely related to the proposed project

Cogburn, C.D., Bailenson, J.N., Ogle, E., Asher, T. & Nichols, T. (2018). 1000 cut journey. ACM SIGGRAPH (2018). Virtual, Augmented, and Mixed Reality, DOI: <https://doi.org/10.1145/3226552.3226575>

Oh, H., Cogburn, C. D., Anglin, D., Lukens, E. & DeVlyder, J. (2016). Major racist events for psychotic experiences among Black Americans. *American Journal of Orthopsychiatry*, 86(3), 277-285

Lewis, T., Cogburn, C.D., & Williams, D.R. (2015). Self-reported experiences of discrimination and health: Scientific advances, ongoing controversies and emerging issues. *Annual Review of Clinical Psychology*, 11(1).

Garces, L. and Cogburn, C. D. (2015). Beyond declines in student body diversity: How campus-level administrators understand a prohibition on race-conscious postsecondary admissions policies. *American Educational Research Journal*, 52(5), 828-860.

Garces, L., & Cogburn, C. D. (2015). Navigating legal barriers while promoting racial diversity in higher education. E. Frankenberg, L. Garces & M. Hopkins (Eds.), *School integration matters: Research-based strategies to advance equity*. Teachers College Press.

(ii) Five (5) other significant publications/products, whether or not related to the proposed project.

DeVylder, J. E., Hyun-Jin, J., Fedina, L., Coleman, D., Anglin, D., Cogburn, C., Link, B. & Barth, R.P. (2018). Association of exposure to police violence with prevalence of mental health symptoms among urban residents in the United States. *JAMA Open Network*, 1(7): e18495.

Hurd, N. M., Sellers, R. M., Cogburn, C.D., Butler-Barnes, S. T., & Zimmerman, M. A. (2012). Racial identity and mental health among Black emerging adults: The moderating effects of neighborhood racial composition. *Developmental Psychology*, 49(5), 938-950.

Cogburn, C.D., Chavous, T., & Griffin, T. M. (2011) School-based racial and gender discrimination among African American adolescents: Exploration variation in frequency and impact among girls and boys. *Journal of Race and Social Problems*, 3(1), 25-37.

Lun, J., Sinclair, S. & Cogburn, C.D. (2009). Cultural stereotypes and the self: A closer examination of implicit self-stereotyping. *Basic and Applied Social Psychology*, 31(2), 117-127.

Chavous, T. & Cogburn, C.D. (2007). The superinvisible woman: The study of Black women in education. *Black Women, Gender and Families*. *Black Women, Gender and Families: Women's Studies and Black Studies Journal*, 1(2)

(d) Synergistic Activities

- Member of the Climate Task Force, Columbia University (2016-Present)
- Co-Chair of Diversity Committee, Columbia School of Social Work (2016-Present)
- Winner of Los Angeles Film Festival for *1000 Cut Journey* (2018)
- Winner of New Orleans Film Festival for *1000 Cut Journey* (2018)

GALEN A. MCKINLEY

Professor of Earth and Environmental Sciences, Columbia University
Lamont Doherty Earth Observatory, 61 Route 9W, Palisades, NY 10964, USA
email: mckinley@ldeo.columbia.edu | *url:* mckinley.ldeo.columbia.edu | *phone:* 845.365.8585

EDUCATION AND TRAINING

Rice University, Houston TX	Civil Engineering, B.S. 1995
Massachusetts Inst. of Technology, MA	Climate Physics & Chemistry, Ph.D. 2002
Princeton University, Princeton NJ	Atmospheric & Oceanic Science, Postdoc 2003-2004

APPOINTMENTS

2017-present Professor, Earth and Environmental Sciences, Columbia University, New York, NY
2017-present Adjunct Professor, Atmospheric and Oceanic Sciences, U. Wisconsin, Madison, WI
2016-2017 Professor, Atmospheric and Oceanic Sciences, U. Wisconsin, Madison, WI
2016-2017 Bryson Professor, Center for Climatic Research, U. Wisconsin, Madison, WI
2011-2016 Associate Prof., Atmospheric and Oceanic Sciences, U. Wisconsin, Madison, WI
2004-2011 Assistant Professor, Atmospheric and Oceanic Sciences, U. Wisconsin, Madison, WI
2003-2004 Visiting Scientist / Postdoctoral Fellow, Princeton University, Princeton, NJ
2002-2003 Consulting scientist and project leader, National Institute of Ecology, Mexico
1996-2002 Graduate Research Assistant, Massachusetts Institute of Tech., Cambridge, MA
1995-1996 Environmental Specialist, Brown & Root Environmental, Houston, TX

FIVE MOST RELEVANT PUBLICATIONS

Fay, A.R., N.S. Lovenduski, G.A. McKinley, D.R. Munro, C. Sweeney, A.R. Gray, P. Landschutzer, B. Stephens, T. Takahashi, N. Williams (2018) Utilizing the Drake Passage Time-series to understand variability and change in subpolar Southern Ocean pCO₂, *Biogeosciences*, 15, 3841-3855, doi:10.5194/bg-15-3841-2018.

McKinley, G.A., A.R. Fay, N. Lovenduski, D.J. Pilcher (2017) Natural variability and anthropogenic trends in the ocean carbon sink, *Ann. Rev. Mar. Sci.* 9, doi:10.1146/annurev-marine-010816-060529.

McKinley, G.A., D.J. Pilcher, A.R. Fay, K. Lindsay, M.C. Long, and N. Lovenduski (2016) Timescales for detection of trends in the ocean carbon sink, *Nature*, doi:10.1038/nature16958.

Fay, A.R. and G.A. McKinley (2013) Global trends in surface ocean pCO₂ from in situ data, *Global Biogeochemical Cycles*, 27, doi:10.1002/gbc.20051.

McKinley, G.A., A. Fay, T. Takahashi and N. Metzl (2011) Convergence of atmospheric and North Atlantic CO₂ trends on multidecadal timescales. *Nature Geoscience*, doi:10.1038/ngeo1193.

FIVE OTHER SIGNIFICANT PUBLICATIONS

- Chen, H.*, and G.A. McKinley (2019) Isopycnal processes allow for summertime net heterotrophy despite net oxygen accumulation in the lower euphotic zone of the North Atlantic subtropical gyre, *Global Biogeochem. Cycles*, doi: 10.1029/2018GB006094.
- McKinley, G.A., A.L. Ritzer*, and N.S. Lovenduski (2018) Mechanisms of northern North Atlantic biomass variability, *Biogeosciences* 15, 6049-6066, doi:10.5194/bg-15-6049-2018.
- Peters, G.P., C. LeQuere, R.M. Andrew, J.G. Canadell, P. Friedlingstein, T. Ilyina, R.B. Jackson, F. Joos, J.I. Korsbakken, G.A. McKinley, S. Sitch, and P. Tans (2017) Towards real-time verification of CO₂ emissions, *Nature Climate Change*, doi: 10.1038/s41558-017-0013-9.
- Fay, A.R. and G.A. McKinley (2017) Correlations of surface ocean pCO₂ to satellite chlorophyll on timescales from monthly to interannual, *Global Biogeochem. Cycles*, 31, doi:10.1002/2016GB005563.
- Breeden, M. and G.A. McKinley (2016) Climate impacts on multidecadal pCO₂ variability in the North Atlantic: 1948-2009, *Biogeosciences*, 13, 3387-3396, doi:10.5194/bg-13-3387-2016.

SYNERGISTIC ACTIVITIES

JASON Advisory group, 2016-present

U.S. GO-SHIP Program Review Committee, 2018-2019

Editorial Board, Annual Reviews of Earth and Planetary Sciences, 2019-2024

Global Carbon Project Scientific Steering Committee, 2014-2018

Developed and maintain Carbon/Climate educational website, with interactive applet; English and Spanish; >100,000 unique hits since December 2009 launch (carboncycle.ldeo.columbia.edu, carboncycle_spanish.ldeo.columbia.edu)

TIAN ZHENG

PROFESSIONAL PREPARATION

Tsinghua University (Beijing, China)	Mathematics (minored in CS)	B.S.	1998
Columbia University (New York, NY)	Statistics	M.A.	1999
Columbia University (New York, NY)	Statistics	Ph.D.	2002

APPOINTMENTS

July 2017-present Professor, Dept. of Statistics, Columbia University.

July 2017-present Associate Director for Education, Data Science Institute, Columbia University.

July 2012-June 2017 Associate Professor (w. tenure), Dept. of Statistics, Columbia University.

Nov 2015-present Member, Task Force on “Data and Society”, Columbia University.

May 2013-present Member, Education Committee, Data Science Institute, Columbia University.

Nov 2012-present Associate member, Herbert Irving Comprehensive Cancer Center, Columbia University Medical Center.

Nov 2012-present Chair and member, Center for the Foundations of Data Science, Data Science Institute, Columbia University.

2007-2012 Associate Professor (w/o tenure), Department of Statistics, Columbia University.

2002-2007 Assistant Professor, Department of Statistics, Columbia University.

PRODUCTS

List of 5 publications related to the proposal

1. Chernoff, H., Lo, S. H. and Zheng, T. (2009) Discovering influential variables: a method of partitions. *Annals of Applied Statistics*, **3**(4):1335-1369.
2. McCormick, T. H., and Zheng, T. (2012) Latent demographic profile estimation in at-risk populations. *Annals of Applied Statistics*, **6**(4): 1795-1813.
3. Lo, A., Chernoff, H., Zheng, T., and Lo, S.-H. (2016). Framework for making better predictions by directly estimating variables’ predictivity. *Proceedings of the National Academy of Sciences* **113**(50) 14277-14282.
4. Ma, Y. and Zheng, T. (2017). Stabilized sparse online learning for sparse data. *The Journal of Machine Learning Research* **18**(1) 4773-4808.
5. Ma, Y., Ding, Y., and Zheng, T. (2018). Feature subspace learning based on local point processes patterns. *Statistical Analysis and Data Mining: The ASA Data Science Journal*, **11**(1), 32-50.

List of other 5 publications for merit review

1. Zheng, T., Salganik, M.J. and Gelman, A. (2006) How many people do you know in prison?: Using overdispersion in count data to estimate social structure in networks, *Journal of the American Statistical Association*, **101**, 409-423.
2. Lo, S.-H., Chernoff, H., Cong, L., Ding, Y. and Zheng, T. (2008) Discovering interactions among BRCA1 and other candidate genes involved in Sporadic Breast Cancer. *Proc Natl Acad Sci U S A* **105**: 12387-12392.
3. McCormick, T. H., Salganik, M. J., and Zheng, T. (2010) Efficiently estimating personal network size. *Journal of the American Statistical Association*, **105**(489):59-70.
4. Lo, A., Chernoff, H., Zheng, T. and Lo, S.-H. (2015) Why aren't significant variables automatically good predictors. *Proc Natl Acad Sci U S A*, **112**(45): 13892-13897
5. Tan, L.S.L, Chan, A. H., and Zheng T. (2016) Topic-adjusted visibility metric for scientific articles. *Annals of Applied Statistics* **10**(1): 1-31.

SYNERGISTIC ACTIVITIES

1. 2015-present, creator of a project-based learning course for master students in Statistics. This course employs the project-based learning approach and a “common task framework” model where the students were tasked to work in teams towards a common data set or topic. Through five well-designed projects, it provides the students with deep experiences in many areas of data sciences such as exploratory data analysis, visualization and presentation, controlling overfitting in predictive analytics, team work, collaboration and version control, etc. This course was very well received.
2. 2016-present, member of the advisory board of Stats.org, a statistical literacy project run by Sense About Science USA in collaboration with the American Statistical Association. In Oct 2016, TZ gave lectures in a Stats.org organized workshop on statistical concepts to the editorial board of Nature biomedical journals. In Oct 2017, TZ gave an introductory lecture on Statistical Thinking in a reporting class at the Columbia Journalism School.
3. 2015-2016 series creator, Columbia's edX Massive Online Open Course (MOOC) series on data science. TZ designed the content, exercises and assessment of the series' first course on “Statistical Thinking for Data Science and Analytics”. It provides an accessible yet comprehensive statistical foundation for data science and was later adopted by the Microsoft Professional Program Certificate in Data Science. Since December 2015, more than 130,000 students worldwide had participated in this online course.
4. Fall 2015-present Faculty Advisor, Columbia Statistics Club. Guided the club leaders in creating weekend study groups on data science topics and organizing hackathons.
5. Other educational activities include: designed and carried out development for *an online teaching protocol for student projects* in an introductory level statistics course. Designed and taught a course on “*Statistical computation and learning*” to graduate students of Statistics and other sciences. Designed and taught a topic course on “*Social network analysis*” to graduate students in Statistics. Designed *Introduction to Data Science* for non-quantitative students. Have been developing a data science curriculum for social work masters students.

Elias Bareimboim
Associate Professor of Computer Science
450 Computer Science Building
500 West 120th Street, New York, NY 10027
Columbia University
eb3304@columbia.edu
(212) 939-7056

Professional Preparation

Federal University of Rio de Janeiro, Brazil, Computer Science, BSc, 2007
Federal University of Rio de Janeiro, Brazil, Computer Science, MSc, 2007
University of California at Los Angeles, Los Angeles, CA, Computer Science, 2014
University of California at Los Angeles, Los Angeles, CA, Causal Inference, Postdoc, 2014-2015

Appointments

Associate Professor, Department of Computer, Columbia University, 2019– present
Director, Causal AI Laboratory, Columbia University, 2019 – present
Assistant Professor, Departments of Computer and Statistics (courtesy), Purdue University, 2015–2019
Director, Causal AI Laboratory, Purdue University, 2015 – 2019.
Faculty Affiliate, Regenstrief Center for Healthcare Engineering, Purdue University, 2017-2019

Products

a) Five Closely Related Publications

E. Bareimboim, J. Pearl, Causal Inference and the Data-Fusion Problem. Proceedings of the National Academy of Sciences (PNAS), v. 113 (27), pp. 7345-7352, 2016.

A. Jaber, JJ. Zhang, E. Bareimboim, Causal Identification under Markov Equivalence. Proc. of the 36th International Conference on Machine Learning (ICML), 2019.

S. Lee, J. Correa, E. Bareimboim, General Identifiability with Arbitrary Surrogate Experiments. Proc. of the 35th Conference on Uncertainty in Artificial Intelligence (UAI), 2019.

S. Lee E. Bareimboim, Structural Causal Bandits: Where to Intervene?. Proceedings of the 32nd Annual Conference on Neural Information Processing Systems (NeurIPS), 2018.

A. Forney, E. Bareimboim, Counterfactual Randomization: Rescuing Experimental Studies from Obscured Confounding. Proceedings of the 33rd AAAI Conference on Artificial Intelligence (AAAI), 2019.

b) Other Significant Publications

J. Zhang, E. Bareimboim, Non-parametric Path Analysis in Structural Causal Models. Proc. of the 34th Conference on Uncertainty in Artificial Intelligence (UAI), 2018.

A. Ghassami, S. Salehkaleybar, N. Kiyavash, E. Bareimboim, Budgeted Experimental Design for Causal Structural Learning. Proc. of the 35th International Conference on Machine Learning (ICML), 2018.

M. Kocaoglu, K. Shanmugam, E. Bareimboim, Experimental Design for Learning Causal Graphs with Latent Variables. Proceedings of the 31st Annual Conference on Neural Information Processing Systems (NeurIPS), 2017.

J. Correa, J. Tian, E. Bareinboim, Identification of Causal Effects in the Presence of Selection Bias. Proceedings of the 33rd AAAI Conference on Artificial Intelligence (AAAI), 2019.

E. Bareinboim, J. Pearl, External Validity: From Do-calculus to Transportability Across Populations. Statistical Science, v.29(4), pp. 579-595, 2014.

Synergistic Activities

- Editorial Board, Journal of Causal Inference, 2017-present
- Chair, 1st AAAI Spring Symposium “Beyond Curve Fitting: Causation, Counterfactuals, and Imagination-based AI”, 2019
- AAAI-18 Outstanding Paper Award Honorable Mention (1 out of 3800 papers), 2018
- UAI-18 Best Student Paper Award (1 out of 337 papers), 2018
- AI Ten to Watch, IEEE Intelligent Systems, 2016

Robin Elizabeth Bell

Palisades Geophysical Institute
 Lamont Research Professor, Marine Geology & Geophysics
 Lamont-Doherty Earth Observatory
 Columbia University
 61 Route 9W, Palisades, New York USA 10964
 (845) 365-8827
 reb4@columbia.edu

PROFESSIONAL PREPARATION

Middlebury College	Middlebury, VT	Geology	B.A., 1980
Columbia University	New York, NY	Geophysics	M.S, 1984
Columbia University	New York, NY	Geophysics	M.Phil, 1985
Columbia University	New York, NY	Geophysics	Ph.D., 1989

APPOINTMENTS:

2011-present *PGI Senior Lamont Research Professor,*
 Lamont-Doherty Earth Observatory of Columbia University 2008-
 2010 *PGI Senior Research Scientist,*
 Lamont-Doherty Earth Observatory of Columbia University 2004-
 2009 *Director,* ADVANCE Program at the Earth Institute
 1999-2008 *Doherty Senior Research Scientist,* Lamont-Doherty Earth Observatory of Co-
 lumbia University 1998-2005 Project Coordinator Hudson River Estuary Program Benthic
 Mapping Project, supported by New York State.
 1994-2000 *Co-Director,* Support Office for Aerogeophysical Research, (SOAR)
 Institute for Geophysics, University of Texas at Austin
 1980-1982 *Geophysicist,* U.S.G.S., Marine Office, Woods Hole, MA.

PRODUCTS**Related**

2006 Bell, R. E., Flood, R. D., S. Carbotte, W. B. F. Ryan, C. McHugh, M. Cormier, R. Versteeg, H. Bokuniewicz, V. L. Ferrini, J. Thissen, J. Ladd and E. A. Blair, Benthic Mapping in the Hudson River, in "The Hudson River Estuary" edited by Jeff Levinton, Cambridge University Press, pp. 51-64.

2007 Nitsche, F.O., W.B.F. Ryan, S.M. Carbotte, R.E. Bell, A. Slagle, C. Bertinato, R. flood, T. Kenna and C. McHugh. Regional Patterns and Local Variations of Sediment Distribution in the Hudson River Estuary Estuarine, Coastal and Shelf Sciences doi: 10.1016/j.ecss.2006.07.021.

2017 Scambos, T. A., Bell, R. E., Alley, R. B., Anandakrishnan, S, Bromwich, D. H., Brunt, K., Christianson, K., Creyts, T., Das, S. B., DeConto, R., Dutrieux, P., Fricker, H. A., Holland, D., MacGregor, J., Medley, B., Nicolas, J. P., Pollard, D., Siegfried, M. R., Smith, A. M., Steig, E. J., Trusel, L. D., Vaughan, D. G., Yager, P. L. How Much, How Fast: A Science Review and Outlook for Research on The Instability of Antarctica's Thwaites Glacier in the 21st Century.

2015 Boghosian, A., Tinto, K. J., Cochran, J. R., Porter, D., Elieff, S., Burton, B., Bell, R. E. Resolving Bathymetry from Airborne Gravity Along

Greenland fjords, *Journal of Geophysical Research: Solid Earth* 120.12 (2015): 8516-8533.

2014 Porter, D., Tinto, K., Boghosian, A., Cochran, J. R., Bell, R., Manizade, S. S., Sonntag, J. G. Bathymetric control of tidewater glacier mass loss in Northwest Greenland, *Earth and Planetary Sciences*, 401, 40-46.

PRODUCTS /Other

2011 Tinto, K. J. and Bell, R. E. Progressive Unpinning Of Thwaites Glacier From Newly Identified Offshore Ridge: Constraints From Aerogravity, *Geophysical Research Letters*, Vol. 38, L20503, 6 Pp., 2011, DOI:10.1029/2011gl049026.

2011 Ferraccioli, F., Carol A. Finn, Tom A. Jordan, Robin E. Bell, Lester M. Anderson, Detlef Damaske, East Antarctic Rifting Triggers Uplift of the Gamburtsev Mountains, *Nature*, 479, 388–392, DOI:10.1038/nature10566

2009 Nitsche, F.O., Slagle, A., Ryan, W.B.F., Carbotte, S., Bell, R., Flood, R. Human Impacts on the Hudson River Valley Morphology and Sediments: Hudson River Environmental Society SUNY Press.

2006 Slagle, A.L., W.B.F. Ryan, S.M. Carbotte, R. Bell, F.O. Nitsche, T. Kenna. Late-stage estuary infilling controlled by limited accommodation space in the Hudson River, *Marine Geology*. doi:10.1016/j.margeo.2006.07.009.

2006 Strayer, D.L., H.M. Malcom, R.E. Bell, S.M. Carbotte, and F.O. Nitsche Using geophysical information to define benthic habitats in a large river. *Freshwater Biology*, 51: 25-38.

SYNERGISTIC ACTIVITIES

- 2014-present President, American Geophysical Union.
- 2006-present Co-Chair, University Committee on International Research.
- 2014-2015: Co-Chair, National Academy Study on the Future of Antarctic Research.
- 2015, National Maritime Historical Society Lecture.
- **Reviewer:** *Nature*, *Nature Geoscience* GRL, JGR, National Academy of Sciences.

Yoshua Bengio

Professor of Computer Science and Operations Research
University of Montreal
6666, rue St-Urbain, bureau 200
Montreal (QC) H2S 3H1 Canada
514-343-6804
yoshua.bengio@mila.quebec

(a) Professional Preparation

McGill University	Montreal, Canada	Computer Engineering	B.Eng., 1986
McGill University	Montreal, Canada	Computer Science	M.Sc., 1988
McGill University	Montreal, Canada	Computer Science	Ph.D., 1991
MIT	Cambridge, MA	Cognitive Sciences	Postdoc, 1991-1992
AT&T Bell Labs	New Jersey	Learning and Vision Algorithms	Postdoc, 1992-1993

(b) Appointments

- Full Professor, Department of Computer Science and Operations Research, University of Montreal, 1993-Present
- Scientific Director, IVADO: Data Valorization Institute, 2016-Present
- Founder and Scientific Director, Mila: Quebec Artificial Intelligence Institute, 2006-Present
- Senior Fellow, Canadian Institute for Advanced Research, 2004-Present
- Canada Research Chair on Statistical Learning Algorithms, 2000-Present
- NSERC Industrial Research Chair, 2005-2015

(c) Products

(i) Five publications/products most closely related to the proposed project

- Goodfellow, Ian J., Yoshua Bengio, and Aaron Courville (2016). Deep Learning. MIT Press.
- Bahdanau, Dzmitry, Kyunghyun Cho, and Yoshua Bengio (2015). “Neural Machine Translation by Jointly Learning to Align and Translate”. In: ICLR’2015, arXiv:1409.0473.
- LeCun, Yann, Yoshua Bengio, and Geoffrey Hinton (2015). “Deep Learning”. In: Nature 521.7553, pp. 436–444.
- Dauphin, Yann, Razvan Pascanu, Caglar Gulcehre, Kyunghyun Cho, Surya Ganguli, and Yoshua Bengio (2014). “Identifying and attacking the saddle point problem in high-dimensional non-convex optimization”. In: NIPS’2014, arXiv:1406.2572.
- Montufar, Guido F., Razvan Pascanu, KyungHyun Cho, and Yoshua Bengio (2014). “On the Number of Linear Regions of Deep Neural Networks”. In: NIPS’2014, arXiv:1402.1869.

(ii) Five other significant publications/products, whether or not related to the proposed project.

- Goodfellow, Ian J., Jean Pouget-Abadie, Mehdi Mirza, Bing Xu, David Warde-Farley, Sherjil Ozair, Aaron Courville, and Yoshua Bengio (2014). “Generative Adversarial Networks”. In: NIPS’2014, arXiv:1406.2661.
- Pascanu, Razvan, Guido Montufar, and Yoshua Bengio (2014). “On the number of inference regions of deep feed forward networks with piece-wise linear activations”. In: International Conference on Learning Representations 2014 (Conference Track), arXiv:1305.6663.

- Yoshua Bengio, Li Yao, Guillaume Alain, and Pascal Vincent (2013). “Generalized Denoising Auto-Encoders as Generative Models”. In: NIPS’2013, arXiv:1305.6663.
- Glorot, X., A. Bordes, and Y. Bengio (2011). “Deep Sparse Rectifier Neural Networks”. In: AISTATS’2011
- Glorot, Xavier and Yoshua Bengio (2010). “Understanding the difficulty of training deep feedforward neural networks”. In: AISTATS’2010.

(d) Synergistic Activities

- Recipient of the 2018 A.M. Turing Award
- Member of the advisory board of the Neural Information Processing Systems (NIPS) Foundation (2010-Present)
- Action Editor, Journal of Machine Learning Research (JMLR) (2010-Present)
- Program Co-Chair, NIPS’2008; General Chair, NIPS’2009
- Founder and General Chair of the International Conference on Learning Representations (2013-Present)

Paulo Blikstein

Associate Professor of Communications, Media and Learning Technology Design
Teachers College of Columbia University
(847) 571 4538
paulob@tc.columbia.edu

PROFESSIONAL PREPARATION

Northwestern University	Evanston, IL	Learning Sciences	PhD, 2009
Massachusetts Institute of Technology	Cambridge, MA	Media Laboratory	MSc, 2002
University of São Paulo	São Paulo, Brazil	Systems Engineering	MSc, 2000
University of São Paulo	São Paulo, Brazil	Metallurgy	BS, 1999

APPOINTMENTS

2018 -	Associate Professor, Teachers College, Columbia University.
2009 - 2018	Assistant Professor, School of Education and School of Engineering (by courtesy), Stanford University.
2007 - 2008	Northwestern University - Research assistant, “Advancing the Science of Agent-based Modeling,” NSF grant #0713619.
2004 - 2006	Northwestern University - Research assistant, “Modeling Across the Curricula”, NSF grant.
2002 - 2003	Visiting Scholar, MIT Media Lab.
2000 - 2002	Research assistant, MIT Media Lab.

FIVE RELEVANT PAPERS

- Blikstein, P.**, Kabayadondo, Z.*, Martin, A.*, & Fields, D. (2017). The Exploration and Fabrication Technology Index (EFTi): Assessment of unexplored technology and engineering literacies in makerspaces and educational FabLabs. *Journal of Engineering Education*, 106 (1), pp. 149-175.
- Blikstein, P.** & Worsley, M. (2016). Multimodal Learning Analytics: a methodological framework for research in constructivist learning. *Journal of Learning Analytics*.
- Schneider, B., & **Blikstein, P.** (2016). Tangible User Interface and Contrasting Cases as a Preparation for Future Learning. *International Journal of Computer-Supported Collaborative learning*.
- Worsley, M. and **Blikstein, P.** (2014). Analyzing Engineering Design through the Lens of Learning Analytics. *Journal of Learning Analytics*. 1 (2), pp. 151-186.
- Blikstein, P.**, Worsley, M., Piech, C., Sahami, M., Cooper, S. & Koller, D. (2014). Programming Pluralism: Using Learning Analytics to Detect Patterns in Novices' Learning of Computer Programming. *Journal of the Learning Sciences*, 23 (4), pp. 561-599.

FIVE OTHER PAPERS

- Hossain, Z.*, Bumbacher, E.*, Brauneis, A*., Diaz, M*., Saltarelli, A*., **Blikstein, P.** & Riedel-Kruse, I. (2018). Design Guidelines and Empirical Case Study for Scaling Authentic Inquiry-based Science Learning via Open Online Courses and Interactive Biology Cloud Labs. *International Journal of Artificial Intelligence in Education*.
- Blikstein, P.**, Fuhmann, T., & Salehi, S. (2016). Using Bifocal framework: combined physical experimentation and virtual modeling to learn about Bacterial growth in Biology. *Journal of Science Education and Technology*, 25 (4), pp. 513-526

Blikstein, P. (2014). Bifocal Modeling: Comparing physical and computational models linked in real time. In Nijholt, A. (Ed.), *Playful learning interfaces* (pp. 317-350), Netherlands: Springer.

Schneider, B., Wallace, J., **Blikstein, P.**, & Pea, R. (2013). Preparing for Future Learning with a Tangible User Interface: the Case of Neuroscience. *IEEE Transaction on Learning Technologies*. 6 (2), pp. 117-129.

Blikstein, P. (2012). Bifocal modeling: a study on the learning outcomes of comparing physical and computational models linked in real time. In *Proceedings of the 14th ACM International Conference on Multimodal Interaction (ICMI)*, pp. 257-264.

SYNERGISTIC ACTIVITIES

- Co-developed and deployed science learning technologies in school settings (as part of multiple NSF grants)
- District- and school-wide implementation of maker and fab lab programs with strong science component
- Director of the FabLearn program, which assists teachers and school systems in complex implementations of complex science and engineering curricula
- Co-designer of the GoGo Board, an open-source, low-cost robotics and sensing interface
- Interdisciplinary work at Stanford and Columbia with professors in Computer Science, Human-Computer Interaction, Bioengineering, Mechanical Engineering.

Vanessa Burbano
Assistant Professor of Management
Graduate School of Business, Columbia University
704 Uris Hall, 3022 Broadway, New York, NY 10027
(917) 628-3800
vb2399@gsb.columbia.edu

(a) Professional Preparation

University of Pennsylvania	Philadelphia, PA	Economics	BA 2002
Universidad Complutense	Madrid, Spain	International Development	MA 2003
Princeton University	Princeton, NJ	Public Affairs	MPA 2009
UCLA	Los Angeles, CA	Economics	MA 2011
UCLA	Los Angeles, CA	Management	PhD 2015

(b) Appointments

Assistant Professor of Management, Graduate School of Business, Columbia University, 2015 – Present

Associate, Goldman Sachs, 2005 – 2007

Strategy Consultant, Monitor Group, 2003 – 2005

(c) Publications

Burbano VC (2019) Getting Gig Workers to Do More by Doing Good: Field Experimental Evidence. *Organization & Environment*. Early online version:
<https://journals.sagepub.com/doi/pdf/10.1177/1086026619846455>

Burbano VC, Mamer J, and Snyder J (2018) Pro Bono as a Human Capital Learning and Screening Mechanism: Evidence from Law Firms. *Strategic Management Journal* 39(11): 2899-2920.

Burbano VC (2016) Social Responsibility Messages and Worker Wage Requirements: Field Experimental Evidence from Online Labor Marketplaces. *Organization Science* 27(4): 1010 – 1028.

Delmas M and Burbano VC (2011) The Drivers of Greenwashing. *California Management Review* 54(1): 64-87.

(d) Synergistic Activities

- Selected to *Poets & Quant's* Best 40 Under 40 Professors (2019)
- Winner, Best Paper Award, Alliance for Research on Corporate Sustainability Annual Conference (2018)
- Winner, Responsible Research in Management Award (2017)
- Research Committee Member, Strategic Management Division of the Academy of Management (2018-present)
- Board Member, Alliance for Research on Corporate Sustainability (2016-present)

Suzana J. Camargo

Marie Tharp Lamont Research Professor
Lamont-Doherty Earth Observatory, Columbia University
61 Route 9W, 206D Oceanography Palisades, NY 10964-8000
Phone: (845) 365-8640
suzana@ldeo.columbia.edu

Professional Preparation

University of São Paulo	São Paulo, Brazil	Physics	BS	1986
University of São Paulo	São Paulo, Brazil	Physics	MS	1989
Technical University of Munich	Munich, Germany	Physics	PhD	1992
Max-Planck Institute for Plasma Physics	Garching, Germany	Postdoctoral Fellow		1993-1996

Appointments

2019 -	Marie Tharp Lamont Research Professor, Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY
2019 -	Adjunct Professor, Department of Earth and Environmental Sciences, Columbia University, New York, NY
2018 -	Associate Faculty Member, The Earth Institute, Columbia University, New York, NY
2018 -	Lecturer, Sustainability Science Program, School of Professional Studies, Columbia University, New York, NY
2015 -	Executive Director, Initiative on Extreme Weather and Climate, Columbia University, New York, NY
2013-2019	Lamont Research Professor, Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY
2010-2013	Lamont Associate Research Professor, Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY
2009-2010	Doherty Research Scientist, Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY
2008-2009	Doherty Associate Research Scientist, Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY
2007-2008	Associate Research Scientist, Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY
2003-2007	Associate Research Scientist, International Research Institute for Climate and Society, Columbia University, Palisades, NY
1999-2003	Senior Staff Associate, International Research Institute for Climate and Society, Columbia University, Palisades, NY
1996-1999	Associate Professor, São Paulo State University, Guaratinguetá, Brazil

Products

Five (5) publications/products most closely related to the proposed project

M. Bieli, A.H. Sobel, **S.J. Camargo**, and M.K. Tippett, 2019. A statistical model to predict the extratropical transition of tropical cyclones. *Wea. Forecasting*, early online, doi: 10.1175/WAF-D-19-

0045.1.

J.P. Duvel, **S.J. Camargo**, and A.H. Sobel, 2017. Role of convection scheme in modeling initiation and intensification of tropical depressions over the North Atlantic. *Mon. Wea. Rev.*, **145** 1495-1509, doi:10.1175/MWR-D-16-0201.1

Y. Moon, D. Kim, **S.J. Camargo**, A.A. Wing, A.H. Sobel, H. Murakami, K.A. Reed, E. Scoccimarro, G.A. Vecchi, M. Wehner, C. Zarzycki, and M. Zhao, 2019. Wind and thermodynamic structures of tropical cyclones in global climate model simulations and their sensitivity to horizontal resolution. *J. Climate*, early online, doi: 10.1175/JCLI-D-19-0172.1.

A.A. Wing, **S.J. Camargo**, A.H. Sobel, D. Kim, Y. Moon, H. Murakami, K.A. Reed, G.A. Vecchi, M.F. Wehner, C. Zarzycki, and M. Zhao, 2019. Moist static energy budget analysis of tropical cyclone formation and intensification in high-resolution climate models. *J. Climate*, **32**, 6071-6095, doi:10.1175/JCLI-D-18-0599.1.

D. Kim, Y. Moon, **S.J. Camargo**, A.A. Wing, A.H. Sobel, H. Murakami, G.A. Vecchi, M. Zhao and E. Page, 2018. Process-oriented diagnosis of tropical cyclones in high-resolution GCMs. *J. Climate*, **31**, 1685-1702, doi: 10.1175/JCLI-D-17-0269.1.

Five (5) other significant publications/products, whether or not related to the proposed project

S.J. Camargo, 2013. Global and regional aspects of tropical cyclone activity in the CMIP5 models, *J. Climate*, **26**, 9880-9902, doi: 10.1175/JCLI-D-12-00549.1.

S.J. Camargo, M.K. Tippett, A.H. Sobel, G.A. Vecchi, and M. Zhao, 2014. Testing the performance of tropical cyclone genesis indices in future climates using the HIRAM model. *J. Climate* **27**, 9171-9196 doi: 10.1175/JCLI-D-13-00505.1.

C.-Y. Lee, **S.J. Camargo**, F. Vitart, A.H. Sobel, and M.K. Tippett, 2018. Sub-seasonal tropical cyclone genesis prediction and MJO in the S2S dataset. *Wea. Forecasting*, **33**, 967-988, doi: 10.1175/WAF-D-17-0165.1.

C.-Y. Lee, M.K. Tippett, A.H. Sobel, and **S.J. Camargo**, 2018. An environmentally forced tropical cyclone hazard model. *J. Adv. Model. Earth Syst.*, **10**, 233-241, doi: 10.1002/2017MS001186.

D.A. Shaevitz, **S.J. Camargo**, A.H. Sobel, J.A. Jonas, D. Kim, A. Kumar, T.E. LaRow, Y.-K. Lim, H. Murakami,

Synergistic Activities

- Editor, *Geophysical Research Letters*, December 2017 - present.
- Associate Editor, *Journal of Climate*, August 2016 - present.
- Secretary, *Natural Hazards Section*, American Geophysical Union, 2019-2020.
- Member, *President's Advisory Committee on University Relations - PACUR*, University Cooperation for Atmospheric Research - UCAR, October 2019 - present.
- Member, *World Meteorological Organization Task Team on Climate Change Impacts on Tropical Cyclones*, May 2017 - present.

VICTOR H. DE LA PENA

Professor, Department of Statistics
Columbia University
1255 Amsterdam Avenue, New York, NY 06825
(212) 851-2144
vhd1@columbia.edu

Education

University of Texas at El Paso	El Paso, TX	Mathematics	BSc, 1981
UC Berkeley	Berkeley, CA	Statistics	MA, 1984
UC Berkeley	Berkeley, CA	Statistics	PhD, 1988

Professional Experience

2001-Present, Professor, Department of Statistics, Columbia University
1993-2001, Associate Professor, Department of Statistics, Columbia University
1994, Visiting Associate Professor, Department of Mathematics, University of Southern California
1992, Professeur Associe, LSTA and Laboratoire de Probabilites, Universite Paris VI
1988-1992, Assistant Professor, Department of Statistics, Columbia University

Publications

Bounds on the expectation of functions of martingales and sums of positive r 's in terms of norms of sums of independent random variables. *Proceedings of the American Mathematical Society*, Vol. 108, No. 1, pp. 233-239 (Jan 1990).

Decoupling and Khintchine's Inequalities for U-statistics. *Annals of Probability*, Vol. 20, No. 4, pp. 1877-1892 (1992).

A note on a second moment of a randomly stopped sum of independent variables. (Joint with Z. Govindarajulu.) *Statistics and Probability Letters*, Vol. 14, No. 4, pp. 275-281 (July 1992).

Nuevas desigualdades para U-estadísticas y gráficas aleatorias. *Proceedings of IV Congreso Latinoamericano en Probabilidad y Estadística Matemática* in *Contribuciones en Probabilidad y Estadística*, No. 3, Edited by E. Cabaña, L. Gorostiza, P. Morettin, R. Rebolledo, V. Yohai and J. Ortega. Publisher, Instituto Nacional de Estadística, Geografía e Informática, Aguascalientes, Ags., México (in Spanish), pp. 290-296 (May 1992).

Sharp bounds on the L_p norm of a randomly stopped multilinear form with an application to Wald's equation. *"Probability in Banach Spaces, VIII"*. Edited by R. M. Dudley, M. G. Hahn, and J. Kuelbs. Birkhauser, New York, New York, pp. 69-79 (Aug 1992).

Other Publications

Bootstrap goodness-of-fit tests based on the empirical characteristic function. (Joint with D. Alemayehu and Evarist Gine.) *Proceedings of the conference on the Interface* (Spring 1993).

Inequalities for tails of adapted processes with an application to Wald's lemma. *Journal of Theoretical Probability*, Vol. 6, No. 2, pp. 285-302 (April 1993).

Wald's lemma for a class of de-normalized U-statistics. (Joint with Y.S. Chow and H. Teicher.) *Annals of Probability*, Vol. 21, No. 2, pp. 1151-1158 (Apr 1993).

A Bound on the moment generating function of a sum of dependent variables with an application to simple random sampling without replacement. *Annales de L'Institute Henry Poincare: Probabilités et Statistiques*, Vol 30, No. 2, pp. 197-211 (1994). Correction: *Annales de L'Institute Henry Poincare. Probabilités et Statistiques*, Vol 31, No. 4, pp. 703-704 (1995).

Order of magnitude bounds for expectations involving quadratic forms. (Joint with M. Klass.) *Annals of Probability*, Vol. 22, No. 2, pp. 1044-1077 (April 1994).

Ruth S. DeFries

University Professor, Denning Family Professor of Sustainable Development
Department of Ecology, Evolution and Environmental Biology, Columbia University
Schermerhorn Extension, 10th Floor, Room 1014
1200 Amsterdam Avenue, New York, NY 10027
212-851-1647
rd2402@columbia.edu

Professional Preparation

Washington University	St. Louis, MO	Earth Science	BA	1976
Johns Hopkins University	Baltimore, MD	Geography	PhD	1980

Appointments

2016-Present	University Professor/ Denning Family Professor of Sustainable Development, Columbia University
2012-2016	Chair of Ecology, Evolution and Environmental Biology, Columbia University
2008-2016	Professor of Ecology, Evolution and Environmental Biology, Columbia University
1999-2008	Professor, Department of Geography, University of Maryland, College Park
1992-1999	Associate Research Scientist of Geography, University of Maryland, College Park
1983-1992	Senior Project Officer, National Research Council
1981-1983	Research Associate, Environmental Science, Indian Institute of Technology, Bombay
1979-1980	Hydrologist, United States Geological Survey

Publications

DeFries, R., Mondal, P., Singh, D., Agrawal, I., Fanzo, J., Remans, R., Wood, S. 2018. Synergies and trade-offs for sustainable agriculture: Nutritional Yields and Climate-Resilience for cereal crops in central India. *Global Food Security*.

DeFries, R., J. Fanzo, R. Remans, C. Palm, S. Wood, and T. Anderman. 2015. Metrics for land-scarce agriculture: Nutrient content must be better integrated into planning. *Science* 349:238-240.

Remans, R., S. Wood, N. Saha, T. Anderman, and R. DeFries. 2014. Measuring nutritional diversity of national food supplies. *Global Food Security* 3:174-182.

Anderman, T., R. Remans, S. Wood, K. DeRosa, and R. DeFries. 2014. Synergies and tradeoffs between cash crop production and food security: a case study in rural Ghana. *Food Security: The Science, Sociology and Economics of Food Production and Access to Food* 6:541-554.

Jain, M., P. Mondal, R. DeFries, C. Small, and G. Galford. 2013. Mapping cropping intensity of smallholder farms: a comparison of methods using multiple sensors. *Remote Sensing of Environment* 134:210-223.

Synergistic Activities

- Elected Member to the National Academy of Sciences in 2006
- MacArthur Fellowship in 2007
- Named Fellow of the American Association for the Advancement of Science in 2008
- Named Fellow of the American Academy of Arts and Sciences in 2010
- Named Fellow of the Ecological Society of America in 2012

Gregory Elsaesser

Associate Research Scientist in the Department of Applied Physics and Applied Mathematics

Columbia University

545 W 112th Street, Armstrong Hall Room 660

New York, NY 10027

212-678-5596

gregory.elsaesser@columbia.edu

(a) Professional Preparation

Ohio State University	Columbus, OH	Geography/Atmospheric Sciences	B.S., 2002
Colorado State University	Fort Collins, CO	Atmospheric Science	M.S., 2006
Colorado State University	Fort Collins, CO	Atmospheric Science	Ph.D., 2011

(b) Appointments

- Associate Research Scientist, Dept of Applied Physics and Applied Mathematics, Columbia University & NASA Goddard Institute for Space Studies, 2014-Present
- Postdoctoral Research Scientist I, Dept. of Atmospheric Science, Colorado State University, 2011-2014

(c) Products

(i) Five publications/products most closely related to the proposed project

- **Elsaesser, G. S.**, A. D. Del Genio, J. Jiang, and M. van Lier-Walqui, 2017: An Improved Convective Ice Parameterization for the NASA GISS Global Climate Model and Impacts on Cloud Ice Simulation. *J. Climate.*, **30**, 1, 317-336.
- Schmidt, G. A., D. Bader, L. J. Donner, **G. S. Elsaesser**, J.-C. Golaz, C. Hannay, A. Molod, R. Neale, and S. Saha, 2017: Practice and philosophy of climate model tuning across six U.S. modeling centers. *Geosci. Model Dev.*, **10**, 3207-3223.
- Kelley, M., G. A. Schmidt, L. Nazarenko, R. L. Miller, S. E. Bauer, R. Ruedy, G. L. Russell, I. Aleinov, M. Bauer, R. Bleck, V. Canuto, G. Cesana, Y. Cheng, T. L. Clune, B. Cook, A. D. Del Genio, G. S. Elsaesser, et al., 2020: GISS-E2.1: Configurations and Climatology. *JAMES*, submitted.
- Miller, R. L., G. A. Schmidt, L. Nazarenko, S. E. Bauer, M. Kelley, R. Ruedy, G. L. Russell, I. Aleinov, M. Bauer, R. Bleck, V. Canuto, G. Cesana, Y. Cheng, T. L. Clune, B. Cook, C. A. Cruz, A. D. Del Genio, **G. S. Elsaesser**, et al., 2020: CMIP6 Historical Simulations (1850-2014) with GISS ModelE2.1. *JAMES*, submitted.
- McCoy, D.T., P.R. Field, **G.S. Elsaesser**, A. Bodas-Salcedo, B.H. Kahn, M.D. Zelinka, C. Kodama, T. Mauritsen, B. Vanniere, M. Roberts, P.L. Vidale, D. Saint-Martin, A. Voldoire, R. Haarsma, A. Hill, B. Shipway, and J. Wilkinson, 2019: Cloud feedbacks in extratropical cyclones: Insight from long-term satellite data and high-resolution global simulations. *Atmos. Chem. Phys.*, **19**, 1147-1172, doi:10.5194/acp-19-1147-2019.

(ii) Five other significant publications/products, whether or not related to the proposed project.

- Cheng, Y., V. M. Canuto, A. M. Howard, A. S. Ackerman, M. Kelley, A. Fridlind, G. A. Schmidt, M. S. Yao, A. D. Del Genio, and G. S. Elsaesser, 2020: An improved simple second-order closure atmospheric turbulence model. *J. Atmos. Sci.*, in review.

- Elsaesser, G. S., M. van Lier-Walqui, A. A. Ackerman, M. Kelley, A. M. Fridlind, G. V. Cesana, A. Behrangi, J. D. O. Strong, and G. A. Schmidt, 2020: A Deep Learning Approach for Optimizing Free Parameters in the NASA GISS ModelE3 Atmosphere. *In prep.*
- Elsaesser, G. S., C. D. Kummerow, T. S. L'Ecuyer, Y. N. Takayabu and S. Shige, 2010: Observed Self-Similarity of Precipitation Regimes Over the Tropical Oceans. *J. Climate*, 23, 2686 – 2698.
- Elsaesser, G. S., and C. D. Kummerow, 2015: The Sensitivity of Rainfall Estimation to Error Assumptions In a Bayesian Passive Microwave Retrieval Algorithm. *J. Appl. Meteor. Clim.*, 54, 408-422.
- McCoy, D. T., P. R. Field, A. Schmidt, D. P. Grosvenor, B. J. Shipway, A. A. Hill, J. M. Wilkinson, and G. S. Elsaesser, 2018: Aerosol midlatitude cyclone indirect effects in observations and high-resolution simulations. *Atmos. Chem. Phys.*, 18, 5821 – 5846.

(d) Synergistic Activities

- Member of New York City Convective Consortium (NY3C) aiming share knowledge and develop collaborations for cloud and convection studies (2016 – present);
- Chair of the NASA Precipitation Measurements Mission (PMM) Annual Science Team Meeting Science Session I (2019);
- Service as a NASA Postdoctoral Program (2016 – present) and NASA New Investigator Program (2018) Reviewer

Jacob Fish

Carleton Professor, Department of Civil Engineering
 Director, NYC Multiscale Science and Engineering Center
 Columbia University
 606 S.W. Mudd, 500 West 120th Street, New York, NY 10027
fishj@columbia.edu
 (212) 854-5275

a. Professional Preparation

Technion, Israel	Structural Engineering	B.S	1982
Technion, Israel	Structural Mechanics	M.S	1985
Northwestern University	Theoretical and Applied Mechanics	Ph.D	1989

b. Appointments

2011-	The Carleton Chaired Professor of Civil Engineering and Engineering Mechanics, Director, NYC Multiscale Science and Engineering Center, Columbia University
2006-2010	Director, Multiscale Science and Engineering Center, RPI
2005-2010	The Rosalind and John J. Redfern, Jr. '33 Chaired Professor in Engineering, RPI
1998-2005	Professor, Mechanical, Aerospace and Nuclear Engineering, and Civil and Environmental Engineering (joint), RPI
2001	Visiting Chair Professor, Ecole Normale Superieure de Cachan, France
1994 - 1998	Associate Professor, Mechanical, Aerospace and Nuclear Engineering, and Civil and Environmental Engineering (joint), RPI
1989 - 1994	Assistant Professor, Civil and Environmental Engineering, RPI
1984 - 1986	Research Engineer, Methods Development Group, Aircraft Industries, Israel
1982 - 1984	Structural Engineer, Civil Engineering Consulting, Inc., Tel-Aviv, Israel

c. Products*FIVE PUBLICATIONS MOST CLOSELY RELATED*

- [1] J. Fish and S. Kuznetsov. Computational Continua. International Journal for Numerical Methods in Engineering 84: 774-802, 2010.
- [2] J. Fish and W. Wu. Nonintrusive Stochastic Multiscale Solver. International Journal for Numerical Methods in Engineering 88: 862-879, 2011.
- [3] J. Fish, Z. Yuan and R. Kumar. Computational Certification under Limited Experiments. International Journal for Numerical Methods in Engineering, Vol. 114, pp. 172-195, 2018.

[4] C. Oskay and J. Fish. Eigendeformation-Based Reduced Order Homogenization. *Comp. Meth. Appl. Mech. Engng.* 196: 1216-1243, 2007.

[5] J. Fish, G. Wagner, S. Keten. Mesoscopic and multiscale modelling. Invited article by Nature Materials. To appear end of 2019.

FIVE FURTHER PUBLICATIONS

[1] J. Fish. *Practical Multiscale*, John Wiley, 2013

[2] J. Fish and Z. Yuan, Multiscale enrichment based on partition of unity, *Int. J. Numer. Meth. Engng* 62:1341–1359, 2005

[3] J. Fish and Z. Yuan. *N-scale Model Reduction Theory. Bridging the Scales in Science and Engineering*, J. Fish (ed), Oxford University Press, 2009

[4] J. Fish. Multiscale Computations: Boom or Bust, *IACM Expressions*, 22: 2008

[5] J. Fish and T. Belytschko, “A First Course in Finite Elements,” John Wiley, 2007

d. Synergistic activities

- Editor-in-Chief, *International Journal of Multiscale Computational Engineering*, 2002-
- Editor, *International Journal for Numerical Methods in Engineering*, 2007-
- Vice President, *International Association for Computational Mechanics*, 2018-
- President, *U.S. Association for Computational Mechanics*, 2002-2006
- Member, *U. S. National Committee on Theoretical and Applied Mechanics*, 2006-

David John Gagne II, Ph.D.

Machine Learning Scientist
 National Center for Atmospheric Research
 3090 Center Green Drive, Boulder, CO 80301
 dgagne@ucar.edu
 303-497-2714

A. Professional Preparation

University of Oklahoma	Norman, OK	Meteorology	B.S. 2010
University of Oklahoma	Norman, OK	Meteorology	M.S. 2012
University of Oklahoma	Norman, OK	Meteorology	Ph.D. 2016
National Center for Atmospheric Research	Boulder, CO	Machine Learning	Postdoc 2018

B. Appointments

2018-Present	Machine Learning Scientist, National Center for Atmospheric Research, Boulder, CO
2016-2018	Postdoctoral Fellow, National Center for Atmospheric Research, Boulder, CO
2014-2016	Graduate Research Assistant, National Center for Atmospheric Research, Boulder, CO
2010-2016	Graduate Research Assistant, University of Oklahoma, Norman, OK.
2012-2014	Consultant, Meso Inc., Troy, NY

C. Products**a. Most Closely Related to Proposed Project**

- Gagne II, D. J., S. E. Haupt, D. W. Nychka, 2018: Interpretable Deep Learning for Spatial Analysis of Severe Hailstorms. *Mon. Wea. Rev.*, In Press, <https://doi.org/10.1175/MWR-D-18-0316.1>.
- Gagne II, D. J., A. McGovern, S. E. Haupt, R. A. Sobash, J. K. Williams, and M. Xue, 2017a: Storm-based probabilistic hail forecasting with machine learning applied to convection-allowing ensembles. *Wea. Forecasting*, 32, 1819–1840, doi: 10.1175/WAF-D-17-0010.1.
- McGovern, A., K. L. Elmore, D. J. Gagne II, S. E. Haupt, C. D. Karstens, R. Lagerquist, T. Smith, and J. K. Williams, 2017: Using artificial intelligence to improve real-time decision making for high-impact weather. *Bull. Amer. Meteor. Soc.*, 28, 2073–2090, doi: 10.1175/BAMS-D-16-0123.1.
- Sobash, R. A., G. S. Romine, C. S. Schwartz, D. J. Gagne II, and M. L. Weisman, 2016: Explicit forecasts of low-level rotation from convection-allowing models for next-day tornado prediction. *Wea. Forecasting*, 31, 1591–1614, doi: 10.1175/WAF-D-16-0073.1.
- McGovern, A., D. J. Gagne II, J. K. Williams, R. A. Brown, and J. B. Basara, 2014: Enhancing understanding and improving prediction of severe weather through spatiotemporal relational learning. *Mach. Learn.*, 95, 27–50, doi: 10.1007/s10994-013-5343-x.

b. Other Significant Products

- Gagne II, D. J., A. McGovern, S. E. Haupt, and J. K. Williams, 2017b: Evaluation of statistical learning configurations for gridded solar irradiance forecasting. *Solar Energy*, 150, 383–393, doi: 10.1016/j.solener.2017.04.031.
- McGovern, A., D. J. Gagne II, J. Basara, T. M. Hamill, and D. Margolin, 2015: Solar energy prediction: An international contest to initiate interdisciplinary research on compelling meteorological

problems. *Bull. Amer. Meteor. Soc.*, 96, 1388–1395, doi: 10.1175/ BAMS-D-14-00006.1.

3. Gagne II, D. J., A. McGovern, and M. Xue, 2014d: Machine learning enhancement of storm scale ensemble probabilistic quantitative precipitation forecasts. *Wea. Forecasting*, 29, 1024–1043, doi: 10.1175/WAF-D-13-00108.1.
4. Gagne II, D. J., A. McGovern, J. B. Basara, and R. A. Brown, 2012a: Tornadoic supercell environments analyzed using surface and reanalysis data: A spatiotemporal relational data mining approach. *J. Appl. Meteorol. Climatol.*, 51, 2203–2217, doi: 10.1175/ JAMC-D-11-060.1.
5. Gagne II, D. J., A. McGovern, and J. Brotzge, 2009a: Classification of convective areas using decision trees. *Journal of Atmospheric and Oceanic Technology*, 26 (7), 1341–1353, doi: 10.1175/2008JTECHA1205.1.

D. Synergistic Activities

1. **Open Source Software Development:** Hagelslag, a Python object-based machine learning severe weather forecast system.
2. **Associate Editor:** *Monthly Weather Review*, *Weather and Forecasting*, **Reviewer:** *Monthly Weather Review*, *Weather and Forecasting*, *Journal of Advances in Modeling Earth Systems*, *IEEE Transactions of Geoscience and Remote Sensing*, *Journal of Renewable and Sustainable Energy*, *Envirometrics*, *Journal of Applied Meteorology and Climatology*, *Energies*, *Sensors*, *Solar Energy*.
3. **Professional Committee Service:** Member, American Meteorological Society Artificial Intelligence Applications to Environmental Sciences Committee; Program Chair, 2020 Conference on Artificial and Computational Intelligence Applied to the Environmental Sciences; Hackathon Chair, 2017 and 2018 Climate Informatics Workshop.
4. **Outreach and Mentoring:** Local Organizer, 2017 Arctic Climate Game Jam; Computing Mentor, 2018 UCAR SOARS program; Mentor, 2016 National Weather Center Research Experience for Undergraduates
5. **Course Development:** Beyond P-Values Course on Machine Learning, American Meteorological Society Short Course on Machine Learning in Python for Environmental Science Problems

Andrew Gelman

Higgins Professor of Statistics, Professor of Political Science
Columbia University
1255 Amsterdam Avenue, Room 1003, New York, NY 10027
(212) 851-2142
gelman@stat.columbia.edu

Professional Preparation

Massachusetts Institute of Technology, Cambridge, MA, Mathematics, S.B., 1985
Massachusetts Institute of Technology, Cambridge, MA, Physics, S.B., 1986
Harvard University, Cambridge, MA, Statistics, PhD, 1990

Appointments

Higgins Professor of Statistics, Columbia University, 2017-present
Founding Director, Applied Statistics Center, Columbia University, 2006–present
Professor, Department of Political Science, Columbia University, 2002-present
Professor, Department of Statistics, Columbia University, 2000–2017
Founding Director, Quantitative Methods in Social Sciences, Columbia University, 1998-2002
Associate Professor, Department of Statistics, Columbia University, 1996–2000
Assistant Professor, Department of Statistics, University of California, Berkeley, 1990–1996

Products Related to this Proposal

1. Gelman, A., Carpenter, B., Lee, D., Hoffman, M., Betancourt, M., Guo, J., Goodrich, B., Brubaker, M., Li, P., Riddell, A. (2012-present). Stan: A computing framework for Bayesian modeling [Software].
2. Hoffman, M., and Gelman, A. (2014). The no-U-turn sampler: Adaptively setting path lengths in Hamiltonian Monte Carlo. *Journal of Machine Learning Research* 15, 1351-1381.
3. Vehtari, A., Gelman, A., and Gabry, J. (2016). Practical Bayesian model evaluation using leave-one-out cross-validation and WAIC. *Statistics and Computing*.
4. Kucukelbir, A., Ranganath, R., Gelman, A., and Blei, D. (2015). Automatic variational inference in Stan. *Neural Information Processing Systems*.
5. Gelman, A., Carlin, J. B., Stern, H. S., Dunson, D. B., Vehtari, A., and Rubin, D. B. (2013). *Bayesian Data Analysis*, third edition. CRC Press. Awarded the DeGroot Prize from the International Society of Bayesian Analysis.

Other Research Products

1. Schofield, M., Barker, R., Gelman, A., Cook, E., and Briffa, K. (2015). A model-based approach to climate reconstruction using tree-ring data. *Journal of the American Statistical Association*.

2. Gelman, A. (2014). The connection between varying treatment effects and the crisis of unreplicable research: A Bayesian perspective. *Journal of Management*.
3. Gelman, A., Jakulin, A., Pittau, M. G., and Su, Y. S. (2008). A weakly informative default prior distribution for logistic and other regression models. *Annals of Applied Statistics*.
4. Gelman, A. (2006). Prior distributions for hierarchical variance parameters. *Bayesian Analysis*.
5. Gelman, A., Meng, X. L., and Stern, H.S. (1996). Posterior predictive assessment of model fitness via realized discrepancies (with discussion). *Statistica Sinica* 6, 733-807.

Synergistic Activities

- Development of Quantitative Methods in Social Science program at Columbia University
- Development of new Applied Statistics Center at Columbia University
- Research blog, Statistical Modeling, Causal Inference, and Social Science
- Communication to public via articles in Slate, New York Times, and other general-interest publications
- Development of open-source statistical software for displaying multilevel models, fitting Bayesian models, and monitoring the convergence of iterative simulations

Dr. Andrew Gettelman

Scientist I-IV, National Center for Atmospheric Research
1850 Table Mesa Dr, Boulder, CO 80305
(303) 497-1887
andrew@ucar.edu

A. Professional Preparation

Princeton University, Princeton, NJ, Civil Engineering, BSE, 1992
University of Washington, Seattle, WA, Atmospheric Sciences, PhD, 1999
National Center for Atmospheric Research, Boulder, CO, Postdoctoral Fellow, 1999-2001

B. Appointments

Scientist I-IV, NCAR, Boulder CO, July 2003-Present
Esrvine Fellow, University of Canterbury, New Zealand, June-August 2016
Visiting Professor, ETH Zürich, Switzerland, August 2011-July 2012
Project Scientist, NCAR, Boulder CO, October 2001-July 2003

C. Relevant Publications**Five Products Most Closely Related to Proposal.**

Gettelman, Andrew, Anja Schmidt, and Jón Egill Kristjánsson. "Icelandic Volcanic Emissions and Climate." *Nature Geoscience* 8, no. 4 (April 2015): 243–243. <https://doi.org/10.1038/ngeo2376>.

Malavelle, Florent F., Jim M. Haywood, Andy Jones, Andrew Gettelman, Lieven Clarisse, Sophie Bauduin, Richard P. Allan, et al. "Strong Constraints on Aerosol–Cloud Interactions from Volcanic Eruptions." *Nature* 546, no. 7659 (June 22, 2017): 485–91. <https://doi.org/10.1038/nature22974>.

Gettelman, A. "Putting the Clouds Back in Aerosol–Cloud Interactions." *Atmos. Chem. Phys.* 15, no. 21 (November 9, 2015): 12397–411. <https://doi.org/10.5194/acp-15-12397-2015>.

Gettelman, A. and H. Morrison, Advanced Two-Moment Microphysics for Global Models. Part I: Off line tests and comparisons with other schemes. *J. Climate*, 28, 1268–1287. doi: 10.1175/JCLI-D-14-00102.1, 2015

Gettelman, A., H. Morrison, S. Santos, P. Bogenschutz and P. H. Caldwell Advanced Two-Moment Microphysics for Global Models. Part II: Global model solutions and Aerosol-Cloud Interactions. *J. Climate*, 28, 1288–1307. doi: 10.1175/JCLI-D-14-00103.1, 2015

Other Products.

Gettelman, A., Schmidt, A. and J.-E. Kristjánsson. Icelandic Volcanic Emissions and Climate, *Nature Geoscience*, 8, doi:10.1038/ngeo2376

Kay, J. E., and A. Gettelman. "Cloud Influence on and Response to Seasonal Arctic Sea Ice Loss." *Jgr* 114, no. D18204 (2009): 10.029/2009JD011773

Bogenschutz, P., A. Gettelman, H. Morrison, V E Larson, C Craig, D P Schanen, Higher Order Turbulence Closure and Its Impact on Climate Simulations in the Community Atmosphere Model, 26:23, 9655-9676, 10.1175/JCLI-D-13-00075.1, 2013

Neale, Richard B., C. C. Chen, A. Gettelman, P. H. Lauritzen, S. Park, D. L. Williamson, A. J. Conley et al. "Description of the NCAR community atmosphere model (CAM 5.0)." NCAR Tech. Note NCAR/TN-486+ STR (2010).

Synergistic Activities

- Co-Chair, Community Earth System Model, Whole Atmosphere Community Climate Model Working Group, 2013-2018
- AGU Ascent Award, 2015
- DOE Atmospheric System Research, User Executive Committee Member (2015-2019)
- Lead Author for SPARC Chemistry Climate Model Assessment UT/LS Chapter, 2007-2010
- Steering Committee, SPARC-IGAC Atmospheric Chemistry and Climate Initiative 2007-present

Marco Giovanni Giometto

Assistant Professor, Department of Civil Engineering and Engineering Mechanics
Columbia University
610 SW Mudd Building, 500 West 120th Street, New York, NY 10027
(212) 853-1799
marco.giometto@columbia.edu

Professional Preparation

University of Padova, Civil Engineering, BS, 2007
University of Padova, Civil Engineering, MS, 2010
Braunschweig University, Civil Engineering, PhD, 2014
École Polytechnique Fédérale de Lausanne, Mechanical Engineering, PhD, 2016

Appointments

Assistant Professor, Civil Eng. And Eng. Mechanics, Columbia University, January 2018 to present
Research Scientist, Computational Fluid Dynamics team, Amazon Prime Air, May 2018 to present
Postdoctoral Fellow, Stanford University, 2017
Postdoctoral Fellow, University of British Columbia, 2016-2017

Publications

FIVE PUBLICATIONS MOST CLOSELY RELATED

1. Giometto M. G., Christen A., Egli P. E., Schmid M. F., Tooke R., Coops N. C., Parlange M. B., Effects of urban trees on mean wind, turbulence and momentum exchange within and above a realistic urban canopy. In *Adv. Water Resour.*, 2018, 106, 154–168
2. Giometto M. G., Christen A., Meneveau C., Fang J., Krafczyk M., Parlange M. B., Spatial characteristics of roughness sublayer mean flow and turbulence over a realistic urban surface. In *Boundary-Layer Meteorol.*, 2016, 160, 425–452
3. Momen, M., Bou-Zeid, E., Parlange, M. B., Giometto, M. G., Modulation of Mean Wind and Turbulence in the Atmospheric Boundary Layer by Baroclinicity, *J. Atmos. Sci.*, 2018, 75, 3797–3821
4. Margairaz F., Giometto M. G., Parlange M. B., Calaf M., Comparison of dealiasing schemes in large-eddy simulation of neutrally-stratified atmospheric boundary-layer type flows. In *Geosci. Model Dev. Discuss.*, 11, 4069–4084
5. Giometto M. G., Katul G. G., Fang J., and Parlange M. B., Direct numerical simulation of slope flows up to Grashof number $Gr = 2^{11}$. In *J. Fluid Mech.*, 2017, 829, 589–620

FIVE FURTHER PUBLICATIONS

6. Giometto M. G., Lozano-Durán A., Park G.I., and Moin P., Three-dimensional transient channel flow at moderate Reynolds numbers: analysis and wall modeling. In *Ann. Res. Brief, Center for Turbulence Research*, 2017, 193-205
7. Giometto M. G., Grandi R., Fang J., Monkewitz P. A. and Parlange M. B., Katabatic flow: A closed-form solution with spatially-varying eddy diffusivities. In *Boundary-Layer Meteorol.*, 2017, 162, 307–317
8. Lenz S., Krafczyk M., Geier M., Schonherr M., Pasquali A., Giometto M. G., and Christen A. Towards real-time Simulation of Turbulent Wind Flows in Urban Areas with the Cumulant Lattice Boltzmann Method on a GPGPU, *J. Wind Eng. Ind. Aerod.*, 2019, 189, 151-162

Synergistic Activities

- Currently developing an a new graduate level class in turbulence at Columbia University.
- Currently mentoring five PhD students, one Postdoc, and two master student, all working on topics related to atmospheric boundary-layer turbulence.

- Journal reviewer for: Journal of Fluid Mechanics, Boundary-Layer Meteorology; Journal of Geophysical Research; Environmental Fluid Mechanics; Theoretical and Applied Climatology; Journal of Urban Climate; Agricultural and Forest Meteorology; Geophysical Model Development.
- Organized a symposium at the World Congress in Computational Mechanics (WCCM2018) with focus on boundary-layer turbulence
- Has chaired and is going to chair sessions at International Conference on Urban Climate (ICUC).

Lisa Goddard
Director and Senior Research Scientist, International Research Institute for Climate and Society
Columbia University
61 Route 9W, Monell Building, Palisades, NY 10964-1000
(845) 680-4430
goddard@iri.columbia.edu

(a) Professional Preparation

UC Berkeley	Berkeley, CA	Physics	BS 1988
Princeton University	Princeton, NJ	Atmosphere & Ocean Sciences	PhD 1996
Scripps Institute of Oceanography	La Jolla, CA	Climate Science	1995-1997

(b) Appointments

2012-present Director, IRI/ Columbia University
2013-present Senior Research Scientist, IRI/ Columbia University
2003-2013 Research Scientist, IRI / Columbia University
2007-present Adjunct Associate Professor, Department of Earth & Environmental Sciences, Columbia University
2004-2006 Lecturer, Department of Earth & Environmental Sciences, Columbia University
2000-2002 Associate Research Scientist, IRI / Columbia University
1997-1999 Assistant Project Scientist, IRI / Scripps Institution of Oceanography
1998 Lecturer, U.C. San Diego/Scripps Institution of Oceanography

(c) Publications

(i) List up to five (5) publications/products most closely related to the proposed project

Goddard, L., A. Kumar, A. Solomon, D. Smith, G. Boer, P. Gonzalez, V. Kharin, W. Merryfield, C. Deser and S. J. Mason, et al., 2013. A verification framework for interannual-to-decadal prediction experiments. *Clim. Dyn.* DOI: 10.1007/s00382-012-1481-2.

Gonzalez, P., L. Goddard, and A. Greene, 2012. Twentieth-century precipitation in southeastern South America: Comparison of gridded and station data. *Int'l J. Climatol.*, DOI: 10.1002/joc.3633

Goddard, L., B. Kirtman, J. Hurrell, J. Murphy, T. Stockdale, C. Vera, 2012. Two Timescales for the Price of One (almost). *Bull. Amer. Meteor. Soc.*, 93, 621–629. (doi: <http://dx.doi.org/10.1175/BAMS-D-11-00220.1>).

Block, P. and L. Goddard, 2012. Statistical and dynamical climate predictions to guide water resources in Ethiopia, *J. Water Res. Plan. & Mgmt.*, 138(3), 287-298, doi:10.1061/(ASCE)WR.1943-5452.0000181.

Fernandes, K., W. Baethgen, S. Bernardes, R. DeFries, D.G. DeWitt, L. Goddard, W. Lavado, D.E. Lee, C. Padoch, M. Pinedo-Vasquez, M. Uriarte, 2011. North Tropical Atlantic influence on Western Amazon fire season variability. *Geophys. Res. Lett.*, 38, L12701, doi:10.1029/2011GL047392.

(ii) List up to five (5) other significant publications/products, whether or not related to the proposed project.

Greene, A.M., L. Goddard and R. Cousin, 2011. Web tool deconstructs variability in twentieth-century climate, *Eos Trans. AGU*, 92(45), 397, doi:10.1029/2011EO450001

Mason, S.J., M.K. Tippett, A.P. Weigel, L. Goddard, B. Rajaratnam, 2011. Reply to “Comment on ‘Conditional Exceedance Probabilities’”, *Mon. Wea. Rev.* 139, 3325-3327.

Mehta, V., G. Meehl, L. Goddard, J. Knight, A. Kumar, M. Latif, T. Lee, A. Rosati, D. Stammer, 2011. Decadal Climate Predictability and Prediction: Where Are We? *Bull. Amer. Meteor. Soc.*, 92, 637-640, doi: <http://dx.doi.org/10.1175/2010BAMS3025.1>

Solomon, A., L. Goddard, A. Kumar, J. Carton, C. Deser, I. Fukumori, A. Greene, G. Hegerl, B. Kirtman, Y. Kushnir, M. Newman, D. Smith, D. Vimont, T. Delworth, J. Meehl, and T. Stockdale, 2010. Distinguishing the roles of natural and anthropogenically forced decadal climate variability: Implications for prediction. *Bull. Amer. Meteor. Soc.*, doi: 10.1175/2010BAMS2962.1.

Barnston, A.G., S. Li, S.J. Mason, D.G. DeWitt, L. Goddard, X. Gong, 2010. Verification of the First 11 Years of IRI's Seasonal Climate Forecasts. *J. App. Met. and Clim.*, 49: 493-520.

(d) Synergistic Activities

- Marquis Who's Who in America and/or of American Women (2004 – Present)
- Stanley Jackson Award for Best Published Paper Contributing to the Atmospheric & Oceanic Sciences in Southern Africa during 2002, for "Statistical Recalibration of GCM Forecasts over Southern Africa Using Model Output Statistics" by W.A. Landman and L. Goddard, *J. Climate*, 15, 2038-2055, 2002. Awarded by the South African Society of Atmospheric Science.
- In 2007, I developed the Postdocs Applying Climate Expertise (PACE) program, a national postdoctoral program administered by NOAA that explicitly links recent climate PhDs with decision-making institutions.
- Co-chair of International CLIVAR under the World Climate Research Programme.

HELGA DO ROSARIO GOMES - Biographical Sketch

Lamont Doherty Earth Observatory of Columbia University
E-mail helga@ldeo.columbia.edu
Ph: 845-365-8443, FAX: 845-365-8150
Weblink: <http://helgagomes.com/>

A. PROFESSIONAL PREPARATION:

Institution	Major	Degree & Year
Bombay University, India	Chemistry	B.Sc., 1979
Bombay University, India	Microbiology	M.Sc, 1982
Bombay University, India	Oceanography	Ph.D, 1987

B. ACADEMIC/ PROFESSIONAL APPOINTMENTS

Research Scientist, Lamont Doherty Earth Observatory Oct. 2010 onwards
Visiting Scientist Nagoya University (Sept-Dec. 2015)
Research Scientist, Bigelow Laboratory for Ocean Sciences, Aug 2009 to Oct. 2010
Sr. Research Associate, Bigelow Laboratory for Ocean Sciences, 1999 -2009
Sr. Research Associate, National Institute of Oceanography (NIO), 1988 -1992
Post-Doctoral Fellow, NIO, 1988-1992
Post-Doctoral Fellow Nagoya University, Japan, 1992-1999
Post-Doctoral Fellow, Soka University, Tokyo, Japan, 1999-2000

C. FIVE PRODUCTS MOST CLOSELY RELATED TO PROPOSAL

- Gomes, H. do R.**, J. I. Goes, K. Al-Hashimi, L. Al-Kharusi (in press) Global Distribution and Range Expansion of Green Vs Red *Noctiluca Scintillans*. In: Dinoflagellates: Morphology, Life History, and Ecological Significance, Ed. D. Subba Rao, Nova Publishers
- Gomes, H. do R.**, K. McKee, A. Mile, S. Thondapu, K. Al-Hashmi, X. Jiang, J. I. Goes (2018) Influence of light availability and prey type on the growth and photo-physiological rates of the mixotroph *Noctiluca scintillans* *Frontiers in Marine Science (Marine Ecosystem Ecology)* <https://doi.org/10.3389/fmars.2018.00374>
- Goes, J.I., **Gomes, H. do R.**, Al-Hashimi, K., and Buranapratheprat, A. (2018). Ecological Drivers of Green *Noctiluca* Blooms in Two Monsoonal-Driven Ecosystems. In Global Ecology and Oceanography of Harmful Algal Blooms, P.M. Glibert, E. Berdalet, M.A. Burford, G.C. Pitcher, and M. Zhou, eds. (Cham, Springer International Publishing), pp. 327-336.
- Gomes, H. do R.**, S. deRada, J. I. Goes, F. Chai (2016) Examining Features of Enhanced phytoplankton biomass in the Bay of Bengal using a Coupled Physical-Biological model. *Journal of Geophysical Research-Oceans*, doi: 10.1002/2015JC011508
- Gomes H. do R.**, Goes, J.I., Matondkar, S.G.P., Buskey, E.J., Basu, S., Parab, S., and Thoppil, P. (2014). Massive outbreaks of *Noctiluca scintillans* blooms in the Arabian Sea due to spread of hypoxia. *Nature Communications*, 5, doi: 10.1038/ncomms5862.

D. FIVE OTHER SIGNIFICANT PRODUCTS

- Gomes, H. do R.**, Xu, Q., Ishizaka, J., Carpenter, E.J., Yager, P.L., and Goes, J.I. (2018). The Influence of Riverine Nutrients in Niche Partitioning of Phytoplankton Communities—A Contrast Between the Amazon River Plume and the Changjiang (Yangtze) River Diluted Water of the East China Sea. *Frontiers in Marine Science*, 10.3389/fmars.2018.00374

- Xu, Q., C. Sukigara, C., J. I. Goes, **H. do. R. Gomes**, Y. Zhu, S. Wang, A. Shen, E. de R. Maure, T. Matsuno, W. Yuji, S. Yoo, J. Ishizaka (2018) Interannual changes in summer phytoplankton community composition in relation to water mass variability in the East China Sea, *J Oceanogr* 1-19, (2018). <https://doi.org/10.1007/s10872-018-0484-y>
- Goes, J. I. and **H. do. R. Gomes** (2016) An ecosystem in transition: the emergence of mixotrophy in the Arabian Sea. In “*Dual Perspectives in Oceanography*”. Glibert P and Kana, T (Editors), Springer International Publishing. DOI 10.1007/978-3-319-30259-1.
- Maúre, E. R., J. Ishizaka, C. Sukigara, Y. Mino, H. Aiki, T. Matsuno, J. I. Goes and **H. do R. Gomes** (2017) Mesoscale eddies control the timing of spring phytoplankton blooms: A case study in the Japan Sea. *Geophysical Research Letters*, 44, 11,115–124
- Goes, J. I., **H. do R. Gomes**, K. Selph and M. Landry (2016) Biological response of Costa Rica Dome phytoplankton to light, silicic acid and trace metals, *Journal of Plankton Research*, 38(2), 290-304. <https://doi.org/10.1002/2017GL074359>

E. SYNERGISTIC ACTIVITIES

1. Conducted a workshop at the Mumbai center of Columbia University (20th-22nd Feb 2019) titled ‘*Towards early detection and forecasting of hypoxic events, harmful algal bloom outbreaks and fish mortality events along the west coast of India*’ supported by Columbia University President’s Global Innovation Fund. This workshop brought together researchers working on water quality and harmful algal blooms in the waters off Mumbai and the rest of Maharashtra, India to establish ties and collaborative projects and to build databases of existing data.
2. Participation in 1) NSF’s Research Experience for Undergraduates 2) Lamont Doherty’s Summer of Science Research for High School students 3) Internships for Uncommon Charter High Schools, Brooklyn, NY for underrepresented students. Mentored 11 undergraduate 14 high school students in the past 5 years.
3. Trustee and Science Advisor for Goa Chitra, Goa, India, an anthropological museum that preserves and showcases the culture and lifestyle of the people of the west coast of India. Held a series of classes on Climate change and rising sea level for coastal communities of Goa.
4. Service in reviewing papers for 1) Science 2) Estuaries and Coasts 3) Deep-Sea Research 4) Journal of Geophysical Research - Oceans 5) Biogeosciences 6) Remote Sensing of Environment 7) Continental Shelf Research 8) Marine Ecology Progress Series 9) Environmental Monitoring and Assessment 10) Symbiosis 11) Water Research 12) Journal of Earth System Science 13) Oceanologia 14) Marine Biology Research 15) Progress in Oceanography 16) IEEE-Selected Topics in Applied Earth Observations and Remote Sensing.
5. Ph.D. dissertation committee of 2 Teachers College, Columbia University students 1) Jason Wu, ‘Assessing Bilingual Knowledge Organization in Secondary Science Classrooms’ (April, 2017) 2) Xiaoxin Lyu “Assessing In-service Secondary Science Teachers’ Views of Nature of Science and Competence in Understanding Scientific Argumentation about Socio-scientific Issues” (April, 2019)

BIOGRAPHICAL SKETCH

Joseph J. Hamman

A. Professional Preparation

University of Arizona	Tucson, AZ	Civil Engineering	BS 2007
University of Washington	Seattle, WA	Civil Engineering	MSc 2012
University of Washington	Seattle, WA	Civil Engineering	PhD 2016
Nat. Ctr. for Atmos. Res.	Boulder, CO	Hydrometeorology	Post-Doc 2018

B. Appointments

2018-current	Project Scientist, National Center for Atmospheric Research, Boulder, CO
2016-2018	Postdoctoral Fellow, National Center for Atmospheric Research, Boulder, CO
2013	Adjunct Professor, Seattle, Univ., Seattle, WA
2010-2016	Graduate Research Assistant, Univ. of Washington, Seattle, WA
2012-2014	Teaching Assistant, Univ. of Washington, Seattle, WA
2010-2014	Water Resource Specialist, Cardno TEC, Inc., Seattle, WA
2007-2009	Civil Engineer Designer II, Roth-Hill Engineering Partners, Bellevue, WA

C. Products

(i) Most Closely Related to the Proposed Project

1. Eynard-Bontemps, G., R. Abernathey, J.J. Hamman, A. Ponte, W. Rath, 2019: The Pangeo Big Data Ecosystem and its use at CNES. In P. Soille, S. Loekken, and S. Albani, *Proc. of the 2019 conference on Big Data from Space (BiDS'2019)*, 49-52. EUR 29660 EN, Publications Office of the European Union, Luxembourg. ISBN: 978-92-76-00034-1, doi:10.2760/848593.
2. Hamman, J. J., B. Nijssen, T. J. Bohn, D. R. Gergel, and Y. Mao, 2018: The Variable Infiltration Capacity Model, Version 5 (VIC-5): Infrastructure improvements for new applications and reproducibility. *Geoscientific Model Development*, doi:10.5194/gmd-11-3481-2018.
3. Hoyer, S., and J. Hamman, 2017: xarray: N-D labeled arrays and datasets in Python. *Journal of Open Research Software*, doi:10.5334/jors.148.
4. Hamman, J., B. Nijssen, A. Roberts, A. Craig, W. Maslowski, and R. Osinski, 2017: The Coastal Streamflow Flux in the Regional Arctic System Model. *Journal of Geophysical Research: Oceans*, doi:10.1002/2016JC012323.
5. Hamman, J., B. Nijssen, M. Brunke, J. Cassano, A. Craig, A. DuVivier, M. Hughes, D.P. Lettenmaier, W. Maslowski, R. Osinski, A. Roberts, and X. Zeng, 2016: Land surface climate in the Regional Arctic System Model. *Journal of Climate*, doi:10.1175/JCLI-D-15-0415.1.

(ii) Other Significant Products

6. Chegwidan, O., B. Nijssen, D. Rupp, J. Arnold, M. Clark, J. Hamman, S.C. Kao, Y. Mao, P. Mote, M. Pan, E. Pytlak, and M. Xiao, 2019: How do modeling decisions affect the spread among hydrologic climate change projections?. *Earth's Future*, doi:10.1029/2018EF001047.
7. Vano, J., M. Clark, J. Arnold, B. Nijssen, A. Wood, E. Gutmann, N. Addor, J. Hamman, F. Lehner, 2018: Dos and Don'ts for using climate change information for water resource planning and management, version 1.0: guidelines for study design. *Climate Services*, doi:10.1016/j.cliser.2018.07.002.
8. Brunke, M., J. Cassano, N. Dawson, A. DuVivier, W. Gutowski, J. Hamman, J., W. Maslowski, B. Nijssen, J. Renteria, A. Roberts, and X. Zeng, 2018: Evaluation of the atmosphere-land-ocean-sea ice interface processes in the Regional Arctic System Model Version 1 (RASMI) using local

and globally gridded observations. *Geoscientific Model Development*, doi:10.5194/gmd-11-4817-2018.

9. Cassano, J., A. DuVivier, A. Roberts, M. Hughes, M. Seefeldt, M. Brunke, A. Craig, B. Fisel, W. Gutowski, J. Hamman, M. Higgins, W. Maslowski, B. Nijssen, R. Osinski, X. Zeng, 2017: Near surface atmospheric climate of the Regional Arctic System Model (RASM). *Journal of Climate*, doi:10.1175/JCLI-D-15-0775.1.
10. Hamman, J., A. Hamlet, S. Lee, E. Grossman, and R. Fuller, 2016: Combined Effects of Projected Sea Level Rise, Storm Surge, and Peak River Flows on Water Levels in the Skagit Floodplain. *Northwest Science*, doi:10.3955/046.090.0106.

D. Synergistic Activities

1. Steering Council Member for the Pangeo Project
2. Governance Council Member and Core Developer for the Xarray Project
3. Peer Reviewer for Journal of Hydrometeorology
4. Peer Reviewer for Geophysical Model Development
5. Peer Reviewer Environmental Modelling and Software

Lucas N. Joppa
Chief Environmental Officer, Microsoft, Inc.
Redmond, Washington
(425) 326-8376
lujoppa@microsoft.com

(a) Professional Preparation

University of Wisconsin	Madison, WI	Wildlife Ecology	BS, 2004
Duke University	Durham, NC	Environmental Science	PhD, 2009

(b) Appointments

Chief Environmental Officer, Microsoft, Inc., 2018-Present
Chief Environmental Scientist, Microsoft, Inc., 2017-2018
Scientist, Microsoft Research, 2009-2016
Co-Founder, EarthAudit LLC, 2008-2009

(c) Publications

Bondi E, Fang F, Hamilton M, Kar D, Dmello D, Noronha V, Choi J, Hannaford R, Iyer A, **Joppa LN**, Tambe M, Nevatia R [2018]. Automatic Detection of Poachers and Wildlife with UAVs. *Artificial Intelligence and Conservation (Book Chapter)*.

Wang Y, Shi ZR, Yu L, Yi Wu, Singh R, **Joppa LN**, Fang F [2018]. Deep Reinforcement Learning for Green Security Games with Real-Time Information. *arXiv preprint arXiv:1811.02483*

Yu L, Wu Y, Singh R, **Joppa LN**, Fang F [2018]. Deep Reinforcement Learning for Green Security Game with Online Information. *Workshops at the Thirty-Second AAAI Conference on Artificial Intelligence*

Smith R, Bennun L, Brooks TM, Butchart SHM, Cuttelod A, Di Marco M, Ferrier S, Fishpool L, **Joppa LN**, Juffe-Bignoli D, Knight AT, Lamoreux JF, Langhammer P, Possingham HP, Rondinini C, Visconti P, Watson JEM, Woodley S, Boitani L, Burgess NB, De Silva N, Dudley N, Fivaz F, Game ET, Groves C, Lötter M, McGowan J, Plumptre AJ, Rebelo AG, Rodriguez J:P, Scaramuzza C [2018]. Synergies between the key biodiversity area and systematic conservation planning approaches. *Conservation Letters* e12625

Valverde S, Montoya J, **Joppa LN**, Sole, R. [2018] Is nestedness in mutualistic networks an evolutionary spandrel? *Nature Ecology and Evolution*. 2(1) 94-98.

Five other products.

Joppa, LN [2017]. The case for technology investments in the environment. *Nature* 552 (7685), 325
Fang F, Nguyen TH, Sinha A, Gholami S, Plumptre A, **Joppa LN**, Tambe M, Driciru M, Wanyama F, Rwetsiba A, Critchlow R, Beale CM [2017]. Predicting poaching for wildlife protection. *IBM Journal of Research and Development* 61 (6), 3: 1-3: 12

Berger-Wolf T, Rubenstein D, Stewart C, Holmberg J, Parham J, Menon S, Crall J, Van Oast J, Kiciman E, **Joppa LN** [2017]. Wildbook: Crowdsourcing, computer vision, and data science for conservation. *arXiv preprint arXiv:1710.08880*

Jackson ST, Duke CS, Hampton SE, Jacobs KL, **Joppa LN**, Kassam KA, Mooney HA, Ogden LA, Ruckelshaus M, Shogren JF [2016] Toward a national, sustained US Ecosystem Assessment. *Science* 354(6314) 838-839.

Joppa, LN, James W Boyd, Clifford S Duke, Stephanie Hampton, Stephen T Jackson, Katharine L Jacobs, KA Kassam, Harold A Mooney, Laura A Ogden, Mary Ruckelshaus, and others, [2016] Government: Plan for ecosystem services. *Science* 351(6277) 1037

Joppa, LN [2016] Technology for nature conservation – an industry perspective. *AMBIO* 44(4) 522-526

(d) Synergistic Activities

- Artificial Intelligence Committee Member, American Meteorological Society
- Associate Editor in Chief, EcoSphere
- Member, United States Federal Advisory Committee for the Sustained National Climate Assessment (2016-2017)
- Advisor on Science and Innovation, United Nations Environmental Program-World Conservation Monitoring Center (2012-Present)
- Chair of Advisory Board, National Socio-Environmental Synthesis Center (2016-Present)

BIOGRAPHICAL SKETCH

NAME: Kaiser, Gail

POSITION TITLE & INSTITUTION: Professor, Columbia University

A. PROFESSIONAL PREPARATION

INSTITUTION	LOCATION	MAJOR	DEGREE	YEAR
Massachusetts Institute of Technology	Cambridge, MA	Computer Science and Engineering	ScB	1979
Carnegie Mellon University	Pittsburgh, PA	Computer Science	MS	1980
Carnegie Mellon University	Pittsburgh, PA	Computer Science	PhD	1985

B. APPOINTMENTS

1998 -	Professor, Columbia University, Department of Computer Science, New York, NY
2005 - 2007	Adjunct Senior Research Scientist, Columbia University, Center for Computational Learning Systems, New York, NY
2000 - 2001	Strategic Technology Research Advisor, Activium, New York, NY
2000 - 2000	Academic Visitor, Telcordia Technologies Applied Research, Piscataway, NJ
1990 - 1997	Associate Professor, Columbia University, Department of Computer Science, New York, NY
1990 - 1990	Academic Visitor, IBM Watson Research Center, Yorktown Heights, NY
1988 - 1988	Academic Visitor, IBM Watson Research Center, Yorktown Heights, NJ
1986 - 1986	Visiting Computer Scientist, Carnegie Mellon University, Software Engineering Institute, Pittsburgh, PA
1985 - 1989	Assistant Professor, Columbia University, Department of Computer Science, New York, NY

C. PUBLICATIONS

Publications Most Closely Related to the Proposed Project

1. Yuchi Tian, Ziyuan Zhong, Vicente Ordonez, Gail Kaiser and Baishakhi Ray. Testing DNN Image Classifier for Confusion & Bias Errors. To appear in *42nd International Conference on Software Engineering (ICSE)*, May 2020, Seoul, South Korea. Pre-print at <https://arxiv.org/abs/1905.07831>.
2. Xie X, Ho JWK, Murphy C, Kaiser G, Xu B, Chen TY. Testing and Validating Machine Learning Classifiers by Metamorphic Testing. *Journal of Systems and Software*, Elsevier, 84(4):544-558, 2011 April. <https://doi.org/10.1016/j.jss.2010.11.920>.
3. Christian Murphy, M. S. Raunak, Andrew King, Sanjian Chen, Christopher Imbriano, Gail Kaiser, Insup Lee, Oleg Sokolsky, Lori Clarke, Leon Osterweil. On Effective Testing of Health Care Simulation Software. *3rd International Workshop on Software Engineering in Health Care (SEHC)*, May 2011, pp. 40-47. <http://dl.acm.org/citation.cfm?id=1988003>.
4. Christian Murphy, Kuang Shen and Gail Kaiser. Automatic System Testing of Programs without Test Oracles. *ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA)*, July 2009, pp. 189-200. <https://doi.org/10.1145/1572272.1572295>.
5. Christian Murphy, Kuang Shen and Gail Kaiser. Using JML Runtime Assertion Checking to Perform Metamorphic Testing in Applications without Test Oracles. *2nd IEEE International*

Conference on Software Testing, Verification and Validation (ICST), April 2009, pp. 436-445. <http://dx.doi.org/10.1109/ICST.2009.19>.

Other Significant Publications, Whether or Not Related to the Proposed Project

1. Suhit Gupta, Gail Kaiser, David Neistadt and Peter Grimm. DOM-Based Content Extraction of HTML Documents. *12th International World Wide Web Conference (WWW)*, May 2003, pp. 207-214. <http://doi.acm.org/10.1145/775152.775182>.
2. Gail E. Kaiser, Stephen E. Dossick, Wenyu Jiang and Jack Jingshuang Yang. An Architecture for WWW-based Hypercode Environments. *19th International Conference on Software Engineering: Pulling Together*, May 1997, pp. 3-12. <http://doi.acm.org/10.1145/253228.253231>.
3. Yoelle S. Maarek, Daniel M. Berry and Gail E. Kaiser. An Information Retrieval Approach for Automatically Constructing Software Libraries. *IEEE Transactions on Software Engineering (TSE)*, 17(8):800-813, August 1991. <http://dx.doi.org/10.1109/32.83915>.
4. Calton Pu, Gail E. Kaiser and Norman Hutchinson. Split-Transactions for Open-Ended Activities. *14th International Conference on Very Large Data Bases (VLDB)*, August 1988, pp. 26-37. <https://pdfs.semanticscholar.org/137b/8467ada9b9edc8efc2f51ce87a7b7981b938.pdf>.
5. Gail E. Kaiser, Peter H. Feiler and Steven S. Popovich. Intelligent Assistance for Software Development and Maintenance. *IEEE Software*, 5(3):40-49, May 1988. <http://dx.doi.org/10.1109/52.2023>.

D. SYNERGISTIC ACTIVITIES

1. Invited attendee at NSF-sponsored workshop on Deep Learning and Software Engineering (SE4ML), 2019.
2. Program Committees for 2020 International Conference on Software Engineering; 2020 Programming Language Design and Implementation (External Review Committee); 2019 OOPSLA; 2019 Late Breaking Results track at IEEE/ACM International Conference on Automated Software Engineering; 2019, 2018, 2017, 2016 International Workshop on Metamorphic Testing.
3. Bergen County New Jersey Technical Schools Computer Science Advisory Board, 2016-2018.
4. Invited Panelist, "Future directions and open problems", *Future of Software Engineering symposium* sponsored by NSF and Microsoft Research, 2013.
5. Columbia University Department of Computer Science Director of Graduate Studies (PhD Chair) since 1997; Data Science Institute PhD Specialization Committee since 2018; Track advisor for terminal-MS Software Systems track since 2004; Track advisor for terminal-MS Machine Learning track since 2018.

Martha Kim
Associate Professor,
Department of Computer Science
500 West 120th Street, NY, NY 10027
(212) 939-7094
martha@cs.columbia.edu

a. Professional Preparation

Harvard University, Cambridge, MA	Computer Science	A.B.	2002
University of Lugano, Lugano, Switzerland	Embedded Systems	M.E.	2003
University of Washington, Seattle, WA	Comp. Sci. & Engr.	M.S.	2005
University of Washington, Seattle, WA	Comp. Sci. & Engr.	Ph.D.	2008

b. Appointments

2018-present	Visiting Faculty Researcher, Google
2015-present	Associate Professor, Department of Computer Science, Columbia University, New York, NY
2009-2014	Assistant Professor, Department of Computer Science, Columbia University, New York, NY
2003-2008	Graduate Research Assistant, University of Washington, Seattle, WA

c. Products

PRODUCTS MOST CLOSELY RELATED

A. Lottarini, J. P. Cerqueira, T. Repetti, S. A. Edwards, K. A. Ross, M. Seok, M. A. Kim. Master of None Acceleration: A Comparison of Accelerator Architectures for Analytical Query Processing. In International Symposium on Computer Architecture (ISCA), 2019.

J. P. Cerqueira, T. Repetti, M. A. Kim, M. Seok. Catena: A 0.5-V Sub-0.4-mW 16-Core Spatial Array Accelerator for Mobile and Embedded Computing. In Symposium on VLSI Circuits (VLSI), 2019.

T. J. Repetti, J. P. Cerqueira, M. A. Kim, M. Seok. Pipelining a Triggered Processing Element. In International Symposium on Microarchitecture (MICRO), November 2017.

S. A. Edwards, R. Townsend, M. A. Kim. Compositional Dataflow Circuits. In ACM-IEEE International Conference on Formal Methods and Models for System Design (MEMOCODE), November 2017.

L. Wu, A. Lottarini, T. Paine, M. A. Kim, K. A. Ross. Q100: The Architecture and Design of a Database Processing Unit. In the *International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)*, March 2014.

OTHER SIGNIFICANT PRODUCTS

A. Lottarini, A. Ramirez, J. Coburn, M. A. Kim, P. Ranganathan, D. Stodolsky, M. Wachsler. vbench: Benchmarking Video Transcoding in the Cloud. In Architectural Support for Programming Languages and Operating Systems (ASPLOS), 2018.

L. Wu, O. Polychroniou, R. J. Barker, M. A. Kim, K. A. Ross. Energy Analysis of Hardware and Software Range Partitioning. In *ACM Transactions on Computer Systems (TOCS)*, 32(3): pages 8:1 – 8:24, August 2014.

M. Kambadur, M. A. Kim. An Experimental Survey of Energy Management Across the Stack. In the *International Conference on Object-Oriented Programming, Systems, Languages and Applications (OOPSLA)*, October 2014.

L. Wu, R. J. Barker, M. A. Kim, K. A. Ross. Hardware Partitioning for Big Data Analytics. In *IEEE Micro: Top Picks from Computer Architecture Conferences (Top Picks)*, 34(3): pages 109 – 119, May/June 2014.

M. Kambadur, K. Tang, M. A. Kim. Collection, Analysis, and Uses of Parallel Block Vectors. In *IEEE Micro: Top Picks from Computer Architecture Conferences (Top Picks)*, 33(3): pages 86 – 94, May/June 2013.

d. Synergistic Activities.

1. Since 2016, I have sat on the advisory board for Bit By Bit, a conference for high school girls, devoted to bringing together girls interested in computer science. During the conference I often speak on or moderate panels.
2. Designated “early adopter” of NSF/IEEE-TCPP Curriculum Initiative on Parallel and Distributed Computing – Core Topics for Undergraduates
3. Co-organized Panel for Grace Hopper Conference 2010 “Beyond Your Technical Skills: What Makes a Successful Researcher”
4. Mentored two CRA-CREU project students. The goal of the CREU initiative is to increase the numbers of women and minorities who continue on to graduate school in computer science, engineering, and allied disciplines.
5. Instructor for “Women, Computing, and Collaborating” outreach course at the University of Washington in 2006-2007.

Jonathan Kingslake

Assistant Professor of Earth and Environmental Sciences
Lamont-Doherty Earth Observatory, Columbia University
Oceanography Room 109A, 61 Route 9W
Palisades, NY 10647
(845) 365-8397
j.kingslake@columbia.edu

a. Professional Preparation

University of York, Yorkshire, UK	Physics	BSc 2009
University of Sheffield, Yorkshire, UK.	Glaciology	PhD, 2013
British Antarctic Survey, Cambridge, UK	Glacier Geophysics	Postdoc, 2013-2015

b. Appointments

2016- , Assistant Professor, Department of Earth and Environmental Sciences, Columbia University
2013-2015, Glaciologist/geophysicist, British Antarctic Survey, Cambridge, UK.

c. Products

(i) Five most closely related to proposal project

Kingslake, J., Ely, J.C., Das, I. & Bell, R.E. (2017) Widespread movement of meltwater onto and across Antarctic ice shelves. *Nature*, 544(7650), 349-352.

Kingslake, J., R.C.H. Hindmarsh, G. Aðalgeirsdóttir, H. Conway, H.F.J. Corr, F. Gillet-Chaulet, C. Martín, E.C. King, R. Mulvaney & H.D. Pritchard (2014) Full-depth englacial vertical ice-sheet velocities measured using phase-sensitive radar. *J. Geophys. Res. Earth Surf.*, 119, 2604–2618.

Bell, R.E., W. Chu, J. Kingslake, I. Das, M. Tedesco, K.J. Tinto, C.J. Zappa, M. Frezzotti, A. Boghosian & W.S. Lee (2017) Antarctic ice shelf potentially stabilized by export of meltwater in surface river. *Nature*, 544(7650), 344-348.

Brisbourne, A.M., C. Martín, A.M. Smith, A.F. Baird, J.M. Kendall & J. Kingslake (2019) Constraining Recent Ice Flow History at Korff Ice Rise, West Antarctica, Using Radar and Seismic Measurements of Ice Fabric. *Journal of Geophysical Research: Earth Surface*. Published online: Jan 7th 2019,

Kingslake, J., R.P. Scherer, T. Albrecht, J. Coenen, R.D. Powell, R. Reese, N.D. Stansell, S. Tulaczyk, M.G. Wearing & P.L. Whitehouse (2018) Extensive retreat and re-advance of the West Antarctic Ice Sheet during the Holocene. *Nature*, 558(7710), 430–434.

(ii) Five others

Kingslake, J., C. Martín, R.J. Arthern, H.F. Corr and E.C. King (2016) Ice-flow reorganization in West Antarctica 2.5 kyr ago dated using radar-derived englacial flow velocities. *Geophys. Res. Lett.*, 43(17), 9103-9112.

Kingslake, J. (2015) Chaotic dynamics of a glaciohydraulic model. *J. Glaciol.*, 61(227), 493.

Kingslake, J. & F. Ng (2013) Modelling the coupling of flood discharge with glacier flow during jökulhlaups. *Ann. Glaciol.*, 54(63), 25-31.

Kingslake, J. and F. Ng (2013) Quantifying the predictability of the timing of jökulhlaups from Merzbacher Lake, Kyrgyzstan. *J. Glaciol.*, 59(217), 805-818.

Kingslake, J., F. Ng, & A. Sole (2015) Modelling channelized surface drainage of supraglacial lakes. *J. Glaciol.*, 61(225), 185-199.

d. Synergistic Activities

- Lamont Open House, a large outreach event held each fall on the Lamont campus that attracts around 4000 attendees of all ages. In 2016, 2017 and 2018 we developed and ran a complimentary set of interactive activities including an augmented reality map of Antarctica (using the Microsoft Hololens), large quantities of “glacier goo” and a 3D-mouse Google Earth tour. We call this exhibit *Ice Flows*.
- Women in STEM, an event held at the Intrepid Air and Space museum in New York City (2016, 2018), we hosted part of our *Ice Flows* exhibit along with a range of other cryosphere-related exhibits.
- Columbia Alumni Association Family STEM day (May, 2018) hosted *Ice Flows* at this event which attracted more than 600 children plus their parents.
- Regular career speaker: e.g. The Hudson Community Sailing Club, New York City (2016), Lycée Français High School, NYC (2016, 2017) and New York Explorer’s Club (2016).
- Hosting undergraduate interns working in my group with ice-penetrating radar data and Antarctica. For many this is their first experience of a research environment (3 in 2016, 2 in 2017, 1 in 2019).

SAMORY KPOTUFE

(+1) 312 928 9756
skk2175@columbia.edu

Department of Statistics, Columbia University
New York, NY, USA

(a) Professional Preparation

- University of Denver. Denver, Colorado, USA. Mathematics, Computer Science
B.S. (June 1999).
- University of California, San Diego. San Diego, California, USA. Computer Science
P.h.D. (Sept. 2010).
- Max Planck Institute for Intelligent Systems. Tuebingen, Germany Machine Learning
(Postdoc. 2010 to 2012).

(b) Appointments

- Assistant Professor Department of Statistics, Columbia University (Jan. 2019 - Present).
- Assistant Professor ORFE, Princeton University (Sept. 2014 - Jan. 2019).
- Assistant Research Professor Toyota Technological Institute-Chicago (Sept. 2012-Sept 2014).

(c) Publications

- (i) Most closely related publications:
 - Heinrich Jiang, S. Kpotufe. *Modal-set estimation with an application to clustering*. Artificial Intelligence and Statistics, (AISTATS) 2017.
 - K. Chaudhuri, S. Dasgupta, S. Kpotufe, U. von Luxburg. *Consistent procedures for cluster tree estimation and pruning*. IEEE Transactions on Information Theory, 2014.
 - S. Kpotufe, E. Sgouritsa, D. Janzing, B. Schoelkopf. *Consistency of causal inference under the additive noise model*. International Conference on Machine Learning, (ICML) 2014.
 - S. Kpotufe, F. Orabona. *Regression-tree Tuning in a Streaming Setting*. Advances in Neural Information Processing Systems (NIPS). 2013.
 - Eric Flynn, Samory Kpotufe, et al.. *SHMTools: a new embeddable software package for SHM applications*. SPIE Smart Structures and Materials+ Nondestructive Evaluation and Health Monitoring. 2010.
- (ii) Other significant publications:
 - A. Locatelli, A. Carpentier, S. Kpotufe. *Adaptivity to Noise Parameters in Nonparametric Active Learning*. Conference On Learning Theory (COLT). 2017.
 - S. Kpotufe, A. Boularias, T. Schultz, K. Kim. *Gradient Weights improve Regression and Classification*. Journal of Machine Learning Research (JMLR). 2016.
 - K. Chaudhuri, S. Dasgupta, S. Kpotufe, U. von Luxburg. *Consistent procedures for cluster tree estimation and pruning*. IEEE Transactions on Information Theory, 2014.
 - S. Kpotufe, E. Sgouritsa, D. Janzing, B. Schoelkopf. *Consistency of causal inference under the additive noise model*. International Conference on Machine Learning, 2014.
 - N. Verma, S. Kpotufe, S. Dasgupta. *Which spatial partition trees are adaptive to intrinsic dimension?* Uncertainty in Artificial Intelligence (UAI). 2009.

(d) Synergistic Activities

- Senior Committees:
 - Editorial Board Member, Journal of Machine Learning Research.
 - Senior committee member at COLT 2015, 2016, 2017, NIPS 2015, 2016, 2019, AISTATS 2017.

- Workshop Co-Chair:
DALI workshop on Machine Learning Theory (2019), NIPS workshop on Modern Nonparametrics (2013, 2014, 2016).
- Honors:
Received many honors (best student paper, plenary presentations) from top Machine Learning conferences over the last six years, and the Bell Labs First Prize (2018).
- Awards:
NSF Grant id. 1739809, (co-PI with N. Feamster and A. Narayanan), for Detecting and Controlling Unwanted Data Flows in the Internet of Things (2018).
- K-12 teaching:
Taught K-12 students, Program in Algorithmic and Combinatorial Thinking, summer 2015.

Vipin Kumar

Regents Professor and William Norris Chair in Large Scale Computing
Department of Computer Science and Engineering, University of Minnesota
612-624-8023
kumar@cs.umn.edu

Professional Preparation

Indian Institute of Technology, Roorkee, India	Electronics & Comm. Eng.	BE, 1977
Philips International Institute, Netherlands	Electrical Engineering	ME, 1979
University of Maryland, College Park, MD	Computer Science	PhD, 1982

Appointments

2015 – Present, Regents Professor and William Norris Chair in Large Scale Computing, Department of Computer Science and Engineering, University of Minnesota
2005 – 2015, William Norris Professor and Head, Department of Computer Science and Engineering, University of Minnesota
1998 – 2005, Director, Army High Performance Computing Research Center, University of Minnesota
1998-99, Director, Graduate Program in Scientific Computation, University of Minnesota
1995 – Present, Professor, University of Minnesota
1989-95, Associate Professor, University of Minnesota
1983-89, Assistant Professor, University of Texas at Austin

Products (i) closely related to proposal

A. Karpatne, G. Atluri, J. Faghmous, M. Steinbach, A. Banerjee, A. Ganguly, S. Shekhar, N. Samatova, V. Kumar, “Theory-guided data science: A new paradigm for scientific discovery IEEE Transactions on Knowledge and Data Engineering 29, no. 10 (2017): 2318-2331.

Jia, X., Willard, J., Karpatne, A., Read, J., Zwart, J., Steinbach, M., & Kumar, V. Physics Guided RNNs for Modeling Dynamical Systems: A Case Study in Simulating Lake Temperature Profiles, 2019 SIAM International Conference on Data Mining, Calgary, Alberta, Canada, 2019.

A. Karpatne, Z. Jiang, R. Vatsavai, S. Shekhar, V. Kumar, “Monitoring Land Cover Changes using Remote Sensing Data: A Machine Learning Perspective,” IEEE Geoscience and Remote Sensing Magazine, 4(2), June 2016.

J. Faghmous and V. Kumar, “A Big Data Guide to Understanding Climate Change: The Case for Theory-Guided Data Science”. Big Data 2(3), 2014.

Jordan S. Read, Xiaowei Jia, Jared Willard², Alison P. Appling, Jacob A. Zwart, Samantha K. Oliver, Anuj Karpatne, Gretchen J.A. Hansen, Paul C. Hanson, William Watkins, Michael Steinbach, Vipin Kumar. Process-guided deep learning predictions of lake water temperature, Water Resources Research, 2019. DOI: 10.1029/2019WR024922

Products (ii) other significant products

M. Lu, U. Lall, J. Kawale, S. Liess, V. Kumar. “Exploring the Predictability of 30-Day Extreme Precipitation Occurrence using a Global SST-SLP Correlation Network”. Journal of Climate. 2015 Nov 13(2015). 3.

J. H. Faghmous, I. Frenger, Y. Yao, R. Warmka, A. Lindell, and V. Kumar. “A Daily Global Mesoscale Ocean Eddy Dataset from Satellite Altimetry.” Scientific Data, Nature Publishing Group, 2. 2015.

A. Khandelwal, A. Karpatne, M.E. Marlier, J. Kim, D. P. Lettenmaier, and V. Kumar, “An Approach for Global Monitoring of Surface Water Extent Variations Using MODIS Data,” Remote Sensing of Environment, 2017.

J. Schwenk, A. Khandelwal, M. Fratkin, V. Kumar, E. Foufoula-Georgiou, “High spatio-temporal resolution of river planform dynamics from Landsat: the RivMAP toolbox and results from the Ucayali River.” Earth and Space Science (an open access AGU Journal), 2016.

X. Jia, A. Khandelwal, G. Nayak, J. Gerber, K. Carlson, P. West, V. Kumar, “Incremental Dual-memory LSTM in Land Cover Prediction” Proceedings of KDD 2017, pp. 867-876

Synergistic Activities

Textbooks: Coauthored “Introduction to Data Mining” textbook, that is used world-wide and has been translated into many languages.

Conference Organization: Serving as co-chair for the 2019 KDD 25TH ACM SIGKDD Conference on Knowledge Discovery and Data Mining.

Editorships: Served as a founding co-editor-in-chief of the Journal of Statistical Analysis and Data Mining (an official journal of the American Statistical Association).

Leadership in Big Data and Climate Change: Lead PI of a 5-year, \$10 Million project, “Understanding Climate Change - A Data Driven Approach”, funded by the NSF's Expeditions in Computing program.

Professional Awards: Honored by the ACM SIGKDD 2012 Innovation Award, which is the highest award for technical excellence in the field of Knowledge Discovery and Data Mining (KDD).

Upmanu Lall

Alan and Carol Silberstein Professor and Chair of Earth and Environmental Engineering
Director, Columbia Water Center
Columbia University
918 Mudd, 500 West 120th Street, New York, NY 10027
(212) 854-7081
ula2@columbia.edu

a. Professional Preparation

Indian Institute of Technology, Kanpur, India, Civil Engineering, BTech, 1976
University of Texas, Austin, TX, Civil & Environmental Engineering, MS, 1980
University of Texas, Austin, TX, Civil & Environmental Engineering, PhD, 1981

b. Appointments

2003-2006,	Chair, Earth & Environmental Engineering Department, Columbia University,
May 2018-present	
2008-present	Director, Columbia Water Center, Columbia University
2005-present	Alan & Carol Silberstein Professor of Engineering, Earth & Environmental Engineering Department, Columbia University
2002-present	Professor, Civil Engineering & Engineering Mechanics, Columbia University
2001-present	Professor, Earth & Environmental Engineering, Columbia University
2001-present	Senior Research Scientist, International Research Institute for Climate & Society, Columbia University
1999-2001	Visiting Professor, Columbia Earth Institute, Columbia University
1997-1999	Adjunct Research Scientist, Lamont-Doherty Earth Observatory, Columbia University
1995-2001	Professor, Civil & Environmental Engineering, Utah State University
1997-2001	Associate Director, Utah Water Research Lab, Utah State University
1988-1995	Associate Professor, Civil & Environmental Engineering, Utah State University
1988-1989	Hydrologist, United States Geological Survey
1987-1988	Associate Professor, Civil and Environmental Engineering, University of Utah
1981-1987	Assistant Professor, Civil and Environmental Engineering, University of Utah
1976-1977	Prestressed Consulting Development Engineer, ISMAL

c. Products

PRODUCTS MOST CLOSELY RELATED

Kwon H.-H., U. Lall, A. F. Khalil (2007), Stochastic simulation model for nonstationary time series using an autoregressive wavelet decomposition: Applications to rainfall and temperature, *Water Resour. Res.*, 43, W05407, doi:10.1029/2006WR005258

Lall U., Y.-I. Moon, H.-H. Kwon, K. Bosworth (2006), Locally weighted polynomial regression: Parameter choice and application to forecasts of the Great Salt Lake, *Water Resour. Res.*, 42, W05422, doi:10.1029/2004WR003782

Jain, S., and U. Lall, Floods in a Changing Climate: Does the Past Represent the Future?, *Water Resources Research*, 37(12), 2001

Khalil A. F., H.-H. Kwon, U. Lall, M. J. Miranda, J. Skees (2007), El Niño–Southern Oscillation based index insurance for floods: Statistical risk analyses and application to Peru, *Water Resour. Res.*, 43, W10416, doi:10.1029/2006WR005281.

Sankarsubramaniam, A., and U. Lall, Flood quantiles and changing climate: Seasonal Forecasts and Causal relations, *Water Resources Research*, May 2003, 39(5), 1154-1165.

OTHER SIGNIFICANT PRODUCTS

Renard, Benjamin; Lall, Upmanu; Regional frequency analysis conditioned on large-scale atmospheric or oceanic fields. *Water Resources Research*, 50(12), 9536-9554, 2014.

Haraguchi, Masahiko; Lall, Upmanu; Flood risks and impacts: A case study of Thailand's floods in 2011 and research questions for supply chain decision making, *International Journal of Disaster Risk Reduction*, 2014.

Lima, Carlos HR; Lall, Upmanu; Troy, Tara J; Devineni, Naresh; A climate informed model for nonstationary flood risk prediction: application to Negro River at Manaus, Amazonia, *Journal of Hydrology*, 2015

Steinschneider, Scott; Lall, Upmanu; A hierarchical Bayesian regional model for nonstationary precipitation extremes in Northern California conditioned on tropical moisture exports, *Water Resources Research*, 2015

Karamperidou, Christina; Cane, Mark A; Lall, Upmanu; Wittenberg, Andrew T; Intrinsic modulation of ENSO predictability viewed through a local Lyapunov lens, *Climate Dynamics*, 42, 2-Jan, 253-270, 2014.

d. Synergistic Activities

1. Participated in a number of NRC panels: Climate and Water Cycle, Flood Risks in the American River, Estimating and Communicating Uncertainty in Weather and Climate Forecasts, Committee on Preparing for the Third Decade (Cycle 3) of the National Water-Quality Assessment (NAWQA) Program, Modeling and uncertainty analysis for the restoration of the Everglades, Florida,
2. Moderator for President's (Gore/Clinton) Regional panel on Global Climate Change.
3. Lead author of the National Climate Assessment's Water Chapter
4. Served as the President of the Natural Hazards Focus Group of the American Geophysical Union.
5. I am regularly interviewed by media on Water, Climate, Risk, Floods related issues and have appeared on the major US Television news networks, a documentary on PBS on the Salton Sea, NPR, BBC, BBC World Service, Globo TV, New York Times, Washington Post, Circle of Blue, Times of India, Reuters, Guardian, Xinhua News, USA Today, Desert Sun, Popular Science, Nature news, , Christian Science Monitor, National Geographic, Atlantic Magazine, Financial Times, Economist.

Curriculum Vitae

Jean-François Lamarque

National Center for Atmospheric Research

Email: lamar@ucar.edu; Tel: 303 497 1495

Education Information

Catholic University of Louvain, Belgium	Licence en Sciences Physiques	1987
Catholic University of Louvain, Belgium	Diplôme d'Etudes Approfondies en Sciences Physiques	1988
Catholic University of Louvain, Belgium	Physics, Ph.D.	1993
National Center for Atmospheric Research, Boulder, Colorado	Postdoctoral fellow	1993-1995

Professional Preparation

2018-present	Director, Climate and Global Dynamics Laboratory, National Center for Atmospheric Research, Boulder, Colorado
2013-2018	Senior Scientist, Atmospheric Chemistry Observations and Modeling and Climate and Global Dynamics Laboratories, National Center for Atmospheric Research, Boulder, Colorado
2007-2013	Scientist III, Atmospheric Chemistry Division and Climate and Global Dynamics Division, National Center for Atmospheric Research, Boulder, Colorado
2008-2009	Senior Research Associate, Chemical Sciences Division, National Oceanic and Atmospheric Administration, Boulder, Colorado (on leave from NCAR)
2004-2007	Scientist II, Atmospheric Chemistry Division, National Center for Atmospheric Research, Boulder, Colorado
2002-2004	Scientist I, Atmospheric Chemistry Division, National Center for Atmospheric Research, Boulder, Colorado
1997-2002	Project Scientist I (research area: data assimilation), National Center for Atmospheric Research, Boulder, Colorado
1995-1997	Visiting Scientist (research area: stratosphere-troposphere exchange), National Center for Atmospheric Research, Boulder, Colorado
1990-1993	Graduate Research Assistant, Advanced Study Program, National Center for Atmospheric Research, Boulder, Colorado
1987-1990	Research Assistant, Catholic University of Louvain (Belgium)

Products

5 products of relevance

1. Danabasoglu, G., J.-F. Lamarque, et al. The Community Earth System Model version 2 (CESM2). Accepted for publication in *JAMES*, 2020.
2. CAM-chem: description and evaluation of interactive atmospheric chemistry in CESM. *Geosci. Mod. Dev.*, **5**, 369-411, doi:10.5194/gmd-5-369-2012, 2012.

3. Gettelman, A., D. Shindell and J.-F. Lamarque, Impact of aerosol radiative effects on recent temperatures. *Climatic Change*, doi: doi: 10.1007/s00382-014-2464-2, 2015.
4. IPCC AR5 Lead author on Chapter 8: Radiative forcing (2010-2013)
5. Westervelt, D. M., A. J. Conley, A. M. Fiore, J.-F. Lamarque, et al, Connecting regional aerosol emissions reductions to local and remote precipitation responses. *Atmos. Chem. Phys.*, 18, 12461-12475, <https://doi.org/10.5194/acp-18-12461-2018>, 2018.

Other relevant products

1. Collins, W., J.-F. Lamarque, M. Schulz, O. Boucher, V. Eyring, M. Hegglin, A. Maycock, G. Myhre, M. Prather, D. Shindell, and S. Smith. AerChemMIP: Quantifying the effects of chemistry and aerosols in CMIP6. *Geosc. Mod. Dev.*, 10, 585-607, doi:10.5194/gmd-10-585-2017, 2017.

Synergistic activities

- IPCC AR5 Lead author on Chapter 8: Radiative forcing (2010-2013)
- IPCC AR5 Contributing Author on Chapter 6: Carbon and Other Biogeochemical Cycles
- CESM Chief Scientist (2014-2018)
- CESM Chemistry-Climate Working Group co-chair (2007-2014)
- NSF representative to the US Climate Model Summit

Charles Lang

Visiting Assistant Professor, Department of Learning Analytics
Columbia University
374 Grace Dodge Hall, New York, NY 10027
212-678-3180
cl3584@columbia.edu

(a) Professional Preparation

University of Melbourne	Melbourne, AUS	Political Science	B.A., 2006
University of Melbourne	Melbourne, AUS	Bioinformatics	B.S., 2006
Harvard University	Cambridge, MA	Mind, Brain & Education	Ed.M., 2008
Harvard University	Cambridge, MA	Human Development	Ed.D., 2015

(b) Appointments

Visiting Assistant Professor, Teachers College, Columbia University, 2016-Present

(c) Products**(i) Five publications/products most closely related to the proposed project**

- Siemens, G., Lang, C. (eds.). The Handbook of Learning Analytics and Educational Data Mining, April, 2016
- Lang, C., Siemens, G., Gasevic, D., Dawson, S., 'Big Data and the Future of Credentialing in Education', Gates Foundation, History & State of Learning Analytics Research Report, April, 2015
- Lang C., 'An Adaptive Model of Student Performance Using Inverse Bayes', Journal of Learning Analytics, Vol.1, Is.3, 2014
- Lang, C. 'The Statistical Imperative for Integrating Biological and Education Research', Mind, Brain, Education, Working Paper for IMBES, 2013
- Lang, C., 'Science, Education, and the Ideology of "How"', Mind, Brain Education, Vol.4, Is.2, 2010

(ii) Five other significant publications/products, whether or not related to the proposed project.

- Gardner, H., Fischman, W., Lang, C., Pollack, C., Murray, B., 'Conceptions of Quality Across the World: A Survey of Attitudes about Quality in Eight Countries', The Good Project, 2011,
- Hochschild, J., Lang, C., 'Including Oneself and Including Others: Who Belongs in My Country?', The Annals of the American Academy of Political and Social Science, 2009
- Lang, C., 'Resolving the Conflict between Personal Wealth and Personal Principles', The Goodwork Project, July, 2008
- Jackson, P., Anderiesz, C, Nunan, J, Lang, C, Blasetti, A, 'Cancer Research in Australia: An Overview of Cancer Research Programs in Australia, 2003 – 2005', Cancer Australia Report, March, 2008
- Zheng, W.Z., Lang, C., Kaye, D.M., 'Determination of Plasma Free 3-nitrotyrosine by Reversed Phase Liquid Chromatography with 4-fluoro-7-Nitrobenzofurazan Derivatization', Biomedical Chromatography, Vol.21, Is.1, January, 2007

David M. Lawrence

Section Head, Terrestrial Sciences Section, Climate and Global Dynamics Laboratory
National Center for Atmospheric Research
P.O. Box 3000, Boulder, Colorado 80307
(303) 497-1384
dlawren@ucar.edu

Professional Preparation

University of California at San Diego	Biophysics	B.A.	1993
University of Colorado at Boulder	Atmospheric and Oceanic Science	Ph.D.	1999
University of Colorado at Boulder	Monsoon variability		2000
University of Reading, UK	Land-atmosphere Interactions		2001 – 2003

Appointments

2019- Section Head, Terrestrial Sciences Section, Climate and Global Dynamics Laboratory, NCAR, Boulder, CO
2018- Senior Scientist, Climate and Global Dynamics Laboratory, NCAR, Boulder, CO
2013-2018 Scientist III, Climate and Global Dynamics Laboratory, NCAR, Boulder, CO
2010-2013 Scientist II, Climate and Global Dynamics Division, NCAR, Boulder, CO
2004 –2010 Project Scientist, Climate and Global Dynamics Division, NCAR, Boulder, CO

Selected Recent Publications Most Relevant to Project

Lawrence, D.M., G.C. Hurtt, A. Arneeth, V. Brovkin, K.V. Calvin, A.D. Jones, C.D. Jones, P.J. Lawrence, N. de Noblet-Ducoudre, J. Pongratz, S.I. Seneviratne, and E. Shevliakova, 2016. The Land Use Model Intercomparison Project (LUMIP) contribution to CMIP6: Rationale and experimental design. *GMD*, 9. <http://doi.org/10.5194/gmd-9-2973-2016>.

Lawrence, D.M. R.A. Fisher, C.D. Koven, K.W. Oleson, S.C. Swenson, G. Bonan, N. Collier, B. Ghimire, L. van Kampenhout, D. Kennedy, E. Kluzek, P.J. Lawrence, F. Li, H. Li, D. Lombardozzi, W.J. Riley, W.J. Sacks, M. Shi, M. Vertenstein, W.R. Wieder,, C. Xu, A.A. Ali, A.M. Badger, G. Bisht, M.A. Brunke, S.P. Burns,, J. Buzan, M. Clark, A. Craig, K. Dahlin, B. Drewniak, J.B. Fisher, M. Flanner, A.M. Fox, P. Gentine, F.Hoffman, G. Keppel-Aleks, R., Knox, S. Kumar, J. Lenaerts, L.R. Leung, W.H. Lipscomb, Y. Lu, A., Pandey, J.D. Pelletier, J. Perket,, J.T. Randerson, D.M. Ricciuto, B.M., Sanderson, A. Slater, Z.M. Subin, J. Tang, R.Q. Thomas, M. Val Martin, and X. Zeng, 2019. The Community Land Model version 5: Description of new features, benchmarking, and impact of forcing uncertainty. *Submitted to J. Adv. Model. Earth Syst.*.

Fisher, R., W. Wieder, C. Koven, K. Oleson, J. Fisher, C. Xu, B. Sanderson, M. Shi, and D. Lawrence, 2019. Parametric controls on vegetation responses to biogeochemical forcing in the CLM5. Submitted to JAMES.

Kennedy, D., S. Swenson, K.W. Oleson, D.M. Lawrence, R. Fisher, A.C. Lola da Costa, and P. Gentine, 2019. Implementing plant hydraulics in the Community Land Model, version 5. JAMES, doi.org/10.1029/2018MS001500.

Collier, N., F.M. Hoffman, D.M. Lawrence, G. Keppel-Aleks, C.D. Koven, W.J. Riley, M. Mu, J.T. Randerson, 2018: The International Land 1 Model Benchmarking (ILAMB) System: Design, Theory, and Implementation. *JAMES*, doi.org/10.1029/2018MS001354.

Other Selected Publications

Swenson, S.C., D.M. Lawrence, and S. Burns, 2019: The Impact of Biomass Heat Storage on the Canopy Energy Balance and Atmospheric Stability in the Community Land Model. *JAMES*, doi.org/10.1029/2018MS001476.

Fan, Y., M. Clark, D.M. Lawrence, S.C. Swenson, et al., 2019. Structures and Functions of Hillslope Hydrology with Relevance to Earth System Modeling: Syntheses and Testable Hypotheses. *Water Res. Research*, 55, doi.org/10.1029/2018WR023903.

Lombardozzi, D.L., G.B. Bonan, W. Wieder, A.S. Grandy, C. Morris, and D.M. Lawrence, 2018. Cover crops may cause winter warming in snow-covered regions. *GRL*, doi.org/10.1029/2018GL079000.

Tawfik, A.B., D.M. Lawrence, and P.A. Dirmeyer, 2017. Representing sub-grid convective initiation in CESM. *JAMES*, 9, doi.org/10.1002/2016MS000866.

Levine, P., J. Randerson, D. Lawrence, and S. Swenson, 2016. Evaluating the strength of the land-atmosphere moisture feedback in earth system models using satellite observations. *HESS*, 20, 4837-4856, doi.org/10.5194/hess-20-4837-2016.

Synergistic Activities

- Co-chair of the Community Earth System Model Land Model Working Group, June 2005-present
- Member of the Community Earth System Model Scientific Steering Committee, 2010-present
- Co-chair of Land-use Model Intercomparison Project (LUMIP) of CMIP6 , 2011-present
- Topical Editor for Geoscientific Model Development, 2009-present
- Member of the GEWEX Global Land-Atmosphere System Study (GLASS) panel, 2013-present

Biographical Sketch: Hod Lipson, Ph.D.

Professor
Departments of Mechanical Engineering
Columbia University, NYC

Professional Preparation:

1. B.Sc., Mechanical Engineering 1985-1989 Technion – Israel Institute of Technology, Haifa, Israel
2. Ph.D., Mechanical Engineering, 1995-1999 - Technion – Israel Institute of Technology, Haifa, Israel
3. Post Doc., Computer Science, 1999-2001 - Brandeis University, Waltham, Massachusetts,
4. Post Doc., Mechanical Engineering, 1999-2001 - Massachusetts Institute of Technology, Cambridge, Massachusetts,

Appointments:

1. 2015- Full Professor, Mechanical Engineering and Data Science, Columbia University, NYC
2. 2001-2015 Assistant-, Associate-, and Full-Professor, Joint Mechanical & Aerospace Engineering, and Computing & Information Science, Cornell University, Ithaca NY
3. 1990-1995: Lt. Cdr, Israeli Navy (full time active duty)

I: Five products most related to the proposed project -

1. Kwiatkowski, Robert, and Hod Lipson. "Task-agnostic self-modeling machines." *Science Robotics* 4.26 (2019): eaau9354.
2. Shuguang Li, Richa Batra, David Brown, Hyun-Dong Chang, Nikhil Ranganathan, Chuck Hoberman, Daniela Rus, Hod Lipson, "Particle robotics based on statistical mechanics of loosely-coupled cells", *Nature* (2019), cover
3. Schmidt, M.D. and Lipson, H. (2009) "Distilling natural laws from experimental data", *Science*, Vol. 324, no. 5923, pp. 81 – 85.
4. Chattopadhyay, I., Kuchina, A., Suel, G. and Lipson, H. (2013) "Inverse Gillespie: Inferring stochastic reaction mechanisms from intermittent samples". *Proceedings of the National Academy of Sciences*
5. Bongard, J. and Lipson, H. (2007) "Automated reverse engineering of nonlinear dynamical systems", *Proceedings of the National Academy of Science*, vol. 104 no. 24, pp. 9943–9948.

II: Five other products -

1. Bongard, J.C., Zykov, V. Lipson, H. (2006) "Resilient Machines through Self-Modeling", *Science*, Vol. 314. no. 5802, pp. 1118 – 1121.
2. Zykov, V., Mytilinaios, E., Adams, B., and Lipson, H. (2005) "Self-reproducing machines", *Nature* Vol. 435 No. 7038, pp. 163-164.
3. Lipson, H. and Kurman, M. (2016) *Driverless: Intelligent cars and the road ahead*, MIT Press. Translated into three languages.
4. Brown, E., Rodenberg, N., Amend, J., Mozeika, A., Steltz, E., Zakin, M., Lipson, H., and Jaeger, H. (2010) "Universal robotic gripper based on the jamming of granular

material," *Proceedings of the National Academy of Sciences (cover)*, Vol. 107, no. 44.

5. Lipson, H. and Pollack, J. B. (2000) "Automatic design and Manufacture of Robotic Lifeforms", *Nature* 406, pp. 974-978.

Five Synergistic Activities:

1. Co-developed *Eureka*, software for automated science, with over 100,000 users from academia, industry and "citizen scientist", leading to many new publications.
2. Founder and General Chair of Inside3DPrinting conference series, with over 20,000+ participants total over 2013, 2014, 2015, 2016.
3. Founding Editor-in-Chief of *3D Printing and Additive Manufacturing*, Mary Ann Lieberts Publishers, Inc.
4. Founded the first open source 3D printer project in the US (Fab@Home, 2005), that together with the RepRap is credited for sparking the consumer 3D printing revolution. Used in elementary schools and developing areas around the world.
5. Co-Founded four startups, three active to date, employing >100 people

Biographical Sketch

Matthew C. Long

National Center for Atmospheric Research

P.O. Box 3000, Boulder, CO 80307

Phone: 303-497-1311; Fax: 303-497-1700; E-mail: mclong@ucar.edu

(a) Professional Preparation

Tufts University	Medford, MA	Environmental Engineering	B.S.	1998
Tufts University	Medford, MA	Environmental Engineering	M.S.	2000
Stanford University	Stanford, CA	Oceanography	Ph.D.	2010
National Center for Atm. Res.	Boulder, CO	Postdoc in Oceanography		2010–2012

(b) Appointments

2014–present	Scientist I, II , National Center for Atmospheric Research, Climate and Global Dynamics Laboratory, Oceanography Section
2012–2014	Project Scientist I , National Center for Atmospheric Research, Climate and Global Dynamics Division, Oceanography Section
2010–2012	Postdoctoral Fellow , Advanced Study Program, National Center for Atmospheric Research, Climate and Global Dynamics Division
2005–2010	Research Assistant , Stanford University
2004–2009	Teaching Assistant , Stanford University
2003–2004	Water Resources Engineer , Camp Dresser & McKee Inc., Cambridge, MA
2003	Field and Laboratory Technician , Desert Research Institute, Reno, NV
2000–2002	High School Physics & Geography Teacher , US Peace Corps, Ashira Girls Secondary School, Marangu, Tanzania

(c) Publications

(i) Five most relevant publications:

- [1] **Long, M. C.**, C. A. Deutsch, and T. Ito, 2016: Finding forced trends in oceanic oxygen. *Global Biogeochem. Cycles*, 30, doi:10.1002/2015GB005310.
- [2] **Long, M. C.**, K. Lindsay, and M. M. Holland, 2015: Modeling photosynthesis in sea ice covered waters. *J. Adv. Model. Earth Syst.*, 07, doi:10.1002/2015MS000436.
- [3] **Long, M. C.**, K. Lindsay, S. Peacock, J. K. Moore, and S. C. Doney, 2013: Twentieth-Century Oceanic Carbon Uptake and Storage in CESM1(BGC). *J. Climate*, 26 (18), 6775–6800, doi:10.1175/JCLI-D-12-00184.1.
- [4] **Long, M. C.**, L. N. Thomas, and R. B. Dunbar, 2012: Control of phytoplankton bloom inception in the Ross Sea, Antarctica, by Ekman restratification. *Global Biogeochem. Cycles*, 26 (1), GB1006, doi:10.1029/2010GB003982.
- [5] **Long, M. C.**, R. B. Dunbar, P. D. Tortell, W. O. Smith, D. A. Mucciarone, and G. R. DiTullio, 2011: Vertical structure, seasonal drawdown, and net community production in the Ross Sea, Antarctica. *J. Geophys. Res.*, 116 (C10029), doi:10.1029/2009JC005954.

(ii) Five other significant publications:

- [1] Eddebbar, Y. A., K. B. Rodgers, **M. C. Long**, A. C. Subramanian, S.-P. Xie, and R. F. Keeling (2019), El Niño–Like Physical and Biogeochemical Ocean Response to Tropical Eruptions, *J. Climate*, 32(9), 2627–2649.
- [2] Ito, T., **M. C. Long**, C. Deutsch, S. Minobe, and D. Sun (2019), Mechanisms of low-frequency oxygen variability in the North Pacific, *Global Biogeochemical Cycles*, 33(2), 110–124.

- [3] Song, H., **M. C. Long**, P. Gaube, I. Frenger, J. Marshall, and D. J. McGillicuddy (2018), Seasonal variation in the correlation between anomalies of sea level and chlorophyll in the Antarctic Circumpolar Current, *Geophysical Research Letters*, *45*(10), 5011–5019.
- [4] McKinley, G. A., D. J. Pilcher, A. R. Fay, K. Lindsay, **M. C. Long**, and N. Lovenduski, 2016: Timescales for detection of trends in the ocean carbon sink. *Nature*, **530**, 469–472, doi:10.1038/nature16958.
- [5] Moore, J. K., K. Lindsay, S. C. Doney, **M. C. Long**, and K. Misumi, 2013: Marine ecosystem dynamics and biogeochemical cycling in the Community Earth System Model [CESM1(BGC)]: Comparison of the 1990s with the 2090s under the RCP4.5 and RCP8.5 scenarios. *J. Climate*, **26** (23), 9291–9312, doi:10.1175/JCLI-D-12-00566.1.

(d) Synergistic Activities

- 2019 Lead organizer of the NCAR/LDEO CMIP6 Hackathon (cmip6hack.github.io)
- 2018– Ocean Carbon & Biogeochemistry (OCB) Scientific Steering Committee Member
- 2017 Advanced Science Plan for NASA OBB Research, working group member.
- 2012-2015 CLIVAR/OCB Oceanic carbon uptake in CMIP5 models working group member.
- 2013 Leader of NCAR ASP Colloquium: *Carbon-climate connections in the Earth System*.

Duncan N. L. Menge

Associate Professor, Department of Ecology, Evolution and Environmental Biology
Columbia University
1111 Schermerhorn Extension, 1200 Amsterdam Avenue, New York, NY 10027
212-854-6889
dm2972@columbia.edu

(a) Professional Preparation:

Stanford University	Palo Alto, CA	Earth Systems	BA, 2003	
Princeton University	Princeton, NJ	Ecology and Evolutionary Biology		PhD, 2008
National Center for Ecological Analysis & Synthesis			Postdoc, 2008-2010	
Princeton University	Princeton, NJ	Ecology and Evolutionary Biology		Postdoc, 2010-2013

(b) Appointments:

2018-present	Columbia University	Associate Professor
2013-2018	Columbia University	Assistant Professor
2010-2013	Princeton University	Postdoctoral Scholar
2010-2013	Stanford University	Visiting Scholar
2008-2010	NCEAS	Postdoctoral Scholar
2003-2008	Princeton University	NSF Graduate Research Fellow

(c) Publications:

(i) Five publications closely related to the project:

1. Sulman, BN, E Shevliakova, ER Brzostek, SN Kivlin, S Malyshev, **DNL Menge**, and X Zhang. 2019. Diverse mycorrhizal associations enhance terrestrial C storage in a global model. *Global Biogeochemical Cycles* **33**: 501-523. doi:10.1029/2018GB005973.
2. Kou-Giesbrecht, S, and **DNL Menge**. 2019. Nitrogen-fixing trees could exacerbate climate change under elevated nitrogen deposition. *Nature Communications* 10: 1493.
3. Sulman, BN, ER Brzostek, C Medici, E Shevliakova, **DNL Menge**, and RP Phillips. Feedbacks between plant N demand and rhizosphere priming depend on type of mycorrhizal association. *Ecology Letters* **20**: 1043-1053.
4. Liao, W, **DNL Menge**, JW Lichstein, and G Ángeles-Pérez. 2017. Global climate change will increase the abundance of symbiotic nitrogen-fixing trees in much of North America. *Global Change Biology* **23**: 4777-4787.
5. **Menge, DNL**, LO Hedin, and SW Pacala. 2012. Nitrogen and phosphorus limitation over long-term ecosystem development in terrestrial ecosystems. *PLoS ONE* **7**: e42045.

(ii) Five other significant publications:

1. Vitousek, PM, **DNL Menge**, SC Reed, & CC Cleveland. 2013. Biological nitrogen fixation: rates, patterns, and ecological controls in terrestrial ecosystems. *Philosophical Transactions of the Royal Society-B* **368**(1621): 20130119.
2. Hedin, LO, ENJ Brookshire, **DNL Menge**, & AR Barron. 2009. The nitrogen paradox in tropical forest ecosystems. *Annual Review of Ecology, Evolution, and Systematics* **40**: 613-635.
3. **Menge, DNL**, AC MacPherson, TA Bytnerowicz*, AW Quebbeman*, NB Schwartz, BN Taylor*, & AA Wolf. 2018. Logarithmic scales in ecological data presentation may cause misinterpretation. *Nature Ecology and Evolution* **2**: 1393-1402.

4. **Menge, DNL**, AA Wolf, and JL Funk. 2015. Diversity of nitrogen fixation strategies in Mediterranean legumes. *Nature Plants* **1**: 15064.
5. **Menge, DNL**, SA Levin, & LO Hedin. 2008. Evolutionary tradeoffs can select against nitrogen fixation and thereby maintain nitrogen limitation. *Proceedings of the National Academy of Sciences USA* **105**(5) 1573-1578.

(d) Synergistic Activities:

- Director of Graduate Studies, Department of Ecology, Evolution, and Environmental Biology, Columbia University, 2018-present
- Lenfest Distinguished Columbia Faculty Award, 2020, which honors excellence in mentoring and teaching
- Editor/advisory board: *Oecologia*, *New Phytologist*
- Panelist for *NSF*, *Dept. of Defense*, *Dept. of Energy*; reviewer (~12/year) for >35 journals, including *Nature*, *Science*, and *PNAS*; Expert reviewer for the IPCC Fifth Assessment Report; reviewer for *NSF*, *AAAS*, *Dept. of Defense*, *Marsden Fund*, *Fondo Nacional de Desarrollo Científico y Tecnológico*, *Research Foundation-Flanders*, *NSERC*, *Icelandic Research Fund*, *Israel Science Foundation*
- Faculty Mentor for aspiring scientists from under-represented groups, Columbia University's Leadership Alliance Summer Research Program, 2014, 2016

Biographical Sketch: Hugh Morrison

National Center for Atmospheric Research
Mesoscale and Microscale Meteorology Laboratory
1850 Table Mesa Drive, Boulder, CO, 80305
Phone (303) 497-8917, email: morrison@ucar.edu

a. Professional Preparation

<i>Institution</i>	<i>Location</i>	<i>Major</i>	<i>Degree and Year</i>
The University of Minnesota	Minneapolis, MN	Geography	B.S. 1997
The University of Colorado	Boulder, CO	Atmospheric Science	M.S. 2000
The University of Colorado	Boulder, CO	Atmospheric Science	Ph.D. 2003
The University of Colorado	Boulder, CO	Atmospheric Science	Post-doc (2003-2005)
NCAR	Boulder, CO	Atmospheric Science	Post-doc (2005-2007)

b. Appointments

- 2018 - **Senior Scientist**, National Center for Atmospheric Research, research scientist position
- 2015 - **Adjunct Professor**, Department of Meteorology, Pennsylvania State University, collaborative research scientist position
- 2013-2018 **Scientist III**, National Center for Atmospheric Research, research scientist position
- 2010-2013 **Scientist II**, National Center for Atmospheric Research, research scientist position
- 2007-2010 **Scientist I**, National Center for Atmospheric Research, research scientist position
- 2005-2007 **Post-doctoral Fellow**, Advanced Study Program, National Center for Atmospheric Research, research scientist position
- 2005 **Research Scientist**, School of Earth and Atmospheric Sciences, Georgia Institute of Technology, research scientist position
- 2003-2005 **Post-doctoral Research Associate**, Department of Aerospace Engineering, University of Colorado at Boulder, research scientist position
- 1998-2003 **Graduate Research Assistant**, Program in Atmospheric and Oceanic Science, University of Colorado at Boulder, graduate student researcher

c. Selected Publications

(i) Five publications related to the proposed project

- Morrison, H.**, J. A. Curry, and V. I. Khvorostyanov, 2005: A new double-moment microphysics parameterization for application in cloud and climate models, Part I: Description. *J. Atmos. Sci.*, 62, 1665-1677.
- Morrison, H.**, and A. Gettelman, 2008: A new two-moment bulk stratiform cloud microphysics scheme in the Community Atmosphere Model (CAM3), Part I: Description and numerical tests. *J. Climate*, 21, 3642-3659.

- Morrison, H.**, and J. A. Milbrandt, 2015: Parameterization of cloud microphysics based on the prediction of bulk ice particle properties. Part I: Scheme description and idealized tests. *J. Atmos. Sci.*, 72, 287-311.
- Gettelman, A., and **H. Morrison**, 2015: Advanced two-moment bulk microphysics for global models. Part I: Off-line tests and comparison with other schemes. *J. Climate*, 28, 1268-1287.
- Grabowski, W. W., **H. Morrison**, S.-I. Shima, G. Abade, H. Pawlowska, and P. Dziekan, 2019: Modeling of cloud microphysics: Can we do better? *Bull. Amer. Meteor. Soc.* (in press)

(ii) Five other significant publications

- Morrison, H.**, and W. W. Grabowski, 2007: Comparison of bulk and bin warm rain microphysics models using a kinematic framework. *J. Atmos. Sci.*, 64, 2839-2861.
- Morrison, H.**, G. Thompson, and V. Tatarskii, 2009: Impact of cloud microphysics on the development of trailing stratiform precipitation in a simulated squall line: Comparison of one- and two-moment schemes. *Mon. Wea. Rev.*, 137, 991-1007.
- Morrison, H.**, G. de Boer, G. Feingold, J. Harrington, M. Shupe, and K. Sulia, 2012: Self-organisation and resilience of Arctic mixed-phase clouds. *Nature Geoscience*, 5, 11-17, doi:10.1038/ngeo1332.
- Bryan, G., and **H. Morrison**, 2012: Sensitivity of a simulated squall line to horizontal resolution and parameterization of microphysics. *Mon Wea. Rev.*, 140, 202-225.
- Morrison, H.**, 2016: Impacts of updraft size and dimensionality on the perturbation pressure and vertical velocity in cumulus convection, Part 1: Simple, generalized analytic solutions. *J. Atmos. Sci.*, 73, 1441-1454.

d. Selected Synergistic Activities

- 2016 - Elected Committee Member, International Commission on Clouds and Precipitation
- 2014 - Editor, *Monthly Weather Review*
- 2013 - 2018 Associate Editor, *Journal of the Atmospheric Sciences*
- 2011 - Steering Committee Member, Global Atmospheric System Studies/GEWEX
- 2008 - Lead or co-lead developer of microphysics schemes in the Community Atmosphere Model and Weather Research and Forecasting model (MG, Morrison, P3 schemes)

Clare Newman

President and Chief Executive Officer
Trust for Governors Island
10 South Street #4
New York, NY 10004
212-440-2200
cnewman@govisland.org

(a) Professional Preparation

Williams College	Williamstown, MA	Political Economy	BA, 2002
Columbia University	New York, NY	Urban Planning	MSUP, 2007

(b) Appointments

- President & CEO, Trust for Governor’s Island, 2019-Present
- Chief of Staff and EVP, Brooklyn Navy Yard Development Corporation, 2014-2019
- Manager, Bennett Midland, 2012-2014
- Government Innovation, Bloomberg Philanthropies, 2012-2014
- Vice President, NYC Economic Development Corporation, 2007-2012
- Project Manager, James Wagman Architects, 2004-2005
- Teacher, Teach for America, 2002-2004

(c) Products

NA

(d) Synergistic Activities

- Board Member of Transit Center, 2016-2019
- Board Member, Women in Housing and Finance, 2017-2019
- Member, New York Women Executives in Real Estate

Robert Pincus

Adjunct Senior Research Scientist, Lamont Doherty Earth Observatory
(303) 497-6310
Robert.Pincus@columbia.edu

Professional Preparation

University of Washington, Physics, BS, 1986
University of Washington, Geophysics, PhD, 1994

Appointments

2017-present: Adjunct senior research scientist, Lamont Doherty Earth Observatory
2001-present: Research scientist, U. Colorado/CIRES and NOAA/ESRL/PSD
1997-2001: Visiting Assistant Professor, Department of Atmospheric & Oceanic Sciences;
Assistant Scientist, Cooperative Institute for Satellite Meteorological Studies, University of
Wisconsin, Madison
1997-1999: Assistant Research Scientist, Joint Center for Earth Systems Technology, University
of Maryland, Baltimore County
1995-1997: National Research Council Research Associate, NASA/Goddard Space Flight Center

Five Relevant Products

- Pincus, R., E. J. Mlawer, and J. S. Delamere, 2019: Balancing accuracy, efficiency, and flexibility in radiation calculations for dynamical models. *J. Adv. Model Earth Syst.*, 11, 2074-3089, doi:10.1029/2019MS001621
- Pincus, R., et al., 2015: Radiative flux and forcing parameterization error in aerosol-free clear skies, *Geophys. Res. Lett.*, 42, 5485–5492, doi: 10.1002/2015GL064291.
- Pincus, R. and B. Stevens, 2013: Paths to accuracy for radiation parameterizations in atmospheric models. *J. Adv. Model Earth Syst.*, 5, 225-233, doi:10.1002/jame.20027.
- Pincus, R. and B. Stevens, 2009: Monte Carlo Spectral Integration: a consistent approximation for radiative transfer in large eddy simulations. *J. Adv. Model Earth Syst.*, 1, 9. doi:10.3894/JAMES.2009.1.1.
- Pincus, R., H. W. Barker, and J. J. Morcrette, 2003: A fast, flexible, approximate technique for computing radiative transfer in inhomogeneous cloud fields. *J. Geophys. Res. - Atmos.*, 108. doi:10.1029/2002jd003322.

Five Significant Publications

- Mauritsen, T. and R. Pincus, 2017: Committed warming inferred from observations. *Nature Clim. Change*, 7, 652–655, doi:10.1038/nclimate3357.
- Seifert, A., T. Heus, R. Pincus, and B. Stevens, 2015: Large-eddy simulation of the transient and near-equilibrium behavior of precipitating shallow convection, *J. Adv. Model. Earth Syst.*, 7, 1918-1937, doi:10.1002/2015MS000489.
- Bony, S., et al., 2015: Clouds, circulation, and climate sensitivity *Nature Geosci.*, 8, 261–268,

doi:10.1038/ngeo2398.

Bozzo, A., R. Pincus, I. Sandu, and J.-J. Morcrette, 2014: Impact of a spectral sampling technique for radiation on ECMWF weather forecasts *J. Adv. Model. Earth Syst.*, **6**, 1288–1300, doi:10.1002/2014MS000386.

Pincus, R. and M. B. Baker, 1994: Effect of precipitation on the albedo susceptibility of clouds in the marine boundary layer. *Nature*, **372**, 250-252. doi:10.1038/372250a0.

Synergistic Activities

- Editor-in-Chief, *Journal of Advances in Modeling Earth Systems* (2015-; Associate Editor 2013-2014)
- Lead coordinator, Radiative Forcing Model Intercomparison Project (RFMIP; 2014-)
- Leader, Initiative on Leveraging the Past Record, WCRP Grand Challenge on Clouds, Circulation, and Climate Sensitivity (2013-)
- Member, Science Advisory Board, Developmental Testbed Center (2018-)
- Member, AMS Panel on Atmospheric Radiation (2013-2018)

Oren Pizmony-Levy

Associate Professor of International and Comparative Education
Columbia University
370 Grace Dodge Hall
New York, NY 10027
212-678-3180
pizmony-levy@tc.columbia.edu

(a) Professional Preparation

Tel-Aviv University	Tel-Aviv, Israel	Political Science and Educational Policy	B.A., 2001
Indiana University	Bloomington, Indiana	Sociology	M.A., 2008
Tel-Aviv University	Tel-Aviv, Israel	Sociology Education	M.A., 2011
Indiana University	Bloomington, Indiana	Educational Leadership and Policy Studies	Ph.D., 2013

(b) Appointments

- Associate Professor of International and Comparative Education, Teacher's College, Columbia University, 2019-Present
- Assistant Professor of International and Comparative Education, Teacher's College, Columbia University, 2013-2019

(c) Products**(i) Five publications/products most closely related to the proposed project**

- Pizmony-Levy, Oren (2015). "Charts, Graphs, Tables and the Environment: Using Service Learning To Teach About Social Statistics" in Nicole Schönemann, Emily Metzger, Andrew Libby (eds.). The Course Reflection Project: Faculty Reflections on Teaching Service-Learning. Charlotte, NC: IAP - Information Age Publishing.
- Learning Assessments for Sustainability? Exploring the Interaction Between Two Global Movements, Education Policy Analysis Archives (co-edited with Dafna Gan).
- Pizmony-Levy, Oren and Jessica Ostrow Michel "Pro-Environmental Attitudes and Behaviors in Higher Education: Investigating the Role of Formal and Informal Factors" (Revise & Resubmit)
- Pallas, Aaron and Oren Pizmony-Levy (2018). The Public Matters: Public Opinion on Education, Health and Psychology. New York: Teachers College, Columbia University. Website: <https://www.tc.columbia.edu/thepublicmatters/>
- Pizmony-Levy, Oren, William Gaudelli, Pam Koch, and Sonali Rajan (2018). Activity Report and Recommendations. Working Group on Environmental & Sustainability Education. New York: Teachers College, Columbia University.

(ii) Five other significant publications/products, whether or not related to the proposed project.

- Yogev, Abraham, Idit Livneh, and Oren Pizmony-Levy. (2010). "Non-Academic Post-Secondary Education in Israel: Different and Equal?" Israeli Sociology 11(2):363-388. [Hebrew]

- Pizmony-Levy, Oren, Guy Shilo, and Batia Pinhassi. (2009). "Is There a New Israeli Gay Teenager?" *Journal of LGBT Youth* 6(4):340-368.
- Pizmony-Levy, Oren, Amit Kama, Sari Lavee, and Guy Shilo (2008). "Do My Teachers Care I'm Gay? Israeli Lesbigan School Students' Experiences at Their Schools." *Journal of LGBT Youth* 5(2):33-62.
- Pizmony-Levy, Oren, Abigail M. Shaddox, Byron K. Thomas and Bryce A. Winger (2010). "Health Care Provision for Local Disadvantaged Populations: Results from a Community-Based Study." *Journal of Applied Social Science* 4(1):3-26.
- Baek, Chanwoong, Hörmann, Bernadette, Karseth, Berit, Pizmony-Levy, Oren, Sivesind, Kirsten and Gita Steiner-Khamsi (2018). "Policy Learning in Norwegian School Reform: A Social Network Analysis of the 2020 Incremental Reform" *Nordic Journal of Studies in Educational Policy*, 4(1): 24-37.

(d) Synergistic Activities

- Editorial Board, *Environmental Education Research*, 2020
- Organizer, presidential session "Educators take action on climate change and sustainability," *American Educational Research Association*, 2020
- Chair, Committee on Special Interest Groups, *Comparative and International Education Society*, 2014- 2015
- Co-Chair, *Comparative and International Education Society*, *Large-Scale Cross- National Studies in Education*, 2013-2016
- Co-Chair, *Comparative and International Education Society*, *Education for Sustainable Development SIG*, 2012-2014

MICHAEL S. PRITCHARD

Associate Professor
Dept. Earth System Science
University of California, Irvine
3200 Croul Hall, Irvine, CA, 92697-3100
mspritch@uci.edu

a. Professional Preparation

Undergraduate	University of Toronto	Physics/Math	BSc, 2004
Graduate	University of Alberta	Earth Science	MSc, 2006
Graduate	University of California, San Diego	Climate Science	PhD, 2011
Postdoctoral	University of Washington	Climate Science	2011-2013

b. Professional appointments

May 2019 to present	Associate Professor of Earth System Science, UC Irvine.
July 2013	Assistant Professor of Earth System Science, UC Irvine.

c. Products

FIVE PRODUCTS MOST CLOSELY RELATED

1. Rasp, S, M. S. Pritchard, and P. Gentine, 2019. Deep learning to represent sub-grid processes in climate models, *Proceedings of the National Academy of Sciences*, doi:10.1073/pnas.1810286115.
2. Parishani, H., M. S. Pritchard, C. S. Bretherton, C. R. Terai, M. C. Wyant, M. Khairoutdinov and B. Singh, 2018. Insensitivity of the cloud response to surface warming under radical changes to boundary layer turbulence and cloud microphysics: Results from the UltraParameterized CAM, *J. Adv. Model. Earth Syst.*, 10, 3139-3158, doi: [10.1029/2018MS001409](https://doi.org/10.1029/2018MS001409)
3. Jones, C., C. S. Bretherton and M. S. Pritchard, 2015. Mean-state acceleration of cloud-resolving model simulations. *J. Adv. Model. Earth Syst.*, 7, doi:[10.1002/2015MS000488](https://doi.org/10.1002/2015MS000488).
4. Woelfle, M., S. Yu, C. S. Bretherton and M. S. Pritchard, 2018. Sensitivity of coupled tropical Pacific model biases to convective parameterization in CESM1, *J. Adv. Model. Earth Syst.*, 10, doi:10.1002/2017MS001176.
5. Yu, S. and M. S. Pritchard, 2019. A strong role for the AMOC in partitioning global energy transport and shifting ITCZ position in response to latitudinally discrete solar forcing in the CESM1.2, *J. Climate*, 32, doi:10.1175/JCLI-D-18-0360.1.

FIVE FURTHER PUBLICATIONS

6. Parishani, H., M. S. Pritchard, C. S. Bretherton, M. C. Wyant and M. Khairoutdinov, 2017. Towards low cloud-permitting cloud superparameterization with explicit boundary layer turbulence, *J. Adv. Model Earth Syst.*, 9, 1542-1571, doi:10.1002/2017MS000968.
7. Kooperman, G. J., M. S. Pritchard, M. A. Burt, M. D. Branson, and D. A. Randall, 2016. Robust effects of cloud super-parameterization on simulated daily rainfall intensity statistics across multiple versions of CESM. *J. Adv. Model. Earth Syst.*, 8, doi:10.1002/2015MS000574.
8. Yu, S., and M. S. Pritchard, 2015. The effect of large-scale model time step and multiscale coupling frequency on cloud climatology, vertical structure, and rainfall extremes in a superparameterized GCM, *J. Adv. Model. Earth Syst.*, 7, 1977–1996, doi:10.1002/2015MS000493.
9. Pritchard M. S., C. DeMott and C. S. Bretherton, 2014. Restricting 32–128 km horizontal scales hardly affects the MJO in the Superparameterized Community Atmosphere Model v.3.0 but the number of cloud-resolving grid columns constrains vertical mixing, *J. Adv. Model. Earth Syst.*, 6, doi:[10.1002/2014MS000340](https://doi.org/10.1002/2014MS000340).

10. Qin, H., M. S. Pritchard, G. J. Kooperman and H. Parishani, 2018. Global Effects of SuperParameterization on Hydro-Thermal Land–Atmosphere Coupling on Multiple Timescales, *J. Adv. Model. Earth Syst.*, 10, 2018.

d. Synergistic Activities

1. Associate Editor for AGU, *Journal of Advances in Modeling Earth Systems*.
2. Co-Lead, US CLIVAR Data Science Working Group.
3. University Partner (1 of 2 nationally), DOE Exascale Computing Project.

Valerie Purdie Greenaway

Associate Professor of Psychology
Columbia University
401D Schermerhorn, 1190 Amsterdam Avenue
New York, NY 10027
(212) 854-1954
vjp12@columbia.edu

(a) Professional Preparation

Columbia University	New York, NY	Psychology	B.A., 1993
Stanford University	Stanford, CA	Psychology	Ph.D., 2004

(b) Appointments

- Associate Professor of Psychology, Columbia University, 2014-Present
- Assistant Professor of Psychology, Columbia University, 2009-2014
- Assistant Professor of Psychology, Yale University, 2004-2009

(c) Products

(i) Five publications/products most closely related to the proposed project

- Purdie-Greenaway, V., & Turetsky, K. M. (2019). Socioecological diversity and inclusion: A framework for advancing diversity science. *Current Opinion in Psychology*, 32, 171–176.
- Goyer, J.P., Garcia, J., Purdie-Vaughns, V., Binning, K.R., Cook, J.E., Reeves, S.L., Apfel, N., Taborsky-Barba, S., Sherman, D.K., & Cohen, G.L. (2017). Self-affirmation facilitates minority middle schoolers' progress along college trajectories. *Proceedings of the National Academy of Sciences*.
- Powers, J., Cook, J. E., Purdie-Vaughns, V., Garcia, J., Apfel, N., & Cohen, G. L. (2016). Changing environments by changing individuals: The emergent effects of psychological intervention. *Psychological Science*, 27(2), 150-160.
- Mohr, R., & Purdie-Vaughns, V. (2015). Diversity within women of color: Why experiences change felt stigma, *Sex Roles*, 7(9-10), 391-398.
- Purdie-Vaughns, V., & Ditlemann, R. (2010). Reflections on diversity science in social psychology. *Psychological Inquiry*, 21(2), 153-159.

(ii) Five other significant publications/products, whether or not related to the proposed project.

- Chen, C. Y., Purdie-Vaughns, V., Phelan, J. C., Yu, G., & Yang, L. H. (2015). Racial and mental illness stereotypes and discrimination: An identity-based analysis of the Virginia Tech and Columbine shootings. *Cultural Diversity and Ethnic Minority Psychology*, 21(2), 279-287.
- Yeager, D.S., Purdie-Vaughns, V., Garcia, J., Apfel, N., Brzustoski, P., Master, A., Hessert, W.T., Williams, M.E., & Cohen, G.L. (2014). Breaking the cycle of mistrust: Wise interventions to provide critical feedback across the racial divide. *Journal of Experimental Psychology-General*, 143(2), 804-824.
- Sedlovskaya, A., Purdie-Vaughns, V., Eibach, R., LaFrance, M., Romero-Canyas, R., & Camp, M. (2013). Internalizing the closet: Stigma concealment heightens the cognitive distinction between public and private selves. *Journal of Personality and Social Psychology*, 104(4), 695-715.

- Shnabel, N., Purdie-Vaughns, V., Cook, J. E., Garcia, J., & Cohen, G. L. (2013). Demystifying values- affirmation interventions: Writing about social-belonging is a key to buffering against stereotype threat. *Personality and Social Psychology Bulletin*, 39(5), 663-676.
- Purdie-Vaughns, V., Cohen, G. L., Garcia, J., Sumner, R., Cook, J. E., & Apfel, N. H. (2009). Improving minority academic performance: How a values-affirmation intervention works. *Teachers College Record*, September 23, 2009.

(d) Synergistic Activities

- Special Advisor to the Executive Vice President for Arts and Sciences, Columbia University, 2014-Present
- National Academies in Education Fellow, 2014
- Society for Personality and Social Psychology Cialdini Award, 2015

MAUREEN E. RAYMO

Lamont-Doherty Earth Observatory
61 Route 9W, Palisades, NY 10964
845-365-8801
Raymo@ldeo.columbia.edu

PROFESSIONAL PREPARATION

Brown University	Providence, RI	Geosciences	Sc.B, 1982
Columbia University	New York, NY	Geosciences	M.A., 1985
Columbia University	New York, NY	Geosciences	M.Phil., 1988
Columbia University	New York, NY	Geosciences	Ph.D., 1989

ACADEMIC APPOINTMENTS

2015-present	Bruce C. Heezen Lamont Research Professor, LDEO
2011-2015	Lamont Research Professor, Lamont-Doherty Earth Observatory
2011-present	Director, Lamont-Doherty Core Repository, LDEO
2003-2011	Research Professor, Dept. of Earth Sciences, Boston University.
2001-2007	Adjunct Scientist, Woods Hole Oceanographic Institution
2000-2003	Research Associate Professor, Dept. of Earth Sciences, Boston University.
1997-2000	Associate Prof., Dept. Earth, Atmospheric, and Planetary Sciences, MIT.
1992-1997	Assistant Prof., Dept. Earth, Atmospheric, and Planetary Sciences, MIT.
1991-1992	Assistant Prof., Dept. Geology and Geophysics, UC-Berkeley.
1989-1994	Adjunct Assoc. Research Scientist, Lamont-Doherty Geological Observatory.
1989-1990	Associate Scientist, Geology Dept., Univ. of Melbourne, Australia.

FIVE PRODUCTS related to proposal (student/post-doc first authors in bold)

- O'Leary**, M., P. Hearty, W. Thompson, M. E. Raymo, J. Mitrovica, and J. Webster, 2013, Ice sheet collapse following a period of stable eustatic sea level during MIS5e, *Nature Geoscience*, doi:10.1038/ngeo1890.
- Rovere** A., M.E. Raymo, M. Vacchi, T. Lorscheid, P. Stocchi, L. Gómez-Pujol, D. L. Harris, Elisa Casella, M. J. O'Leary, P. J. Hearty, 2016, The analysis of Last Interglacial (MIS5e) relative sea-level indicators: Reconstructing sea-level in a warmer world, *Earth Science Revs.*, v. 159, p. 404-427.
- Toomey, M. R.**, A. Ashton, M. E. Raymo, and J. T. Perron, 2016, Cenozoic sea level and the rise of modern rimmed atolls, *Palaeo. Palaeo. Palaeo.*, v. 451, p. 73-83.
- Raymo, M.E., R. Kozdon, D. Evans, L. Lisiecki, and **H. Ford**, 2017, The accuracy of mid-Pliocene $\delta^{18}\text{O}$ based ice volume and sea level reconstructions, *Earth Science Reviews*, v. 177, p. 291-302.
- Rovere, A., E. Casella, **D. Harris**, **T. Lorscheid**, N. Nanadasena, **B. Dyer**, **M. Sandstrom**, P. Stocchi, W. D'Andrea, and M. Raymo, 2017, North Atlantic "superstorms" during the last Interglacial? Modeling paleo waves and the transport of giant boulders. *PNAS*, v. 114, 12144-12149.

FIVE ADDITIONAL PRODUCTS

- Ford, H.**, S. Sosdian, Y. Rosenthal, and M. E. Raymo, 2016, Gradual and abrupt changes during the Mid-

- Pleistocene Transition., *Quat. Sci. Revs.*, v. 148, p. 222-233.
- Shakun, J.D.**, M. E. Raymo, and D. W. Lea, 2016, An early Pleistocene Mg/Ca- $\delta^{18}\text{O}$ record from the Gulf of Mexico: Evaluating ice sheet size and pacing in the 41-kyr world, *Paleoceanography*, v. 31, p. 1011-1027, DOI: 10.1002/2016PA002956.
- Evans, D.**, C. Brierly, M.E. Raymo, J. Erez, W. Muller, 2016, Planktic foraminifera shell chemistry response to seawater chemistry: Pliocene-Pleistocene seawater Mg/Ca, temperature, and sea level change, *EPSL*, v. 438, p. 139-148, doi.org/10.1016/j.epsl.2016.01.013.
- Eshel, G., A. Shepon, **S. Gilutz, D. Giddings**, M. Raymo, and R. Milo, 2017, How much sustainable beef can the U.S. produce? *Nature Ecology and Evolution*, v. 2, p. 81-85. (This paper arose from a directed study I lead with MA students in the School of International and Public Affairs at Columbia University).
- Campbell, S. M.**, R. Moucha, L. A. Derry, and M.E. Raymo, 2018, Dynamic topography and the Cenozoic carbonate compensation depth, *G-cubed*, 19, DOI: 10.1002/2017GC007386.

SYNERGISTIC ACTIVITIES

Active participant in the organizational structure of ODP and IODP including service on a number of committees (SCICOM, OHP) and planning groups and Chair of SASEC (IODP) and member of IWG+

Published book on geological history of Northeastern U. S. for non-scientists but also widely used in classrooms at college level (Written In Stone, C. Raymo and M. E. Raymo, 1989, revised 3rd edition published in 2007—continually in press for twenty-five years)

Lecturer at Urbino Summer School in Paleoclimatology and the CIDER Summer School
Member PALSEA steering committee; Community service through committees in AGU, EGU and AAAS and numerous public lectures to local civic organizations and to Lamont interns
Supervised more than two dozen undergraduate research projects in last 25 years (mostly women, the overwhelming majority of applicants)

Andrew Revkin

Earth Institute, Columbia University
2910 Broadway, New York, NY 10025
914-441-5556
andrew.revkin@columbia.edu

a. Professional Preparation

Brown University	Biology	BA, 1978
Columbia University	Journalism	MS, 1982

b. Appointments

2019-Present – Founding Director, Initiative on Communication and Sustainability, Earth Institute, Columbia University
2018-2019, Strategic Adviser for Science Journalism, National Geographic Society
2016-2018, Senior Reporter for Climate Change, ProPublica
2013-2019, A.D. White Professor-at-Large, Institute for Climate Smart Solutions, Cornell University
2010-2016, Senior Fellow for Environmental Understanding, Pace University
1995-2016, News Reporter and then Dot Earth Blogger for Opinion Section, The New York Times
1987-1989, Senior Editor, Discover Magazine
1986-1987, Reporter, Los Angeles Times
1983-1985, Assistant Editor and Senior Writer, Science Digest Magazine

c. Products**Five products most closely related to proposal project.**

1. Revkin, A., & Mechaley, L. (2018). *Weather: an illustrated history: from cloud atlases to climate change*. New York: Sterling.
2. Revkin, A. C. (2010, October 26). On Balance, Hype, Climate and the Media. Retrieved from <https://dotearth.blogs.nytimes.com/2010/10/26/on-balance-hype-climate-and-the-media/>
3. Revkin, A. (2011). Communicating Climate Change. In *Successful Science Communication: Telling It Like It Is*. New York, NY: Cambridge University Press.
4. Revkin, A. (2005). Why the Media Stumble Over the Environment. In *A Field Guide for Science Writers* (2nd ed.). New York, NY: Oxford University Press.
5. The New Communications Climate. (2017, November 27). Retrieved from <https://public.wmo.int/en/bulletin/new-communications-climate>.

Five other significant products.

1. Revkin, A. C. (2010, October 26). On Balance, Hype, Climate and the Media. Retrieved from <https://dotearth.blogs.nytimes.com/2010/10/26/on-balance-hype-climate-and-the-media/?mtrref=undefined&gwh=4C6E92CE33F371890B0D05E5A0A60701&gwt=pay&assetType=REGIWALL>.
2. Revkin, A. (1992). *Global warming: understanding the forecast*. New York u.a.: Abbeville Press.
3. Revkin, A. C. (2010, August 1). Into the breach. Retrieved from <https://esajournals.onlinelibrary.wiley.com/doi/full/10.1890/1540-9295-8.6.283>.

d. Synergistic Activities

1. National Academy of Sciences Communication Award, 2002 and 2011
2. Member, Working Group on the “Anthropocene” – Subcommission on Quaternary Stratigraphy, International Commission on Stratigraphy (2010-2016)
3. Guggenheim Fellow (science writing), John Simon Guggenheim Foundation (2006)
4. Co-creator of the Warm Regards podcast on climate science, policy, communication and perceptions
5. Science in Society Award, National Association of Science Writers, 2006

Cynthia G. Rush

Assistant Professor, Department of Statistics
Columbia University
Room 1009, 1255 Amsterdam Avenue, New York, NY 10027

Professional Preparation

University of North Carolina at Chapel Hill	Chapel Hill, NC	Mathematics	B.S. 2010
Yale University	New Haven, CT	Statistics	M.A. 2011
Yale University	New Haven, CT	Statistics	PhD. 2016

Appointments

2017 – Present Assistant Professor, *Columbia University*, New York, NY
2016 – 2017 Term Assistant Professor, *Columbia University*, New York, NY
2010 – 2016 Graduate Research Assistant, *Yale University*, New Haven, CT

Relevant Products

- C. Rush and R. Venkataramanan, “Finite Sample Analysis of Approximate Message Passing”, forthcoming *IEEE Transactions on Information Theory*.
- Y. Ma, C. Rush, and D. Baron, “Analysis of Approximate Message Passing with Non-Separable Denoisers and Markov Random Field Priors”, *IEEE Transactions on Information Theory*, Vol. 65, No. 11, November 2019.
- C. Rush, A. Greig, and R. Venkataramanan, “Capacity-achieving Sparse Superposition Codes with Approximate Message Passing Decoding”, *IEEE Transactions on Information Theory*, Vol. 63, No. 3, March 2017.
- Z. Bu, J. Klusowski, C. Rush, and W. Su, “Algorithmic Analysis and Statistical Estimation of SLOPE via Approximate Message Passing”, *NeurIPs 2019*.
- C. Rush and R. Venkataramanan, “The Error Exponent of Sparse Regression Codes with AMP Decoding”, *IEEE Transactions on Information Theory*, Vol. 65, No. 5, May 2019.

Other Significant Products

- A. Ma, Y. Zhou, C. Rush, D. Baron, and D. Needell, “An Approximate Message Passing Framework for Side Information”, *IEEE Transactions on Signal Processing*, Vol. 67, No. 7, February 2019.
- K. Hsieh, C. Rush, and R. Venkataramanan, “Spatially Coupled Sparse Regression Codes: Design and State Evolution Analysis”, *Proceedings of IEEE Int. Symp. on Information Theory (ISIT)*, 2018.
- C. Rush, “An Asymptotic Rate for the LASSO Loss”, *AISTATS 2020*.
- H. Liu, C. Rush, and D. Baron, “State Evolution Analysis of Approximate Message Passing with Side Information”, *Proceedings of IEEE Int. Symp. on Information Theory (ISIT)*, 2019.
- C. Rush, K. Hsieh, and R. Venkataramanan, “Capacity-achieving Sparse Regression Codes via Spatial Coupling”, *Proceedings of IEEE Information Theory Workshop (ITW)*, 2019.

Synergistic Activities

- *Co-organizer of the Columbia University Department of Statistics and TRIPODS Theme Year on Statistical Machine Learning*: Organized seminars, workshops, machine learning bootcamps, and tutorials.

- *Statistical Machine Learning Curriculum Development*: independently developed curricular materials for ‘Introduction to Statistical Computing’, the first course in three-course statistical machine learning sequence for undergraduates and Master’s students at Columbia University.
- *Development of Pedagogical Methods for Data Science Education*: See X. Wang, C. Rush, and N. Horton “Data Visualization on Day One: Bringing Big Ideas Into Intro Stats Early and Often”, *Technology Innovations in Statistics Education*, Volume 10, Issue 1, 2017.
- *Reviewer*: *Annals of Statistics*; *Journal of Machine Learning Research*; *IEEE Transactions on Information Theory*; *SIAM Journal on Mathematical Analysis*; *IEEE Transactions on Signal Processing*; *IEEE Communications Letters*; *NeurIPS*; *International Conference of Machine Learning*; *Women in Machine Learning Conference*; *IEEE International Symposium on Information Theory*; *Sensors*; *Journal of Statistics Education*.
- *Mentor*: *Statistical Learning Research Roundtable*, *Finding and Academic Job Roundtable*, *Women in Machine Learning Workshop*, December 2016.

Gavin Schmidt

Director, Goddard Institute for Space Studies
National Aeronautics and Space Administration
2880 Broadway, New York, NY 10025
212) 678-5627
Gavin.A.Schmidt-at-nasa.gov

A. PROFESSIONAL PREPARATION

Oxford University, Oxford, UK, Mathematics, B.A., 1988
University College London, London, UK, Applied Mathematics, Ph.D., 1994
McGill University, Montreal, QC, Climate Science, Postdoc, 1994-1996
National Oceanic and Atmospheric Administration, Silver Spring, MD, Postdoc, 1996-1998

B. ACADEMIC/PROFESSIONAL APPOINTMENTS

NASA Goddard Institute for Space Studies, New York, NY	
Director	2014-
Deputy Director	2012-2014
Physical Scientist	2004-
Columbia University, Earth Institute, New York, NY	
Adjunct Research Scientist	2004-
Research Scientist	2002-2004
Associate Research Scientist	1998-2002
NOAA Postdoctoral Fellow in Climate and Global Change	1996-1998

C. PRODUCTS

Five Products Most Closely Related to Proposal

Abramowitz, G., N. Herger, E. Gutmann, D. Hammerling, R. Knutti, M. Leduc, R. Lorenz, R. Pincus, and **G.A. Schmidt**, 2019: Model dependence in multi-model climate ensembles: weighting, sub-selection and out-of-sample testing. *Earth Syst. Dynam.*, **10**, 91-105, doi:10.5194/esd-10-91-2019.

Schmidt, G.A., D. Bader, L.J. Donner, G.S. Elsaesser, J.-C. Golaz, C. Hannay, A. Molod, R. Neale, and S. Saha, 2017: Practice and philosophy of climate model tuning across six U.S. modeling centers. *Geosci. Model Dev.*, **10**, 3207-3223, doi:10.5194/gmd-10-3207-2017.

Schmidt, G.A., J.D. Annan, P.J. Bartlein, B.I. Cook, E. Guilyardi, J.C. Hargreaves, S.P. Harrison, M. Kageyama, A.N. LeGrande, B. Konecky, S. Lovejoy, M.E. Mann, V. Masson-Delmotte, C. Risi, D. Thompson, A. Timmermann, L.-B. Tremblay, and P. Yiou, 2014: Using paleo-climate comparisons to constrain future projections in CMIP5. *Clim. Past*, **10**, 221-250, doi:10.5194/cp-10-221-2014.

Monteleoni, C., **G.A. Schmidt**, F. Alexander, A. Niculescu-Mizil, K. Steinhäuser, M. Tippet, A. Banerjee, M.B. Blumenthal, A.R. Ganguly, J.E. Smerdon, and M. Tedesco, 2013: Climate informatics. In *Computational Intelligent Data Analysis for Sustainable Development*. T. Yu, N. Chawla, and S. Simoff, Eds., Data Mining and Knowledge Discovery Series. Chapman and Hall/CRC, pp. 81-126.

Monteleoni, C., **G.A. Schmidt**, and S. McQuade, 2013: Climate informatics: Accelerating discovering in climate science with machine learning. *Comput. Sci. Eng.*, **15**, 32-41, doi:10.1109/MCSE.2013.50.

Five Other Significant Products

Susskind, J., **G.A. Schmidt**, J.N. Lee, and L. Iredell, 2019: Recent global warming as confirmed by AIRS. *Environ. Res. Lett.*, **14**, no. 4, 044030, doi:10.1088/1748-9326/aafd4e.

Schmidt, G.A., D. Bader, L.J. Donner, G.S. Elsaesser, J.-C. Golaz, C. Hannay, A. Molod, R. Neale, and S. Saha, 2017: Practice and philosophy of climate model tuning across six U.S. modeling centers. *Geosci. Model Dev.*, **10**, 3207-3223, doi:10.5194/gmd-10-3207-2017.

Marvel, K., G.A. Schmidt, R.L. Miller, and L. Nazarenko, 2016: Implications for climate sensitivity from the response to individual forcings. *Nature Clim. Change*, **6**, no. 4, 386-389, doi:10.1038/nclimate2888.

Schmidt, G.A., M. Kelley, L. Nazarenko, R. Ruedy, G.L. Russell, I. Aleinov, M. Bauer, S.E. Bauer, M.K. Bhat, R. Bleck, V. Canuto, Y.-H. Chen, Y. Cheng, T.L. Clune, A. Del Genio, R. de Fainchtein, G. Faluvegi, J.E. Hansen, R.J. Healy, N.Y. Kiang, D. Koch, A.A. Lacis, A.N. LeGrande, J. Lerner, K.K. Lo, E.E. Matthews, S. Menon, R.L. Miller, V. Oinas, A.O. Oloso, J.P. Perlwitz, M.J. Puma, W.M. Putman, D. Rind, A. Romanou, M. Sato, D.T. Shindell, S. Sun, R.A. Syed, N. Tausnev, K. Tsigaridis, N. Unger, A. Voulgarakis, M.-S. Yao, and J. Zhang, 2014: Configuration and assessment of the GISS ModelE2 contributions to the CMIP5 archive. *J. Adv. Model. Earth Syst.*, **6**, no. 1, 141-184, doi:10.1002/2013MS000265.

Miller, R.L., **G.A. Schmidt**, L.S. Nazarenko, N. Tausnev, S.E. Bauer, A.D. Del Genio, M. Kelley, K.K. Lo, R. Ruedy, D.T. Shindell, I. Aleinov, M. Bauer, R. Bleck, V. Canuto, Y.-H. Chen, Y. Cheng, T.L. Clune, G. Faluvegi, J.E. Hansen, R.J. Healy, N.Y. Kiang, D. Koch, A.A. Lacis, A.N. LeGrande, J. Lerner, S. Menon, V. Oinas, C. Pérez García-Pando, J.P. Perlwitz, M.J. Puma, D. Rind, A. Romanou, G.L. Russell, M. Sato, S. Sun, K. Tsigaridis, N. Unger, A. Voulgarakis, M.-S. Yao, and J. Zhang, 2014: CMIP5 historical simulations (1850-2012) with GISS ModelE2. *J. Adv. Model. Earth Syst.*, **6**, no. 2, 441-477, doi:10.1002/2013MS000266.

D. SYNERGISTIC ACTIVITIES

- Co-chair First Annual Workshop in Climate Informatics, NYAS, New York, NY (2011)
- Co-chair of the U.S. Climate Modeling Summit, Washington DC. (2019-2020)

Rahul Sukthankar

Distinguished Scientist & Senior Director, Google Research
1600 Amphitheatre Parkway,
Mountain View, CA 94043
sukthankar@google.com

Professional Preparation

Princeton University	Princeton, NJ	Computer Science	BSE, 1991
Carnegie Mellon University	Pittsburgh, PA	Robotics	PhD, 1997

Appointments

Distinguished Scientist and Senior Director, Google Research, 2011-Present
Courtesy Faculty, Department of Computer Science, University of Central Florida, 2007-Present
Adjunct Research Professor, Robotics Institute, Carnegie Mellon University, 1997-Present
Senior Principal Research Scientist, Intel Research, 2003-2011
Senior Researcher, HP Labs/ Compaq Research, 2000-2003
Research Scientist, Just Research, 1997-2000

Products

Five (5) publications/products most closely related to the proposed project

C. Gu, C. Sun, D. Ross, C. Vondrick, C. Pantofaru, Y. Li, S. Vijayanarasimhan, G. Toderici, S. Ricco, R. Sukthankar, C. Schmid, J. Malik. AVA: A Video Dataset of Spatio-temporally localized atomic visual actions. Proceedings of CVPR, 2018.

Y.-W. Chao, S. Vijayanarasimhan, B. Seybold, D. Ross, J. Deng, R. Sukthankar. Rethinking the Faster R-CNN Architecture for Temporal Action Recognition. Proceedings of CVPR, 2018.

S. Gupta, J. Davidson, S. Levine, R. Sukthankar, J. Malik. Cognitive mapping and planning for visual navigation. Proceedings of CVPR, 2017.

L. Pinto, J. Davidson, R. Sukthankar, A. Gupta. Robust adversarial reinforcement learning. Proceedings of International Conference on Machine Learning, 2017.

L. Del Pero, S. Ricco, R. Sukthankar, V. Ferrari. Behavior discovery and alignment of articulated object classes from unstructured video. International Journal of Computer Vision, 121(2), 2017.

Five (5) other significant publications/products, whether or not related to the proposed project.

M. Satyanarayanan, P. Gibbons, L. Mummert, P. Pillai, P. Simoens, R. Sukthankar. Cloudlet-based just-in-time indexing of IoT video. Global Internet of Things Summit, 2017.

H. Idrees, A. Zamir, Y.-G. Jiang, A. Gorban, I. Laptev, R. Sukthankar, M. Shah. The THUMOS Challenge on Action Recognition for videos "in the Wild". Computer Vision and Image Understanding, 2016.

L. Del Pero, S. Ricco, R. Sukthankar, V. Ferrari. Discovering the physical parts of an articulated object class from multiple videos. Proceedings of CVPR, 2016.

G. Toderici, S. O'Malley, S.-J. Hwang, D. Vincent, D. Minnen, S. Baluja, M. Covell, R. Sukthankar. Variable rate image compression with Recurrent Neural Networks. Proceedings of ICLR, 2016.

M. Leordeanu, A. Radu, S. Baluja, R. Sukthankar. Labeling the Features Not the Samples: Efficient Video Classification. Proceedings of AAAI, 2016.

Synergistic Activities

- Editor in Chief, Journal of Machine Vision and Applications, 2015-present
- Fellow, Institute of Electrical and Electronics Engineers
- General Chair, IEEE International Conference on Computer Vision and Pattern Recognition, 2021
- Program Chair, IEEE Winter Conference on Applications of Computer Vision, 2014, 2016
- Workshop Chair. IEEE Conference on Computer Vision and Pattern Recognition, 2009

MARÍA URIARTE

Professor of Ecology, Evolution & Environmental Biology
Columbia University
1200 Amsterdam Avenue, New York, NY 10027
212-854-1494
mu2126@columbia.edu

PROFESSIONAL PREPARATION

State University of New York, Albany, NY	Information Systems	B.S. 1984
Yale University, New Haven, CT	Environmental Science	M.S. 1995
Cornell University, Ithaca, NY	Ecology and Evolutionary Biology	Ph.D. 2002

APPOINTMENTS

2013- Professor, Columbia University, Dept. of Ecology, Evolution & Environmental Biology
2013- Adjunct Professor, University of São Paulo, Brazil
2011-2013 Associate Professor, Columbia University, Dept. of Ecology, Evolution & Environmental Biology
2005-2011 Assistant Professor, Columbia University, Dept. of Ecology, Evolution & Environmental Biology
2002–2005 Postdoctoral Fellow, Institute of Ecosystem Studies

FIVE PUBLICATIONS MOST CLOSELY RELATED TO THE PROPOSED PROJECT

Uriarte, M. J. Thompson, and J.K. Zimmerman. 2019. Hurricane María tripled stem breaks and doubled tree mortality relative to other major storms. *Nature Communications* 10:1362.

Feng, X., **M. Uriarte**, J. Thompson, G. Gonzalez, S. Reed, J. K. Zimmerman, and L. Murphy. 2017. Improving predictions of tropical forest response to climate change through integration of field studies and ecosystem modeling. *Global Change Biology* doi: 10.1111/gcb.13863.

Uriarte, M., J. R. Lasky, V. Boukili, and R. L. Chazdon. (2016). A trait-mediated, neighborhood approach to quantify climate impacts on tropical rainforest succession. *Functional Ecology* 30: 157-167.

Uriarte, M. J. S. Clark, L. S. Comita, J. Thompson, and J. K. Zimmerman. (2012). Multi-dimensional tradeoffs in species responses to disturbance: Implications for successional diversity in a subtropical forest. *Ecology* 93: 191-205.

Uriarte, M., C. D. Canham, J. Thompson, J. K. Zimmerman. (2009). Understanding natural disturbance and human land use as determinants of tree community dynamics in a subtropical wet forest: Results from a forest simulator. *Ecological Monographs* 79:423-443.

FIVE OTHER SIGNIFICANT PUBLICATIONS

Uriarte, M., N. Schwartz, J. Powers, E. Marin-Spiotta, W. Liao, and L. Werden. (2016). Impacts of climate variability on tree demography in second-growth tropical forests: The importance of regional context for predicting successional trajectories. *Biotropica* 48: 780-797.

Lasky, J., **M. Uriarte**, V. Boukili, and R. L. Chazdon. (2014). Trait-mediated assembly processes predict successional changes in community diversity of tropical forests. *Proceedings of the National Academy of Sciences, USA* 15: 5616–5621.

Uriarte, M., N. Swenson, R. Chazdon, L.S. Comita, D. L. Erickson, W.J. Kress, J. Thompson, and J.K. Zimmerman. (2010). Trait similarity, shared ancestry, and the structure of neighborhood interactions in a subtropical forest: Implications for community assembly. *Ecology Letters* 13: 1503-1514.

Uriarte, M., C.D. Canham, J. Thompson and J.K. Zimmerman. (2005). Seedling recruitment in a hurricane-driven tropical forest: light limitation, density dependence and the spatial distribution of parent trees. *Journal of Ecology* 93: 291-304.

Canham, CD, J. Thompson, J.K. Zimmerman, and **M. Uriarte**. (2010). Variation in susceptibility to hurricane damage as a function of storm severity in Puerto Rican tree species. *Biotropica* 42: 87-94.

SYNERGISTIC ACTIVITIES

- Smithsonian Tropical Research Institute, Member, Professional Accomplishments and Evaluation Committee.
- Editorial/board services: *Ecology* (2012-present), *Biotropica* (2010-2014), *Ecology Letters* (2014-present).
- Organized and led workshop on the use of Bayesian methods for practicing ecologists (May 2013, 2016). Co-instructors: T. Hobbs, K. Ogle, and M. Hooten.
- Council Member. Association for Tropical Biology and Conservation (2010-2013).
- Co-organizer (with T. Rudel and L. Schneider), 2008 workshop “Land Use Transitions in the Tropics”, Columbia University., Dept. of Ecology, Evolution and Environmental Biology & Rutgers University, Dept. of Geography.

Marcus van Lier-Walqui

Associate Research Scientist

Center for Climate Systems Research, Columbia University

NASA Goddard Institute for Space Studies

2880 Broadway, New York, NY 10025

(212) 678-5513

mv2525@columbia.edu

a. Professional Preparation

Wesleyan University	Middletown, CT	Physics/Philosophy	B.A.	2003
Wesleyan University	Middletown, CT	Physics	M.A.	2006
University of Miami	Miami, FL	Meteorology & Phys. Ocean.	Ph.D.	2013

b. Appointments

2016-	Associate Research Scientist, Columbia University & NASA/GISS
2013-2016	Postdoctoral Research Scientist Columbia University & NASA/GISS

c. Publications

- i. Five publications most closely related to the proposed project
 1. Fridlind, A.M., M. van Lier-Walqui, S. Collis, S.E. Giangrande, R.C. Jackson, X. Li, T. Matsui, R. Orville, M.H. Picel, D. Rosenfeld, A. Ryzhkov, R. Weitz, and P. Zhang, 2019: Use of polarimetric radar measurements to constrain simulated convective cell evolution: A pilot study with Lagrangian tracking. *Atmos. Meas. Tech.*, 12, 2979-3000, doi:10.5194/amt-12-2979-2019.
 2. Morrison, H.C., M. van Lier-Walqui, M.R. Kumjian, and O.P. Prat, 2019: A Bayesian approach for statistical-physical bulk parameterization of rain microphysics, Part I: Scheme description. *J. Atmos. Sci.*, submitted.
 3. van Lier-Walqui, M., H.C. Morrison, M.R. Kumjian, K.J. Karly J. Reimel, O.P. Prat, S. Lunderman, and M. Morzfeld, 2019: A Bayesian approach for statistical-physical bulk parameterization of rain microphysics, Part II: Idealized Markov chain Monte Carlo experiments. *J. Atmos. Sci.*, submitted.
 4. van Lier-Walqui, M., T. Vukicevic, and D.J. Posselt, 2014: Linearization of microphysical parameterization uncertainty using multiplicative process perturbation parameters. *Mon. Weather Rev.*, **142**, no. 1, 401-413, doi:10.1175/MWR-D-13-00076.1.
 5. van Lier-Walqui, M., T. Vukicevic, and D.J. Posselt, 2012: Quantification of cloud microphysical parameterization uncertainty using radar reflectivity. *Mon. Weather Rev.*, **140**, 3442-3466, doi:10.1175/MWR-D-11-00216.1.
- ii. Other significant publications
 1. Kumjian, M.R., O.P. Prat, S. Collis, M. van Lier-Walqui, and H.C. Morrison, 2019: A moment-based polarimetric radar forward operator for rain microphysics. *J. Appl. Meteorol. Climatol.*, **58**, no. 1, 113-130, doi:10.1175/JAMC-D-18-0121.1.
 2. Morrison, H.C., M.R. Kumjian, C.P. Martinkus, O.P. Prat, and M. van Lier-Walqui, 2019: A general N-moment normalization method for deriving rain drop size distribution scaling relationships. *J. Appl. Meteorol. Climatol.*, **58**, no. 2, 247-267, doi:10.1175/JAMC-D-18-0060.1.

3. Elsaesser, G.S., A.D. Del Genio, J. Jiang, and M. van Lier-Walqui, 2017: An improved convective ice parameterization for the NASA GISS Global Climate Model and impacts on cloud ice simulation. *J. Climate*, **30**, no. 1, 317-336, doi:10.1175/JCLI-D-16-0346.1.
4. Fridlind, A.M., X. Li, D. Wu, M. van Lier-Walqui, A.S. Ackerman, W.-K. Tao, G.M. McFarquhar, W. Wu, X. Dong, J. Wang, A. Ryzhkov, P. Zhang, M.R. Poellot, A. Neumann, and J.M. Tomlinson, 2017: Derivation of aerosol profiles for MC3E convection studies and use in simulations of the 20 May squall line case. *Atmos. Chem. Phys.*, **17**, 5947-5972, doi:10.5194/acp-17-5947-2017.
5. Van Lier-Walqui, M., A.M. Fridlind, A.S. Ackerman, S. Collis, J.J. Helmus, D.R. MacGorman, K. North, P. Kollias, and D.J. Posselt, 2016: Polarimetric radar signatures of deep convection: Columns of specific differential phase observed during MC3E. *Mon. Weather Rev.*, **144**, no. 2, 737-758, doi:10.1175/MWR-D-15-0100.1.

d. Synergistic Activities

1. Organizer and co-chair, DOE ASR Radar Science breakout session (2015)
2. Participant and contributor, GEWEX Aerosol-Clouds-Precipitation and Climate (ACPC) initiative.
3. Co-chair, discussion session, ASR Radar Science Meeting (2017) Member, Program Committee, AMS Radar Conference (2017)
4. Associate Editor, Monthly Weather Review (2015-present) and Journal of Applied Meteorology and Climatology (2015-2018).
5. Co-convenor, ASR Principal Investigator Meeting breakout session on process-oriented atmospheric observations (2019)

Carl Vondrick

Assistant Professor of Computer Science

Columbia University

Computer Science Building, 500 West 120th Street, New York, NY 10027

(212) 939-7020

vondrick@cs.columbia.edu

<https://www.cs.columbia.edu/~vondrick/>

(a) Professional Preparation

University of California, Irvine	Irvine, CA	Computer Science	B.S. 2011
Massachusetts Institute of Technology	Cambridge, MA	Computer Science	M.S. 2013
Massachusetts Institute of Technology	Cambridge, MA	Computer Science	Ph.D. 2017

(b) Appointments

Assistant Professor, Department of Computer Science, Columbia University, July 2018 to Present

Research Scientist, Google Research, June 2017 to July 2018

(c) Products

Most Closely Related

1. Carl Vondrick, Abhinav Shrivastava, Alireza Fathi, Sergio Guadarrama, Kevin Murphy. “Tracking Emerges by Colorizing Videos.” European Conference on Computer Vision (ECCV). 2018.
2. Carl Vondrick, Hamed Pirsiavash, Antonio Torralba. “Generating Videos with Scene Dynamics” Neural Information Processing Systems (NIPS). 2016.
3. Carl Vondrick, Hamed Pirsiavash, Antonio Torralba. “Anticipating Visual Representations with Unlabeled Video” Computer Vision and Pattern Recognition (CVPR). 2016.
4. Carl Vondrick, Yusuf Aytar, Antonio Torralba. “SoundNet: Learning Sound Representations from Unlabeled Video” Neural Information Processing Systems (NIPS). 2016.
5. Hang Zhao, Chuang Gan, Andrew Rouditchenko, Carl Vondrick, Josh McDermott, Antonio Torralba “The Sound of Pixels.” European Conference on Computer Vision (ECCV). 2018.

Other Significant Products

6. Carl Vondrick, Aditya Khosla, Hamed Pirsiavash, Tomasz Malisiewicz, Antonio Torralba. “Visualizing Object Detection Features” International Journal of Computer Vision (IJCV). 2016.
7. Carl Vondrick, Donald Patterson, Deva Ramanan. “Efficiently Scaling Up Crowdsourced Video Annotation” International Journal of Computer Vision (IJCV). 2012.
8. Xiangxin Zhu, Carl Vondrick, Charless Fowlkes, Deva Ramanan. “Do we need more training data?” International Journal of Computer Vision (IJCV). 2015.
9. Hamed Pirsiavash, Carl Vondrick, Antonio Torralba. “Assessing the Quality of Actions” European Conference on Computer Vision (ECCV). 2014.
10. Lluís Castrejon, Yusuf Aytar, Carl Vondrick, Hamed Pirsiavash, Antonio Torralba. “Learning Aligned Cross-Modal Representations from Weakly Aligned Data” Computer Vision and Pattern Recognition (CVPR). 2016.

(d) Synergistic Activities

- Senior Program Committee for CVPR (2018-2020), ICML (2019), NeurIPS (2019), and peer reviewer for CVPR, ECCV, ICCV, NIPS, PAMI, IJCV (2011 to Present).
- I am co-organizer of several workshops on unsupervised learning (CVPR 2018, 2019, ICML 2019).
- My research infrastructure, such as datasets, software, and models, are widely used by industry, academia, and other government agencies.
- We actively involve undergraduates, often from diverse backgrounds, in all aspects of our research.

Ensheng Weng

Associate Research Scientist, NASA Goddard Institute for Space Studies

2880 Broadway

(212) 678-5500

ensheng.weng@nasa.gov

(a) Professional Preparation

Shaanxi Normal University	China	Biology	BS 1997
National Academy of Sciences	China	Ecology	PhD 2005
University of Oklahoma	Oklahoma	Ecosystem Modeling	PhD 2011
Princeton University	Princeton, NJ	Vegetation Modeling	Postdoc 2011-2016

(b) Appointments

Associate Research Scientist, NASA Goddard Institute, 2016-Present

Associate Research Scientist, Center for Climate Systems research, Columbia University, 2016-Present

(c) Products

(i) 5 publications/products most closely related to the proposed project

Weng, E., Dybzinski, R., Farrior, C. E., Pacala, S. W., 2019. Competition alters predicted forest carbon cycle responses to nitrogen availability and elevated CO₂: simulations using an explicitly competitive, game-theoretic vegetation demographic model. *Biogeosciences-Discussion*, <https://doi.org/10.5194/bg-2019-55>, in revision.

Du, Z., **Weng, E.**, Xia, J., Jiang, L., Luo, Y.Q, Zhou, X., 2018. Carbon-nitrogen coupling under three schemes of model representation: Traceability analysis. *Geoscience Model Development*, 10.5194/gmd-2018-41.

Weng, E. S., Farrior, C. E., Dybzinski, R., Pacala, S. W., 2017. Predicting vegetation type through physiological and environmental interactions with leaf traits: evergreen and deciduous forests in an earth system modeling framework. *Global Change Biology*, 23, 2482–2498. doi: 10.1111/gcb.13542.

Weng, E. S., Malyshev, S., Lichstein, J. W., Farrior, C. E., Dybzinski, R., Zhang, T., Shevliakova, E., Pacala, S. W., 2015. Scaling from individual trees to forests in an Earth system modeling framework using a mathematically tractable model of height-structured competition. *Biogeosciences*, 12: 2655–2694, doi:10.5194/bg-12-2655-2015.

Medlyn, B. E., S. Zaehle, M. G. De Kauwe, A. P. Walker, M. C. Dietze, P. J. Hanson, T. Hickler, A. K. Jain, Y. Luo, W. Parton, I. C. Prentice, P. E. Thornton, S. Wang, Y.-P. Wang, **E. S. Weng**, C. M. Iversen, H. R. McCarthy, J. M. Warren, R. Oren and R. J. Norby, 2015. Using ecosystem experiments to improve vegetation models. *Nature Climate Change*, 5: 528-534, doi: 10.1038/NCLIMATE2621

(ii) Five other significant publications/products, whether or not related to the proposed project.

Weng, E.S., Y.Q. Luo, W.L. Wang, H. Wang, D.J. Hayes, A. D. McGuire, A. Hastings, D. S. Schimel, 2012. Ecosystem carbon storage capacity as affected by disturbance regimes: a general theoretical model. *Journal of Geophysical Research*, 117, G03014, doi:10.1029/ 2012JG002040.

Weng, E.S., Y.Q. Luo, C. Gao, R. Oren, 2011. Uncertainty Analysis of Forest carbon sink forecast with varying measurement errors: A Data Assimilation Approach. *Journal of Plant Ecology*, 4: 178-191.

Luo, Y.Q., **Weng, E.S.**, 2011. Dynamic disequilibrium of land carbon cycle under global change. *Trends in Ecology & Evolution* 26:96-104.

Weng, E.S., and Y. Luo, 2011. Relative Information Contributions of Model vs. Data to Constraints of Short- and Long-Term Forecasts of Forest Carbon Dynamics. *Ecological Applications* 21:1490–1505.

Luo, Y. Q., **E.S. Weng**, X. W. Wu, C. Gao, X. H. Zhou, and L. Zhang. 2009. Parameter identifiability, constraint, and equifinality in data assimilation with ecosystem models. *Ecological Applications* 19: 571-574.

(d) Synergistic Activities

- Vegetation dynamics and distribution modeling in NASA Goddard Institute's ModelE
- 2018 participant at LTER/NCEAS grassland experiments and modeling workshop
- 2018 participant at NASA-USGS workshop on biodiversity and climate modeling
- 2017 participant at iLEAPS conference: Understanding the impact of land-atmosphere exchanges
- 2016 participant at National Center for Atmospheric Research (NCAR) workshop: Ecosystem Demographics in Earth System Models

Laure Zanna
Professor, Department of Mathematics, Courant Institute for Mathematical Sciences
New York University
251 Mercer Street, New York, NY 10012
(212) 998-3180
laure.zanna@nyu.edu

Professional Preparation

Tel Aviv University	Tel Aviv, Israel	B.Sc. Atmospheric Science	2001
Weizmann Institute	Rehovot, Israel	M.Sc. Environmental Sciences	2003
Harvard University	Cambridge, MA	Ph.D. Earth & Planetary Sciences	2009
University of Oxford	Oxford, UK	Postdoc in Climate Physics	2009-11

Appointments

09/01/2019- Associate Professor, Courant Institute, New York University, USA
& Affiliated Faculty, Center for Data Science.
09/01/2019- Visiting Professor, Dept. of Physics, University of Oxford, UK
2017-2018 Visiting Research Faculty, Princeton University, AOS and GFDL, USA
2017-2019 David Richards Fellow & Tutor, Wadham College, University of Oxford, UK
2011-2019 Associate Professor, Dept. of Physics, University of Oxford, UK (tenured 2016)

Publications

Bolton, T., & L. Zanna, 2019. Applications of deep learning to ocean data inference and subgrid parameterization. *Journal of Advances in Modeling Earth Systems*, 11, 376– 399.

Bachman S., J. Anstey, L. Zanna, 2018. The relationship between a deformation-based eddy parametrization and the LANS-alpha turbulence model. *Oc. Modelling*, 126, 56-62.

Zanna L., J. M. Brankart, M. Huber, S. Leroux, T. Penduff, P. D. Williams, 2018. Uncertainty and Scale Interactions in Ocean Ensembles: From Seasonal Forecasts to Multi-Decadal Climate Predictions. *QJRM*, doi: 10.1002/qj.3397

Zanna L., P.G.L. Porta Mana, J. Anstey, T. David, T. Bolton, 2017. Scale-Aware Deterministic and Stochastic Parametrizations of Eddy-Mean Flow Interaction. *Oc. Model.*, 111, 66-80.

Anstey J., L. Zanna, 2017. A deformation-based parametrization of ocean mesoscale eddy Reynolds stresses. *Oc. Modelling*, 112, 99-111.

Other Publications

Zanna L., S. Khatiwala, J. M. Gregory, J. Ison, P. Heimbach, 2019. Global reconstruction of historical ocean heat storage and transport. *Proceedings of the National Academy of Sciences*, 116(4), pp.1126-1131

Bronselaer B., L. Zanna, D. Munday, J. Lowe, 2018. Southern Ocean carbon-wind stress feedback. *Clim. Dyn.*, 51(7-8), 2743-2757.

Huber M., L. Zanna, 2017. Drivers of uncertainty in simulated ocean circulation and heat uptake. *GRL*, 44 (3), 1402-1413.

O'Reilly C., M. Huber, T. Woollings, L. Zanna, 2016. The signature of low frequency oceanic forcing in the Atlantic Multidecadal Oscillation. *GRL*, 43, 2810-2818.

Marshall D. P. & L. Zanna, 2014. A conceptual model of ocean heat uptake under climate change. *J. Of Climate*, 27, 22, 8444-8465.

Synergistic Activities

- Core Member US CLIVAR Group on Emerging Data Science Tools for Climate Variability and Predictability 08/2019-.
- Editor for Journal of Climate, American Meteorological Society, 10/2019 -.
- UK Research Council (NERC) Panel Member and reviewer 2011-16, and Southern Ocean Scoping Group, 2016. Reviewer for other funding agencies and journals, including NSF, SIAM, J. of Climate, PNAS, GRL, Clim. Dyn., Ocean Modelling, J. Phys. Ocean., QJRMS.
- Session organizer and convener AGU fall meeting, AGU Ocean Sciences, IUGG, APS, 2012-present.
- Advised or co-advised 11 postdocs, 5 PhD, 6 undergrads; designed a new graduate course on Climate Dynamics. University of Oxford, 2011-2019.

Daniel A. Zarrilli

Chief Climate Policy Advisor | OneNYC Director
NYC Office of the Mayor
110 William Street
New York, NY 10038
212-676-0756
DZarrilli@cityhall.nyc.gov

(a) Professional Preparation

Lehigh University	Bethlehem, PA	Civil Engineering	B.S., 1997
MIT	Cambridge, MA	Civil and Environmental Engineering	M.S., 1999

(b) Appointments

- Chief Climate Policy Advisor | OneNYC Director, NYC Office of the Mayor, 2018-Present
- Senior Director, Climate Policy and Programs | Chief Resilience Officer, NYC Office of the Mayor, 2016-2018
- Director of the Office of Recovery and Resiliency, NYC Office of the Mayor, 2014-2017
- Acting Director of the Office of Long-Term Planning and Sustainability, NYC Office of the Mayor, 2014-2014
- Director of Resiliency, NYC Office of the Mayo, 2013-2014
- Senior Policy Advisor, Coastal Protection, NYC Office of the Mayor, 2012-2013
- Senior Vice President, Portfolio Manager – Asset Management, NYC Economic Development Corporation, 2004-2013
- Senior Project Controls Engineer, Bechtel Infrastructure Corporation, 1999-2004

(d) Synergistic Activities

- Appointed to FEMA’s National Advisory Council, 2014-2017
- Served on the Resiliency Technical Advisory Panel for the State of Louisiana’s 2017 Coastal Master Plan, 2017

Biographical Sketch: Changxi Zheng

Professional Preparation Shanghai Jiaotong University, Shanghai, China
B.Eng. in Computer Science 2001–2005
Cornell University, Ithaca, NY, USA
M.S. in Computer Science 2009
Cornell University, Ithaca, NY, USA
Ph.D. in Computer Science Sep. 2006–Aug. 2012

Academic Positions Associate Professor Jul. 2017–present
Department of Computer Science, Columbia University, New York, NY, USA
Assistant Professor Sep. 2012–Jun. 2017
Department of Computer Science, Columbia University, New York, NY, USA

Related Products 1. *AirCode: Unobtrusive Physical Tags for Digital Fabrication*. Dingzeyu Li, Avinash Nair, Shree Nayar, and Changxi Zheng. *ACM Symposium on User Interface Software and Technology (UIST 2017)* (Best Paper Award).
2. *Acoustic Voxels: Computational Optimization of Modular Acoustic Filters*. Dingzeyu Li, David I.W. Levin, Wojciech Matusik, and Changxi Zheng. *ACM Transactions on Graphics (SIGGRAPH 2016)*, 35(4), July, 2016.
3. *FontCode: Embedding Information in Text Documents using Glyph Perturbation*. Chang Xiao, Cheng Zhang, and Changxi Zheng. *ACM Transactions on Graphics*, 2018.
4. *Augmenting Indoor Inertial Tracking with Polarized Light*. Zhao Tian, Yu-Lin Wei, Wei-Nin Chang, Xi Xiong, Changxi Zheng, Hsin-Mu Tsai, Kate Ching-Ju Lin, and Xia Zhou. *ACM MobiSys*, 2018.
5. *Scene-Aware Audio for 360°Videos*. Dingzeyu Li, Timothy Langlois, and Changxi Zheng. *ACM Transactions on Graphics (SIGGRAPH 2018)*.

Selected Other Products 1. *A Multi-Scale Model for Simulating Liquid-Fabric Interactions*. Yun (Raymond) Fei, Christopher Batty, Eitan Grinspun, and Changxi Zheng. *ACM Transactions on Graphics (SIGGRAPH 2018)*.
2. *Interactive Design Space Exploration and Optimization for CAD Models*. Adriana Schulz, Jie Xu, Bo Zhu, Changxi Zheng, Eitan Grinspun, and Wojciech Matusik. *ACM Transactions on Graphics (SIGGRAPH 2017)*.
3. *Multi-Scale Simulation of Nonlinear Thin-Shell Sound with Wave Turbulence*. Gabriel Cirio, Ante Qu, George Drettakis, Eitan Grinspun, and Changxi Zheng. *ACM Transactions on Graphics (SIGGRAPH 2018)*.
4. *Computational Design of Transformables*. Ye Yuan, Changxi Zheng, and Stelian Coros. *ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA)*, 2018.
5. *Computational Hydrographic Printing*. Yizhong Zhang, Chunji Yin, Changxi Zheng, and Kun Zhou. *ACM Transactions on Graphics (SIGGRAPH 2015)*, 34(4), August, 2015