

Michael J. Puma

Professor of Climate, Columbia Climate School
Director, Center for Climate Systems Research

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Research Overview

Professor Puma directs the Center for Climate Systems Research at Columbia's Climate School, a center of approximately 35 scientists and staff that works in close partnership with NASA's Goddard Institute for Space Studies under a cooperative agreement. He also serves as Editor of Earth's Future (AGU).

Prof. Puma's research develops new theoretical frameworks at the intersection of Earth system science, human decision-making, and complex systems. Current work includes extending Kahneman's System 1/System 2 framework using quantum mechanics principles, developing the "AgRichter Scale" for quantifying cascading disruptions in global food systems, and building agent-based models of refugee movement that integrate dual-process theory with network dynamics. His work spans hydroclimatology and land-atmosphere interactions to complex systems modeling of global food networks, with emphasis on shock propagation and resilience. Funders have included DARPA, NASA, NSF, and the Department of Defense.

As Interim Director of Columbia's Food for Humanity (F4H) Initiative, Prof. Puma leads a three-pillar program: Food System Dynamics, which identifies structural vulnerabilities in global food trade networks through graph theory and dynamic modeling; Operational Intelligence & Forecasting, which builds decision-support tools from annual food system dashboards to real-time humanitarian early warning platforms; and a Living Lab developing hands-on research infrastructure at Lamont campus, beginning with greenhouse and circular food systems work, with plans to expand in partnership with New York City and beyond.

Education

- 2006 **Ph.D., Civil Engineering**, *Princeton University*, Princeton, NJ
Environmental Engineering & Water Resources
- 2003 **M.A., Civil Engineering**, *Princeton University*, Princeton, NJ
Environmental Engineering & Water Resources
- 1999 **Master of International Affairs**, *Columbia University*, New York, NY
Environmental Policy Studies
- 1998 **Bachelor of Science, Civil Engineering**, *Columbia University*, New York, NY
Environmental Eng. & Water Resources
- 1994 **High School Diploma**, *Regis High School*, New York, NY

Current Positions

- 2025–present **Professor of Climate**, *Columbia Climate School*, Columbia University
Research, teaching, and service focusing on global food systems, human migration, and climate-society interactions. Current courses: Global Food Trade, Shocks, and Migration; Water Governance.
- 2017–present **Director**, *Center for Climate Systems Research*, Columbia University
Leading multi-institutional research enterprise with NASA Goddard Institute for Space Studies, overseeing 40 scientists and staff across climate science, space studies, and impact analysis. Executive responsibilities include strategic budget management through federal funding uncertainties; personnel oversight (appointments, reappointments, terminations); facilities and infrastructure management; inter-institutional coordination between NASA and Columbia; conflict resolution in a high-stakes research environment.
- 2025–present **Co-Director**, *Climate School Postdoctoral Research Program*, Columbia University
Overseeing postdoctoral research program for the Columbia Climate School, coordinating with multiple departments and external partners.
- 2026–present **Interim Director**, *Food for Humanity Initiative*, Columbia Climate School, Columbia University
Providing strategic leadership for multi-institutional initiative focused on food security, humanitarian response systems, and climate-resilient supply chains.
- 2025–present **Interim Director**, *Climate and Food Systems Advanced Certificate*, Columbia Climate School, Columbia University
Overseeing curriculum development, student advising, and cross-school coordination for newly launched advanced academic program bridging climate science and global food systems policy.
- 2025–present **Editor**, *Earth's Future*, American Geophysical Union
Handling manuscript reviews and editorial decisions for premier interdisciplinary journal focusing on global environmental challenges.
- 2025–present **Main Track Committee Chair**, *International Conference on Computational Science (ICCS)*
Co-chairing program committee for annual conference of 350+ computational science researchers. Defining and advancing state-of-the-art in computational methods across sciences and humanities.

Professional Experience

Columbia University

- 2023–2024 **Senior Research Scientist**, *Center for Climate Systems Research*
- 2016–2023 **Research Scientist**, *Center for Climate Systems Research*
- 2016–2019 **Climate and Life Fellow**, *Center for Climate and Life*
- 2010–2016 **Associate Research Scientist**, *Center for Climate Systems Research*
- 2007–2010 **Postdoctoral Research Scientist**, *Center for Climate Systems Research*

Teaching Appointments

- 2010–2024 **Adjunct Lecturer**, *School of Professional Studies*, Columbia University
- 2017–2018 **Adjunct Associate Professor**, *School of Int'l and Public Affairs*, Columbia University
Summers
- 2010–2016 **Adjunct Assistant Professor**, *School of Int'l and Public Affairs*, Columbia University
Summers

United Nations

- 2010–2014 **Principal Investigator**, *UN Development Programme*, Technical advisory role
Grant funding through Columbia University
- 1998 **Intern**, *UN Secretariat*, Dept. of Economic & Social Affairs

1998 **Research Intern**, *UN Development Programme*, Office to Combat Desertification & Drought

Other Positions

Spring 2018 **Haub Visiting Scholar**, *Pace University*, Elisabeth Haub School of Law

2006–2007 **Research Associate**, *Princeton University*, National Center for Earth-Surface Dynamics

2001 **Environmental Engineer**, *Dvirka & Bartolucci Consulting Engineers*

1999–2000 **Project/Field Environmental Engineer**, *URS Corporation*

1997 **Intern**, *Inform, Inc.*, under Dr. Nevin Cohen

Grants and Funding

Current Funding

2026–present **\$100,000**, *Climate Science and Communication Fund*, Gift, Recipient
Managed by Tilia Fund

2021–2027 **\$414,560**, *Human History of Marine Life Extraction*, European Commission, Co-Investigator
B1-ERC Synergy Grant through Trinity College Dublin

Select Past Funding

2022–2025 **\$967,357**, *South-North Migration Drivers Study*, US Department of Defense, Co-Investigator
PI: Alex de Sherbinin

2018–2023 **\$3,085,318**, *Agent-Based Network Platform for Risk Mitigation*, DARPA I2O, Principal Investigator
Symbiotic expert-ML system

2024–2025 **\$80,000**, *A KAUST Economy and Nature Model*, King Abdullah University, Principal Investigator
KAUST collaboration

2018–2024 **\$5,135,720**, *Multi-Scale Human Mobility Theory*, US Department of Defense, Co-Investigator
PI: Rachata Muneeppeerakul

2021–2024 **\$849,494**, *Modeling forest physiological responses*, NASA Modeling Analysis, Co-Investigator
PI: Ensheng Weng

2022–2023 **\$86,719**, *Satellite Monitoring of Settlement Dynamics*, NASA RAPID, Co-Investigator
PI: Jamon Van Den Hoek

2019–2021 **\$1,038,094**, *Environmental Change and Migration*, National Science Foundation, Co-Investigator
Award #1934978, PI: Richard Seager

2016–2019 **\$182,035**, *Global Food System Resilience*, Center for Climate and Life, Principal Investigator
Columbia University

2010–2014 **\$20,889**, *Climate information and modeling*, United Nations Development Programme (UNDP),
Principal Investigator
Technical advisory role

2017–2021 **\$191,607**, *Drought and heat wave forcing*, NASA, Co-Investigator
PI: BI Cook

Publications Summary

Google Scholar 8200+ citations, h-index: 37, i10-index: 52

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Peer-reviewed 56 journal articles

In preparation	14 manuscripts under review, in revision, or in preparation
Popular science	9 lay audience publications (including New York Times Op-Ed, 2022)
Reports & chapters	19 reports, chapters, or proceedings
Books	1 published; 1 in development

Publications Under Review / In Revision / In Preparation

1. **Puma MJ**, Hall J, Verschuur J, Otto C, Kuhla K, Konar M. Rethinking agricultural systems models for a polycrisis world. *Nature Food*. **In preparation.**
2. **Puma MJ**, Chon S, Wada Y, Cook BI, Nordbotten JM, Kuhla K, Otto C. Richter-scale envelopes for agricultural production disruptions. *Nature Food*. **In preparation.**
3. **Puma MJ**, Groen D, Suleimenova D, Mezuman K, Wu E, Cottier F, de Sherbinin A, Nakamura J, Wrathall DJ. Dual-Process Signatures in Conflict-Driven Displacement from South Sudan. **In preparation.**
4. **Puma MJ**, Groen D, Suleimenova D, Mezuman K. A Dual-Process Cognitive Architecture for Nuclear Evacuation Modeling. *PNAS*. **In preparation.**
5. Rager S, **Puma MJ**, Muneeppeerakul R. CHSH inequality: An economic indicator for market fragility and systemic risk. **In preparation.**
6. Johnson JC, Traff J, Hood J, Zurek-Ost M, **Puma MJ**, and Muneeppeerakul R. Network Models Reveal Food Vulnerability as a Key Factor in Migration Across African Regions. *Global Environmental Change*. **Resubmitting.**
7. Kuhla K, Jonas J, **Puma MJ**, Otto C. Climate-driven crop production volatility amplifies food price and consumption risks. *Nature Climate Change*. **In review.**
8. Esmaili E, **Puma MJ**, Ludlow F, Jobbová E, and Holm P. Warfare Ignited Price Contagion Dynamics in Early Modern Europe. **In preparation.**
9. Esmaili E, **Puma MJ**, Ludlow F, Jobbová E, and Kumar J. El Niño amplified food insecurity in early modern Europe. *Nature Food*. **In review.**
10. Esmaili E, **Puma MJ**, Ludlow F, Jobbová E, Kumar J, Holm P, Dahl JR. Seasonal Climate Shocks and Trade Flows: 300 Years of Evidence. **In preparation.**
11. Cottier F, Nébié E, Seager R, Schlenker W, McDermid S, **Puma MJ**, Morris CA, de Sherbinin A, Anderson W, Bell AR. Migration within and out of West Africa: recent trends and drivers. **In revision.**
12. Zurek-Ost M, Johnson JC, Traff J, **Puma MJ**, and Muneeppeerakul R. Toward an Expanded Typology of Global Migration Networks and Their Environmental-Conflict Dimensions. *Environmental Research Letters*. **In preparation.**
13. Kuhla K, Otto C, **Puma MJ**, Jaegermeyr J. Climate change-driven shifts of global and regional food security risks throughout the 21st century. *Nature Food*. **In review.**
14. Jahani A, **Puma MJ**, Harbach L, Ghorbani M, Suleimenova D, Xue Y, and others. DFlee: An Agent-Based Model for Flood-Induced Population Displacement. *Sci. Rep.* **In revision.**

Peer-Reviewed Publications (Complete List)

1. Best, M.J., A.P. Lock, G. Balsamo, E. Bazile, I. Beau, J. Cuxart, M.B. Ek, K. Findell, A. Fridlind, A.A.M. Holtlag, W. Huang, M.A. Jiménez, S. Kumar, D. Lawrence, S. Malyshev, P. Le Moigne, **M. Puma**, R. Ronda, J.A. Santanello, I. Sandu, X. Shen, G.-J. Steeneveld, G. Svensson, P.A. Vaillancourt, W. Wang, A. Zadra, and W. Zheng, 2025 Rolling DICE to advance knowledge of land-atmosphere interactions. *Q. J. Roy. Meteorol. Soc.*, early on-line, doi:10.1002/qj.4944.
2. Konar M, Fisher-Vanden K, Grogran D, Haqiqi I, Mejia A, **Puma MJ**, 2025 Groundwater and trade: towards an interdisciplinary consensus and roadmap for future research. *Environ. Res. Lett.*, 20, no. 7, 071002, doi:10.1088/1748-9326/adda61.
3. Palandri C, Concha Larrauri P, Gelman A, Lall U, **Puma MJ**, 2025 A multilevel Bayesian approach to climate-fueled migration and conflict. *Sci. Rep.*, 15, 41268, doi:10.1038/s41598-025-25332-6.
4. Kuhla, K., **M.J. Puma**, and C. Otto, 2024 International cooperation was key to stabilize wheat prices after the Russian invasion of Ukraine. *Commun. Earth Environ.*, 5, no. 1, 481, doi:10.1038/s43247-024-01638-7.
5. Nakamura, J., R. Seager, H. Liu, F. Cottier, **M.J. Puma**, D.J. Wrathall, B. Katz, A. de Sherbinin, and S.B. Adamo, 2024 Recent trends in agriculturally relevant climate in Central America. *Int. J. Climatol.*, 44, no. 8, 2701-2724, doi:10.1002/joc.8476.
6. Muneeppeerakul, R., J. Johnson, **M. Puma**, and M. Zurek, 2024 Triadic signatures of global refugee and migrant flow networks. *PLOS ONE*, 19, no. 2, e0298876, doi:10.1371/journal.pone.0298876.
7. Karakoc, D.B., M. Konar, **M.J. Puma**, and L.R. Varshney, 2023 Structural chokepoints determine the resilience of agri-food supply chains in the United States. *Nat. Food*, 4, no. 7, 607-615, doi:10.1038/s43016-023-00793-y.
8. Heino, M., P. Kinnunen, W. Anderson, D.K. Ray, **M.J. Puma**, O. Varis, S. Siebert, and M. Kummu, 2023 Increased probability of hot and dry weather extremes during the growing season threatens global crop yields. *Sci. Rep.*, 13, 3583, doi:10.1038/s41598-023-29378-2.
9. Griffith, D., R. Muneeppeerakul, G. Guerry, A.C. Cabrero, J.C. Johnson, R. Munoz-Carpena, **M. Puma**, U. Lall, and M. Homayounfar, 2023 Migration and livelihood constellations: Assessing common themes in the face of environmental change in Somalia and among Agro-Pastoral peoples. *Int. Migr.*, early on-line, doi:10.1111/imig.13122.
10. Weng, E., I. Aleinov, R. Singh, **M.J. Puma**, S.S. McDermid, N.Y. Kiang, M.A. Kelley, K. Wilcox, R. Dybzinski, C.E. Farrior, S.W. Pacala, and B.I. Cook, 2022 Modeling demographic-driven vegetation dynamics and ecosystem biogeochemical cycling in NASA GISS's Earth system model (ModelE-BiomeE v.1.0). *Geosci. Model Dev.*, 15, no. 22, 8153-8180, doi:10.5194/gmd-15-8153-2022.
11. McDermid, S.S., E. Weng, **M. Puma**, B. Cook, T. Hengl, J. Sanderman, G.J.M. De Lannoy, and I. Aleinov, 2022 Soil carbon losses reduce soil moisture in global climate model simulations. *Earth Interact.*, 26, no. 1, 195-208, doi:10.1175/EI-D-22-0003.1.
12. De Sherbinin, A., K. Grace, S. McDermid, K. Van Der Geest, **M.J. Puma**, and A. Bell, 2022 Migration theory in climate mobility research. *Front. Clim.*, 4, 882343, doi:10.3389/fclim.2022.882343.

13. Nazarenko L and 45 others including **MJ Puma**, 2022 Future climate change under SSP emission scenarios with GISS-E2.1. *J. Adv. Model Earth. Syst.*, 14, no. 7, e2021MS002871, doi:10.1029/2021MS002871.
14. Lehtikoinen, E., P. Kinnunen, J. Piipponen, A. Heslin, **M.J. Puma**, and M. Kummu, 2021 Importance of trade dependencies for agricultural inputs: A case study of Finland. *Environ. Res. Commun.*, 3, no. 6, 061003, doi:10.1088/2515-7620/ac02d0.
15. Schon, J., K. Mezuman, A. Heslin, R.D. Field, and **M.J. Puma**, 2021 How fire patterns reveal uneven stabilization at the end of conflict: Examining Syria's unusual fire year in 2019. *Environ. Res. Lett.*, 16, no. 4, 044046, doi:10.1088/1748-9326/abe327.
16. McDermid, S.S., B.I. Cook, M.G. De Kauwe, J. Mankin, J.E. Smerdon, A.P. Williams, R. Seager, **M.J. Puma**, I. Aleinov, M. Kelley, and L. Nazarenko, 2021 Disentangling the regional climate impacts of competing vegetation responses to elevated atmospheric CO₂. *J. Geophys. Res. Atmos.*, 126, no. 5, e2020JD034108, doi:10.1029/2020JD034108.
17. Falkendal, T., C. Otto, J. Schewe, J. Jägermeyr, M. Konar, M. Kummu, B. Watkins, and **M.J. Puma**, 2021 Grain export restrictions during COVID-19 risk food insecurity in many low- and middle-income countries. *Nat. Food*, 2, no. 1, 11-14, doi:10.1038/s43016-020-00211-7.
18. Miller, J.R., J.E. Fuller, **M.J. Puma**, and J.M. Finnegan, 2021 Elevation dependent warming in the Eastern Siberian Arctic. *Environ. Res. Lett.*, 16, no. 2, 024044, doi:10.1088/1748-9326/abdb5e.
19. Miller, R.L., G.A. Schmidt, L. Nazarenko, S.E. Bauer, M. Kelley, R. Ruedy, G.L. Russell, A. Ackerman, 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, G. Faluvegi, N.Y. Kiang, D. Kim, A.A. Lacis, A. Leboissetier, A.N. LeGrande, K.K. Lo, J. Marshall, E.E. Matthews, S. McDermid, K. Mezuman, L.T. Murray, V. Oinas, C. Orbe, C. Pérez García-Pando, J.P. Perlwitz, **M.J. Puma**, D. Rind, A. Romanou, D.T. Shindell, S. Sun, N. Tausnev, K. Tsigaridis, G. Tselioudis, E. Weng, J. Wu, and M.-S. Yao, 2021 CMIP6 historical simulations (1850-2014) with GISS-E2.1. *J. Adv. Model Earth Syst.*, 13, no. 1, e2019MS002034, doi:10.1029/2019MS002034.
20. Kakinuma, K., **M.J. Puma**, Y. Hirabayashi, M. Tanoue, E.A. Baptista, and S. Kanae, 2020 Flood-induced population displacements in the world. *Environ. Res. Lett.*, 15, no. 12, 124029, doi:10.1088/1748-9326/abc586.
21. Krakauer, N.Y., B.I. Cook, and **M.J. Puma**, 2020 Effect of irrigation on humid heat extremes. *Environ. Res. Lett.*, 15, no. 9, 094010, doi:10.1088/1748-9326/ab9ecf.
22. Cook, B.I., S.S. McDermid, **M.J. Puma**, A.P. Williams, R. Seager, M. Kelley, L. Nazarenko, and I. Aleinov, 2020 Divergent regional climate consequences of maintaining current irrigation rates in the 21st century. *J. Geophys. Res. Atmos.*, 125, no. 14, e2019JD031814, doi:10.1029/2019JD031814.
23. Heslin, A., **M.J. Puma**, P. Marchand, J.A. Carr, J. Dell'Angelo, P. D'Odorico, J.A. Gephart, M. Kummu, M. Porkka, M.C. Rulli, D. Seekell, S. Suweis, and A. Tavoni, 2020 Simulating the cascading effects of an extreme agricultural production shock: Global implications of a contemporary US Dust Bowl event. *Front. Sustain. Food Syst.*, 4, 26, doi:10.3389/fsufs.2020.00026.

24. Jägermeyr, J., A. Robock, J. Elliott, C. Müller, L. Xia, N. Khabarov, C. Folberth, E. Schmid, W. Liu, F. Zabel, S.S. Rabin, **M.J. Puma**, A.C. Heslin, J. Franke, I. Foster, S. Asseng, C.G. Bardeen, O.B. Toon, and C. Rosenzweig, 2020 A regional nuclear conflict would compromise global food security. *Proc. Natl. Acad. Sci.*, 117, no. 13, 7071-7081, doi:10.1073/pnas.1919049117.
25. Kinnunen, P., J.H.A. Guillaume, M. Taka, P. D'Odorico, S. Siebert, **M.J. Puma**, M. Jalava, and M. Kummu, 2020 Local food crop production can fulfil demand for less than one-third of the population. *Nat. Food*, 1, no. 4, 229-237, doi:10.1038/s43016-020-0060-7.
26. Kelley, M., G.A. Schmidt, L. Nazarenko, S.E. Bauer, R. Ruedy, G.L. Russell, A.S. Ackerman, I. Aleinov, M. Bauer, R. Bleck, V. Canuto, G. Cesana, Y. Cheng, T.L. Clune, B.I. Cook, C.A. Cruz, A.D. Del Genio, G.S. Elsaesser, G. Faluvegi, N.Y. Kiang, D. Kim, A.A. Lacis, A. Leboissetier, A.N. LeGrande, K.K. Lo, J. Marshall, E.E. Matthews, S. McDermid, K. Mezuman, R.L. Miller, L.T. Murray, V. Oinas, C. Orbe, C. Pérez García-Pando, J.P. Perlwitz, **M.J. Puma**, D. Rind, A. Romanou, D.T. Shindell, S. Sun, N. Tausnev, K. Tsigaridis, G. Tselioudis, E. Weng, J. Wu, and M.-S. Yao, 2020 GISS-E2.1: Configurations and climatology. *J. Adv. Model. Earth Syst.*, 12, no. 8, e2019MS002025, doi:10.1029/2019MS002025.
27. Del Genio, A.D., M.J. Way, N. Kiang, I. Aleinov, **M.J. Puma**, and B. Cook, 2019 Climates of warm Earth-like planets III: Fractional habitability from a water cycle perspective. *Astrophys. J.*, 887, no. 2, 197, doi:10.3847/1538-4357/ab57fd.
28. Cook, B.I., R. Seager, A.P. Williams, **M.J. Puma**, S. McDermid, M. Kelley, and L. Nazarenko, 2019 Climate change amplification of natural drought variability: The historic mid-twentieth century North American drought in a warmer world. *J. Climate*, doi:10.1175/JCLI-D-18-0832.1.
29. McDermid, S.S., C. Montes, B.I. Cook, **M.J. Puma**, N.Y. Kiang, and I. Aleinov, 2019 The sensitivity of land-atmosphere coupling to modern agriculture in the northern mid-latitudes. *J. Climate*, 32, no. 2, 465-484, doi:10.1175/JCLI-D-17-0799.1.
30. Singh, D., S.P. McDermid, B.I. Cook, **M.J. Puma**, L. Nazarenko, and M. Kelley, 2018 Distinct influences of land-cover and land-management on seasonal climate. *J. Geophys. Res. Atmos.*, 123, no. 21, 12017-12039, doi:10.1029/2018JD028874.
31. **Puma, M.J.**, S.Y. Chon, K. Kakinuma, M. Kummu, R. Mutarak, R. Seager, and W. Wada, 2018 A developing food crisis and potential refugee movements. *Nature Sustain.*, 1, 380-382, doi:10.1038/s41893-018-0123-z.
32. Torreggiani, S., G. Mangioni, **M.J. Puma**, and G. Fagilo, 2018 Identifying the community structure of the international food-trade multi network. *Environ. Res. Lett.*, 13, no. 5, 054026, doi:10.1088/1748-9326/aabf23.
33. Heino, M., **M.J. Puma**, P.J. Ward, D. Gerten, V. Heck, S. Siebert, and M. Kummu, 2018 Two-thirds of global cropland area impacted by climate oscillations. *Nat. Commun.*, 9, 1257, doi:10.1038/s41467-017-02071-5.
34. Dalin, C., Y. Wada, T. Kastner, and **M.J. Puma**, 2017 Groundwater depletion embedded in international food trade. *Nature*, 543, no. 7647, 700-704, doi:10.1038/nature21403.
35. Seekell, D.A., J. Carr, J. Dell'Angelo, P. D'Odorico, M. Fader, J.A. Gephart, M. Kummu, N. Magliocca, M. Porkka, and **M.J. Puma**, 2017 Resilience in the global food system. *Environ. Res. Lett.*, 12, no. 2, 025010, doi:10.1088/1748-9326/aa5730.

36. Krakauer, N.Y., **M.J. Puma**, B.I. Cook, P. Gentine, and L. Nazarenko, 2016 Ocean-atmosphere interactions modulate irrigation's climate impacts. *Earth Syst. Dyn.*, 7, 863-876, doi:10.5194/esd-7-863-2016.
37. Marchand, P., J.A. Carr, J. Dell'Angelo, M. Fader, J.A. Gephard, M. Kummu, N.R. Magliocca, M. Porkka, **M.J. Puma**, and Z. Ratajczak, 2016 Reserves and trade jointly determine exposure to food supply shocks. *Environ. Res. Lett.*, 11, no. 9, 095009, doi:10.1088/1748-9326/11/9/095009.
38. Fader, M., M.C. Rulli, J. Carr, J. Dell'Angelo, P. D'Odorico, J. Gephart, M. Kummu, N. Magliocca, M. Porkka, C. Prell, **M.J. Puma**, Z. Ratajczak, D.A. Seekell, S. Suweis, and A. Tavoni, 2016 Past and present biophysical redundancy of countries as a buffer to changes in food supply. *Environ. Res. Lett.*, 11, no. 5, 055008, doi:10.1088/1748-9326/11/5/055008.
39. Van den Hurk, B., H. Kim, G. Krinner, S.I. Seneviratne, C. Derksen, T. Oki, H. Douville, J. Colin, A. Ducharne, F. Cheruy, N. Viovy, **M. Puma**, Y. Wada, W. Li, B. Jia, A. Alessandri, D. Lawrence, G.P. Weedon, R. Ellis, S. Hagemann, J. Mao, M.G. Flanner, M. Zampieri, R. Law, and J. Sheffield, 2016 LS3MIP (v1.0) contribution to CMIP6: The Land Surface, Snow and Soil moisture Model Intercomparison Project — Aims, setup and expected outcome. *Geosci. Model. Dev.*, 6, 2809-2832, doi:10.5194/gmd-9-2809-2016.
40. Kim, Y., P.R. Moorcroft, I. Aleinov, **M.J. Puma**, and N.Y. Kiang, 2015 Variability of phenology and fluxes of water and carbon with observed and simulated soil moisture in the Ent Terrestrial Biosphere Model (Ent TBM version 1.0.1.0.0). *Geosci. Model Dev.*, doi:10.5194/gmd-8-3837-2015.
41. **Puma, M.**, S. Bose, S.Y. Chon, and B. Cook, 2015 Assessing the evolving fragility of the global food system. *Environ. Res. Lett.*, 10, no. 2, 024007, doi:10.1088/1748-9326/10/2/024007.
42. Nazarenko, L., G.A. Schmidt, R.L. Miller, N. Tausnev, M. Kelley, R. Ruedy, G.L. Russell, I. Aleinov, M. Bauer, S. Bauer, R. Bleck, V. Canuto, Y. Cheng, T.L. Clune, A.D. Del Genio, G. Faluvegi, J.E. Hansen, R.J. Healy, N.Y. Kiang, D. Koch, A.A. Lacis, A.N. LeGrande, J. Lerner, K.K. Lo, S. Menon, V. Oinas, J.P. Perlwitz, **M.J. Puma**, D. Rind, A. Romanou, M. Sato, D.T. Shindell, S. Sun, K. Tsigaridis, N. Unger, A. Voulgarakis, M.-S. Yao, and J. Zhang, 2015 Future climate change under RCP emission scenarios with GISS ModelE2. *J. Adv. Model. Earth Syst.*, 7, no. 1, 244-267, doi:10.1002/2014MS000403.
43. Cook, B.I., S.P. Shukla, **M.J. Puma**, and L. Nazarenko, 2015 Irrigation as an historical climate forcing. *Clim. Dyn.*, 44, no. 5-6, 1715-1730, doi:10.1007/s00382-014-2204-7.
44. 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.

45. 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.
46. Shukla, S.P., **M.J. Puma**, and B.I. Cook, 2014 The response of the South Asian Summer Monsoon circulation to intensified irrigation in global climate model simulations. *Clim. Dyn.*, 42, no. 1-2, 21-36, doi:10.1007/s00382-013-1786-9.
47. **Puma, M.J.**, R.D. Koster, and B.I. Cook, 2013 Phenological versus meteorological controls on land-atmosphere water and carbon fluxes. *J. Geophys. Res. Biogeosci.*, 118, no. 1, 14-29, doi:10.1029/2012JG002088.
48. Krakauer, N.Y., **M.J. Puma**, and B.I. Cook, 2013 Impacts of soil-aquifer heat and water fluxes on simulated global climate. *Hydrol. Earth Syst. Sci.*, 17, 1963-1974, doi:10.5194/hess-17-1963-2013.
49. Cook, B.I., K.J. Anchukaitis, J.O. Kaplan, **M.J. Puma**, M. Kelley, and D. Gueyffier, 2012 Pre-Columbian deforestation as an amplifier of drought in Mesoamerica. *Geophys. Res. Lett.*, 39, L16706, doi:10.1029/2012GL052565.
50. **Puma, M.J.**, 2012 A holistic approach to guide development of future climate scenarios for water-resource applications. *J. Contemp. Water Res. Educ.*, 147, 41-48.
51. Cook, B.I., **M.J. Puma**, and N.Y. Krakauer, 2011 Irrigation induced surface cooling in the context of modern and increased greenhouse gas forcing. *Clim. Dyn.*, 37, 1587-1600, doi:10.1007/s00382-010-0932-x.
52. **Puma, M.J.**, and B.I. Cook, 2010 Effects of irrigation on global climate during the 20th century. *J. Geophys. Res.*, 115, D16120, doi:10.1029/2010JD014122.
53. Krakauer, N.Y., B.I. Cook, and **M.J. Puma**, 2010 Contribution of soil moisture feedback to hydroclimatic variability. *Hydrol. Earth Syst. Sci.*, 14, 505-520.
54. Koster, R.D., Z. Guo, P.A. Dirmeyer, R. Yang, K. Mitchell, and **M.J. Puma**, 2009 On the nature of soil moisture in land surface models. *J. Climate*, 22, 4322-4335, doi:10.1175/2009JCLI2832.1.
55. **Puma, M.J.**, R. Rodriguez-Iturbe, M.A. Celia, and A.J. Guswa, 2007 Implications of rainfall temporal resolution for soil-moisture and transpiration modeling. *Transp. Porous Media*, 68, 37-67, doi:10.1007/s11242-006-9057-4.
56. **Puma, M.J.**, M.A. Celia, R. Rodriguez-Iturbe, and A.J. Guswa, 2005 Functional relationship to describe temporal statistics of soil moisture averaged over different depths. *Adv. Water Resour.*, 28, 553-566, doi:10.1016/j.advwatres.2004.08.015.

Books and Book Projects

1. **Puma, M.J.**, and S. Gold, 2011 Formulating Climate Change Scenarios to Inform Climate-Resilient Development Strategies: A Guidebook for Practitioners. United Nations Development Programme.

2. **Puma, M.J.** Five Days Until Fuhgeddaboutit: The Hidden Fragility of Global Food Trade — and How We Can Fix It. **In development.**

Honors & Awards

- 2016–2019 **Fellow**, *Center for Climate and Life*, Columbia University
- 2018 **Haub Visiting Scholar**, *Pace University*, Elisabeth Haub School of Law
Delivered keynote Lloyd K. Garrison Lecture: "De-risking the global food system in a changing climate"
- 2010–2021 **NASA GISS Publication Honors**, *NASA Goddard Institute*, By vote of scientific staff
- 2010: Lead author, Best Popular Science Brief
 - 2014: Coauthor, Best Publication Award (CMIP5 historical simulations)
 - 2018: Lead author, 3rd Best Publication (food crisis and refugee movements)
 - 2020: Coauthor, Best Publication Award (GISS-E2.1 configurations)
 - 2021: Coauthor, Best Publication Award (CMIP6 historical simulations)
- 2002–2006 **Graduate Fellowships**, *Princeton University*
William Clay Ford, Jr. '79 and Lisa Vanderzee Ford '82 Graduate Fellowship (2004–2005), Princeton Environmental Institute Fellowship (2002–2003, 2005–2006)
- 1998 **King's Crown Awards**, *Columbia University*, Gold Crown
Outstanding leadership and service to Columbia community

Teaching Experience

Current Columbia Courses

- 2025–present **Global food trade, shocks and migration**, *Columbia Climate School*
- 2013–present **Water Governance**, *School of Professional Studies/Columbia Climate School*

Past Courses

- 2011–2018 Hydrology (Summers), School of International and Public Affairs, Columbia University
- 2009–2012 Various water and sustainability courses, Columbia University
- 2005–2007 Assistant Instructor, Princeton University (Hydrology, Environmental Science)
- 2021 Guest online lecturer, Cheikh Anta Diop University, Dakar (Climate Risk Management for Nutrition)

Student Advising

- Postdoctoral Researchers** Keren Mezuman (2019–2022); Alison Heslin (2018–2020); Kaoru Kakinuma (2016–2018).
- PhD Committees** Miriam Nielsen, Columbia University (2024–2025); Deniz Berfin Karakoc, University of Illinois Urbana–Champaign (2022–2024); Alvaro Carmona Cabrero, University of Florida–Gainesville (2021–2022); Lisa Thalheimer, University of Oxford, Christ Church (External Examiner, 2021); Madeleine Pascolini-Campbell, Columbia University (2018).
- Master's Theses Supervised** Michael DeMichiei, Columbia Southern Asian Institute (2019); Aïcha Diongue, Cheikh Anta Diop University of Dakar (2022).
- NASA Interns** Nonnie Woodruff (Summer 2019); Roland Maio (Spring 2017); Morgan DiCarlo (Summer 2016).
- Master's Advising** Approximately 10 advisees per year (2013–2024), School of Professional Studies.

Selected advisees Yongle (Leo) Yan (Haiti food prices); Nadhira Azzahra Hendra (4-Oceans project); Samuel Rager (quantum modeling); Janavi Kumar (ENSO-famine connections); Erika Wu (agent-based modeling); Clara Bardot (displacement theory); Primanta Bangun (Ukraine war, AI and water); Regita Zakia (AI and water); Theo Pelletier (quantum modeling); Angie Sillah (living lab greenhouse); Sai Venkata Teja Bacham (AI and port dynamics).

External mentees Yawei Bai (PhD student, King Abdullah University of Science and Technology); Kilian Kuhla (Postdoctoral Researcher, Potsdam Institute for Climate Impact Research).

Professional Service & Leadership

Editorial Service

2025–present **Editor**, *Earth's Future*, American Geophysical Union
2023–2024 **Guest Editor**, *Proceedings of the National Academy of Sciences*
2020–2021 **Associate Editor**, *CABI Agriculture and Bioscience*

University Service

Columbia Climate School Graduate Admissions (2025–present); Appointments & Promotions Committee (2024–present); Climate School Doctoral Program Development Committee (2024–2025).
University-wide Cross-School Leadership AI Working Group (2024–present); Earth Institute Faculty (*ex officio*, 2017–2025).

Conference Organization

Co-Organizer Global food system vulnerabilities relevant to US institutions in a changing climate (January 31, 2019), Thomson Reuters Building, New York City
Co-Organizer Systemic Risk in Global Agriculture – A Princeton-Columbia Joint Conference (October 24–25, 2014), Princeton University

**AGU Session
Convener**

Fall Meeting Session Convener/Co-Convener:

- 2014: The Effects of Anthropogenic Land-Use and Land-Cover Change on Local to Global Climate (GC22F)
- 2014: Global and Regional Food and Water Security Under Increasing Socioeconomic Pressure and Changing Climate (GC24A)
- 2015: Global and Regional Water-Food-Energy Security under Changing Environments I-III (GC31H, GC32B, GC33C)
- 2016: Global and Regional Water-Food-Energy Security under Changing Environments I-III (GC41G, GC42B, GC43C)
- 2019: Environmental Changes and Human Migration: Advances in Data, Modeling, and Analysis I-II (GC11A, GC13G)
- 2020: Food System, Food Security, and Food-Related Human Health Responses to COVID-19 and Other Pandemics (GH011-II)
- 2023: Agrifood Supply Chain Resilience and Sustainability with a Focus on Human Impacts on Forest Ecosystems
- 2020–2025: Environmental Changes and Human Migration: Advances in Modeling and Analysis

[Review Service](#)

**Funding
Agencies**

National Science Foundation (proposals and fellowships)

Journals

Nature, Nature Climate Change, Proceedings of the National Academy of Sciences, Global Food Security, Geophysical Research Letters, Environmental Research Letters, PLOS ONE, Journal of Climate, International Journal of Climatology, Journal of Hydrometeorology, Water Resources Research, Journal of Water Resources Planning and Management, African Journal of Environmental Science and Technology, African Journal of Agricultural Research, Journal of Environmental Studies and Science, Transport in Porous Media, Ecohydrology

[Professional Membership & Other Service](#)

2003–present

Member, *American Geophysical Union*

2016

Travel Grant Reviewer, *Columbia Earth Institute*

2012–2013

Publicity Ambassador, *Baekje Cultural Festival (백제문화제)*, Gongju, South Korea
International cultural promotion and academic exchange

2010–2012

Co-founder/Lead Organizer, *Columbia University Hydrology Consortium*
Promoting cross-disciplinary water research

2003–2004

Co-Organizer, *Princeton Environmental Engineering & Water Resources Seminar Series*

[Reports / Chapters / Proceedings](#)

1. **Puma MJ**. The Three Gorges Dam Project in China: an analysis of the dam's effects on the Yangtze River. Senior Thesis, Department of Civil Engineering and Eng. Mechanics, Columbia University, 1998.

2. **Puma MJ.** Small-scale irrigation in sub-Saharan Africa: technology transfer possibilities. Report, Office to Combat Desertification and Drought, United Nations Development Programme, 1998.
3. **Puma MJ.** Pilot study for the “Second Comprehensive Assessment of the World’s Freshwater Resources.” Report, Natural Resources Branch, United Nations Secretariat, 1998.
4. **Puma, MJ.** Space-time scaling properties of soil moisture and evapotranspiration in water-limited ecosystems. PhD Dissertation, Princeton University, 2006.
5. **Puma, M.J.,** M.A. Celia, I. Rodriguez-Iturbe, J.M. Nordbotton, and A.J. Guswa. Threshold scales for spatially averaged soil moisture and evapotranspiration with rainfall heterogeneity. In Proceedings of XVI International Conference on Computational Methods in Water Resources. P.J. Binning, P.K. Engesgaard, H.K. Dahle, G.F. Pinder, and W.G. Gray, Eds. Technical University of Denmark, 2006.
6. **Puma MJ.** Global ecohydrology and climate, K-water Techzine (Technology + webzine), pp. 104–113, Daejeon, South Korea, April 2009.
7. **Puma MJ,** Tadross M. Climate-Change Profiles for the Capital Region of Bogotá- Cundinamarca, Colombia: Summary of initial procedures undertaken to develop scenarios of climate change, 2012.
8. **Puma, MJ.** Transboundary River and Lake Basin Climate Profiles. United Nations Development Programme, 2013.
9. **Puma MJ,** Cook BI. Land-atmosphere coupling and greenhouse warming in four major food-producing regions, 2015.
10. **Puma MJ,** Celia MA, Rodriguez-Iturbe I, Nordbotten JM, Guswa AJ, Kavetski D. Effects of spatial heterogeneity in rainfall and vegetation type on soil moisture and evapotranspiration. arXiv preprint arXiv:1606.05256, 2016.
11. **Puma MJ,** Muneeppeerakul R, Paola C, Rinaldo A, Rodriguez-Iturbe I. On the connections between surficial processes and stratigraphy in river deltas. arXiv: 1606.04558, 2016.
12. Schimel, D., Sellers, P., Moore III, B., Chatterjee, A., Baker, D., Berry, J., Bowman, K., Ciais, P., Crisp, D., Crowell, S., Denning, S., Duren, R., Friedlingstein, P., Gierach, M., Gurney, K., Hibbard, K., Houghton, RA, Huntzinger, D., Hurtt, G., Jucks, K., Kawa, R., Koster, R., Koven, C., Luo, Y., Masek, J., McKinley, G., Miller, C. Miller, J., Moorcroft, P., Nassar, R., ODell, C., Ott, L., Pawson, S., **Puma, M.**, Quaife, T., Riris, H., Romanou, A., Rousseaux, C., Schuh, A., Shevliakova, E., Tucker, C., Wang, Y.P., Williams, C., Xiao, X., & Yokota, T. Observing the carbon-climate system. arXiv:1604.02106, 2016.
13. **Puma MJ,** Maio R. Improving the resilience of African Countries to Food Shocks (#5259). 20th Annual Conference on Global Economic Analysis: “Global Economic Analysis in the 21st Century: Challenges and Opportunities”, ISSN 2160-2115 (online), 2017.
14. Del Genio, A.D., M.J. Way, N. Kiang, I. Aleinov, **M.J. Puma,** and B. Cook. Climates of warm Earth-like planets III: Fractional habitability from a water cycle perspective. arXiv:1910.03479 [astro-ph.EP], 2019.
15. Ruth DeFries, Ottmar Edenhofer, Alex Halliday, Geoffrey Heal, Timothy Lenton, **Michael Puma,** James Rising, Johan Rockström, Alex C. Ruane, Hans Joachim Schellnhuber, David Stainforth, Nicholas Stern, Marco Tedesco, Bob Ward. The missing economic risks in assessments of climate change impacts, 2019.

16. MM Jahn, AM Kelly, GF Treverton, MS Gremillion, E Cardon, MA Rose, M Konar, **MJ Puma**, DA Bray, J Byrum, AL Nguy-Robertson, JP Rodrigue, TL Creely, SC Murray, WL Oemichen, and B Jayamaha. Contemporary Global Food Systems as Contested Space: Implications for Special Operations Forces. In *Strategic Latency Unleashed: The Role of Technology in a Revisionist Global Order and the Implications for Special Operations Forces*. Edited by ZS Davis, F Gac, C Rager, P Reiner, and J Snow, Center for Global Security Research Lawrence Livermore National Laboratory, 2021.
17. Cutuli A, Lall U, **Puma MJ**, Esmaili E, Muneeppeerakul R, 2024 A Bayesian hierarchical framework for capturing preference heterogeneity in migration flows. arXiv:2412.01242.
18. Fanzo J, Carducci B, **Puma MJ**. What do we know about the future of measuring food systems? International Food Policy Research Institute, 2025.
19. Caylor KK, Abatzoglou JT, Dalin C, De Beurs KM, Diffenbaugh NS, **Puma MJ**, and others. Thematic areas for a growing journal. *Earth's Future*, 14, no. 3, e2026EF008498, 2026.

News & Popular-Science Publications

1. **Puma MJ**, Cook BI, 2010 Irrigation and Twentieth Century Climate. *NASA GISS Science Brief*. http://www.giss.nasa.gov/research/briefs/puma_01/
2. **Puma MJ**, Cook BI, 2011 Irrigation's Climate Effects and the Water Sustainability Link. *International Water Power and Dam Construction Magazine*, pp. 38–40.
3. **Puma MJ**, 2012 Climate Modelers and the Moth. *NASA GISS Science Brief*. http://www.giss.nasa.gov/research/briefs/puma_02/
4. **Puma MJ**, 2015 Study Assesses Fragility of Global Food System. *NASA GISS Science Brief*. http://www.giss.nasa.gov/research/briefs/puma_03/
5. **Puma MJ**, Chon S, Wada Y, 2015 Exploring the potential impacts of historic volcanic eruptions on the contemporary global food system. *Past Global Changes Magazine (PAGES)*, 23, no. 2, 66–67.
6. **Puma MJ**, de Menocal P, 2017 Trump's Unifying Opportunity: Food Security. *Climate and Life Blog*. <http://climateandlife.columbia.edu/2017/03/02/trumps-unifying-opportunity-food-security/>
7. Schon J, Field RD, **Puma MJ**, 2019 How Fires Threaten Syria's Security. *New Security Beat*. <https://www.newsecuritybeat.org/2019/10/fires-threaten-syrias-security/>
8. **Puma MJ**, 2019 Resilience of the global food system. *Nature Sustain.*, 2, no. 4, 260–261, doi:10.1038/s41893-019-0274-6.
9. **Puma MJ**, Konar M, 2022 What the War in Ukraine Means for the World's Food Supply. *New York Times* Op-Ed.

Select Invited Talks & Presentations

Dec 16, 2025

Invited Oral Presentation, *AGU Fall Meeting*, New Orleans, LA

Session GC24F: "Multisector Dynamics: Advances in Modeling Adaptive Human Systems II." Talk: "Modeling Adaptive Human Decision-Making in Refugee Movement Using Dual Process Theory."

- Nov 3, 2025 **Invited Speaker**, *Wells Fargo Water Week*, 30 Hudson Yards, New York, NY
Opening keynote: "Water Crisis and Financial Risk Across Business Sectors." Livestreamed event for Wells Fargo clients and employees globally."
- September 3, 2025 **Invited Talk**, *University of Cambridge, Centre for the Study of Existential Risk*, Cambridge, UK
"Hidden Correlations and Systemic Risk in the Global Food System"
- March 5, 2025 **Invited Talk**, *Johns Hopkins Bloomberg Center*, Washington, DC
"Climate to Conflict: Advancing Multiscale Models of Human Mobility and Displacement." Session title: From Data to Action: Addressing the Nexus of Climate, Health, Conflict & Displacement Across Diverse Contexts
- February 6, 2025 **Invited Class Talk**, *Columbia University Mailman School of Public Health*, New York, NY
"Towards an Understanding of Human Mobility." Prof. Lewis Ziska's Class: Environmental Health Sciences Public Health Impacts of Climate Change
- September 25–27, 2024 **Invited Panel**, *Climate Migration Modeling Intercomparison Workshop*, Princeton University
Panel title: "Validating Model Outputs: Best Practices for Model Validation with Limited Data, Metrics Prioritization, Statistical Inference Role"
- April 11, 2024 **Invited Talk**, *5th Global Food Security Conference*, Leuven, Belgium
"Strategically Transforming Food Systems for Robustness and Resilience." Session title: Towards equitable, sustainable and resilient food systems
- April 3, 2024 **Invited Talk**, *The Future of Food Forum*, University of Florida, Gainesville
"Reducing Global Food System Vulnerability to Unpredictable Events"
- March 22, 2024 **Invited Talk**, *World Water Day*, Arizona State University, Walton Center
"Global human migration and trade impacts of water and climate disruptions." Session title: Water Futures – Adaptation & Innovation
- May 13, 2022 **Invited Talk**, *Museum of Food and Drink (MOFAD)*, New York, NY
"The Impact of War on Food Security"
- February 16, 2018 **Invited Roundtable**, *Chatham House*, London, UK
"Global food system interconnectivity." Roundtable: Food Trade Chokepoints: Designing an Effective Risk Management System (organized in collaboration with AMIS)
- November 10, 2016 **Invited Talk**, *Harvard University*, Cambridge, MA
"Exploring the Impacts of Major Atmospheric Anomalies on the Contemporary Global Food System." Harvard Atmospheric & Environmental Seminar Series
- September 7, 2006 **Invited Seminar**, *Korea University, Department of Civil and Environmental Engineering*, Seoul, South Korea
"Ecohydrology of the Vadose Zone"
- May 4, 2006 **Invited Seminar**, *City College of New York, Department of Civil and Environmental Engineering*, New York, NY
"Ecohydrology of the Vadose Zone"
- March 3, 2006 **Invited Seminar**, *University of Connecticut, Department of Civil and Environmental Engineering*, Storrs, CT
"Spatial and Temporal Dynamics of Ecohydrology in the Vadose Zone"
- April 28, 2005 **Invited Seminar**, *Harvard University, Department of Organismic and Evolutionary Biology*, Cambridge, MA
"Effects of Spatial Heterogeneity in Rainfall and Plant Species on Soil Moisture and Evapotranspiration Predictions"

Published Conference Abstracts

- 2025 **Puma MJ, Groen D, Suleimenova D, Mezuman K.**, *Fall Meeting 2025. AGU*, Modeling Adaptive Human Decision-Making in Refugee Movement Using Dual Process Theory, Abstract GC24F-03 (invited)
- 2024 **Johnson J, Traff J, Hood J, Puma MJ, Muneeppeerakul R.**, *Fall Meeting 2024. AGU*, Challenges to the Creation and Sustainability of Comprehensive Longitudinal Network and Environmental Databases and Analytical Platforms, Abstract GC11Q-0126
- 2024 **Hood J, Traff J, Johnson J, Puma MJ, Muneeppeerakul R.**, *Fall Meeting 2024. AGU*, Geographic Regional Ego Networks: Utilizing MRQAP Analysis to Explore Environmental Drivers of Human Mobility in Pacific Island Networks, Abstract GC01-159
- 2024 **Puma MJ, Groen D, Suleimenova D, Cottier F.**, *Fall Meeting 2024. AGU*, Agent-Based Modeling of West African Migration Using Aspirations and Capabilities, Abstract GC11Q-0121
- 2024 **Esmaili E, Lall U, Cutuli A, Puma MJ, Muneeppeerakul R.**, *Fall Meeting 2024. AGU*, Modeling Human Migration with Non-Homogeneous Hidden Markov Models: an Application to Inter-state Mobility in the United States, Abstract GC11Q-0124
- 2024 **Weng E, Detto M, McDermid SS, Longo M, Li L, Lichstein JW, Puma MJ, et al.**, *Fall Meeting 2024. AGU*, Modeling compositional dynamics of evergreen and drought-deciduous trees in tropical forests with a demographic vegetation model, Abstract B41H-1395
- 2024 **Cottier F, Nakamura J, Puma MJ, Wrathall DJ, Katz B, Seager R, et al.**, *Fall Meeting 2024. AGU*, Drivers of Migration from Central America and West Africa, Abstract GC11Q-0127
- 2023 **Esmaili E, Cutuli A, Lall U, Puma MJ, Muneeppeerakul R.**, *Fall Meeting 2023. AGU*, Modeling Migration Flows with Non-Homogeneous Hidden Markov Models
- 2023 **Cutuli, A., Lall, U., Puma, M. J., Esmaili, E., & Muneeppeerakul, R.**, *Fall Meeting 2023. AGU*, A Bayesian Hierarchical Framework for Modeling Migration Flows
- 2023 **Puma MJ, Rose B, Kalro AM, Printz M, Marsh K, Barnett E, Samson D, Mezuman K, Suleimenova D, Groen D, Muneeppeerakul R.**, *Fall Meeting 2023. AGU*, A comparative assessment of top-down and bottom-up approaches to modeling refugee movement in the Russo-Ukrainian War
- 2022 **Puma, M. J., Rose, B., Printz, M., Marsh, K., Barnett, E., Kalro, A. M., et al.**, *Fall Meeting 2022. AGU*, A Parsimonious Model to Simulate Refugee Movement Due to the Russian Invasion of Ukraine
- 2022 **Johnson, J., Zurek-Ost, M., Hood, J., Puma, M. J., & Muneeppeerakul, R.**, *Fall Meeting 2022. AGU*, Network Models of Possible Climate Drivers to Refugee Flows: Regional Scale Comparisons
- 2021 **MJ Puma, K Mezuman, H Arabnejad, D Groen, A Jahani, U Lall, P Concha Larrauri, R Muneeppeerakul, G Suarez, D Suleimenova.**, *AGU Fall Meeting 2021. AGU*, Assessing operational insights gained from simulation of refugee movements with an agent based model
- 2021 **J Johnson, J Hood, J Schon, MJ Puma, E Smith.**, *AGU Fall Meeting 2021. AGU*, The Transformation of Global Network Migrant and Refugee Flows: Examining the Potential Emergence of Climate Drivers
- 2021 **MJ Puma, M Thomas.**, *AGU Fall Meeting 2021. AGU*, Harnessing causal linkages between climate and food prices to address nutrition concerns in Senegal
- 2021 **M Heino, P Kinnunen, WB Anderson, DK Ray, MJ Puma, O Varis, S Siebert, M Kummu.**, *AGU Fall Meeting 2021. AGU*, Hot and dry weather extremes pose an increasing threat to global crop yields

- 2021 **R Muneeppeerakul, J Johnson, MJ Puma, U Lall.**, *AGU Fall Meeting 2021. AGU*, Network character of global refugee flows and its evolution
- 2020 **Puma, M. J., Falkendal, T., Otto, C., Schewe, J., Jägermeyr, J., Konar, M., et al.**, *AGU Fall Meeting 2020. AGU*, Safeguard global supply chains to protect food security during the COVID-19 pandemic
- 2020 **Cottier, F., Ilboudo-Nébié, E., Morris, C.A., Puma, M.J., Seager, R., de Sherbinin, A.M.**, *AGU Fall Meeting 2020. AGU*, Disentangling the drivers of regional migration in West Africa: The impact of food (in) security on migration
- 2019 **McDermid SS, Cook BI, De Kauwe MG, Mankin JS, Smerdon JE, Williams AP, Seager R, Puma MJ, Aleinov ID, Kelley M, Nazarenko L.**, *AGU Fall Meeting 2019. AGU*, Disentangling the regional climate impacts of competing vegetation responses to elevated [CO₂], Abstract H44A-07
- 2019 **Puma, M.J. and Heslin, A.**, *AGUFM, 2019*, Assessing potential cascading effects of a US Dust Bowl event on food security and human migration. GC13G-1232
- 2018 **McDermid S, Singh D, Cook B, Puma M, Montes C.**, *American Meteorological Society Meeting 2018*, The Impacts of Agricultural Land Use and Management on Regional Climate Systems: Interactions with the Asian Summer Monsoon, Abstract 473
- 2018 **Cook B, Seager R, Williams AP, Puma MJ, McDermid S, Kelley M, Nazarenko L.**, *AGU Fall Meeting 2018. AGU*, Climate Change Amplification of Natural Drought Variability: What if Ocean Conditions that Caused the Historic Mid-Twentieth Century North American Drought Occurred Again?, Abstract H41C-07
- 2018 **Kakinuma K, Puma MJ, Hirabayashi Y, Kanae S.**, *AGU Fall Meeting 2018. AGU*, Population displacement and flood in the world, Abstract H44B-06
- 2018 **Puma MJ, Wada Y, Cook BI, Nordbotten JM.**, *AGU Fall Meeting, 2018*, A Richter scale reveals the magnitude of global food disruptions Abstract PA12B-01
- 2018 **Jaegermeyr J, L Xia, MJ Puma, JW Elliott, C Mueller, and A Robock.**, *AGU Fall Meeting Abstracts. 2018*, A regional nuclear conflict has global implications for food security
- 2017 **Maio R, Puma MJ.**, *20th Annual Conference on Global Economic Analysis*, Improving the Resilience of African Countries to Food Shocks, Abstract #5259
- 2017 **Otto C, Schewe J, Puma MJ, Frieler K.**, *AGU Fall Meeting 2017. AGU*, Beneficial impacts of an international grain reserve on global food security, Abstract GC31E-1048
- 2016 **Dalin C, Wada Y, Kastner T, Puma MJ.**, *EGU General Assembly 2016*, Food supply reliance on groundwater, Abstract EPSC2016-4178
- 2016 **Dalin C, Wada Y, Kastner T, Puma MJ.**, *AGU Fall Meeting 2016. AGU*, Who is eating up the world's aquifers? Unsustainable irrigation embedded in global food trade, Abstract GC41G-06
- 2016 **Kakinuma K, Puma MJ, Kanae S.**, *AGU Fall Meeting 2016. AGU*, Climate change may affect human migration in Mongolia, Abstract NH33A-1912
- 2016 **Puma MJ, Wada Y, Chon S, Cook BI, Nordbotten JM.**, *AGU Fall Meeting, 2016*, Global and country-level fragility to major disruptions in crop production. Abstract GC43C-1169
- 2015 **Krakauer N, Puma MJ, Cook B, Gentine P, Nazarenko L, Kelley M.**, *AGU Fall Meeting 2015. AGU*, Impacts of irrigation on regional water resources in the coupled climate system, Abstract GC33C-1308
- 2015 **Puma MJ, Chon SY.**, *AGU Fall Meeting 2015. AGU*, Susceptibility of South Korea to hydrologic extremes affecting the global food system, Abstract GC33C-1312

- 2015 **Tucker CJ, Puma MJ.**, *AGU Fall Meeting, 2015*, Advances in remote sensing for vegetation dynamics and agricultural management. Abstract GC31H-02
- 2014 **McDermid SP, Cook BI, Puma MJ, Nazarenko L.**, *AGU Fall Meeting 2014. AGU*, The Impact of Agricultural Irrigation on the South Asian Monsoon Variability and Moisture Transport, Abstract A43K-04
- 2014 **Puma MJ, Cook BI, Krakauer N, Gentine P, Nazarenko L, Kelley M, Wada Y.**, *AGU Fall Meeting 2014. AGU*, Impacts of Irrigation on Daily Extremes in the Coupled Climate System, Abstract GC33C-1308
- 2014 **Puma MJ, Cook BI.**, *AGU Fall Meeting, 2014*, Impacts of irrigation on surface temperature and precipitation distributions in the United States. Abstract GC13J-0815
- 2013 **Puma MJ, Bose S, Chon S, Cook BI.**, *AGU Fall Meeting, 2013*, Increasing susceptibility of the global food trade network to disturbances. Abstract GC11D-1038
- 2011 **Cook BI, Puma MJ, Kaplan JO, Anchukaitis KJ.**, *AGU Fall Meeting 2011. AGU*, Pre- and Post-Columbian Land Cover Changes and Associated Climate Impacts, Abstract H24E-05
- 2011 **Perveen S, Puma MJ, Troy TJ, Browne M, Ghosh M.**, *AGU Fall Meeting 2011. AGU*, Virtual Water Trade: Revisiting the Assessments to Incorporate Regional Water Stress, Abstract GC13A-0969
- 2011 **Krakauer N, Puma MJ, Cook BI.**, *AGU Fall Meeting 2011. AGU*, Groundwater variability under climate change in a global climate model, Abstract H11D-1079
- 2011 **Puma MJ, Cook BI, Kelley M.**, *AGU Fall Meeting 2011. AGU*, Impacts of irrigation and urbanization on land-atmosphere coupling in a climate model, Abstract H31C-1160
- 2010 **Aleinov ID, Kiang NY, Romanou A, Puma MJ, Moorcroft PR, Kim Y.**, *AGU Fall Meeting 2010. AGU*, Implementation of Global Carbon Cycle in GISS ModelE GCM: from Leaf to Planetary Scale, Abstract B41G-0403
- 2008 **Kiang NY, Kharecha P, Delgrosso S, Aleinov I, Puma M, Kim Y.**, *AGU Fall Meeting 2008. AGU*, Seasonal and Long-Term Behavior of Soil and Autotrophic Respiration in the Ent Dynamic Global Terrestrial Ecosystem Model, Abstract B13D-08
- 2008 **Aleinov I, Kiang NY, Romanou A, Puma MJ, Kharecha P, Moorcroft PR, Kim Y.**, *AGU Fall Meeting 2008. AGU*, Global Carbon Cycle Inside GISS ModelE GCM: Results of Equilibrium and Transient Simulations, Abstract U41B-0019
- 2008 **Puma MJ, Kiang NY, Aleinov I.**, *AGU Fall Meeting 2008. AGU*, Evapotranspiration Partitioning and its Effects on Terrestrial Ecosystem Dynamics in the GISS Land Surface Model, Abstract B31A-0289
- 2005 **Puma MJ, Celia MA, Rodriguez-Iturbe I, Nordbotten JM, Guswa AJ.**, *AGU Fall Meeting, 2005*, Effects of spatial heterogeneity in rainfall and vegetation on soil moisture and evapotranspiration, Abstract B33D-1056
- 2005 **Celia MA, Rodriguez-Iturbe I, Guswa AJ, Nordbotten JM, Puma MJ.**, *AGU Joint Assembly, 2005*, Representation of soil moisture, evapotranspiration, and solute transport across different length and time scales, Abstract H42A-01
- 2003 **Puma MJ, Celia MA, Rodriguez-Iturbe I, Guswa AJ.**, *AGU Fall Meeting, 2003*, Functional relationship to describe temporal statistics of soil moisture averaged over different depths, Abstract H42H-02

Research Methods and Computational Expertise

Programming Python, R, Fortran, Matlab

Statistical Methods Bayesian inference, statistical physics, machine learning, network analysis

Modeling Frameworks Climate models (GISS ModelE), agent-based models (FLEE), complex systems modeling, quantum theoretical frameworks

Computational Infrastructure High-performance computing systems, NASA GISS computing resources, distributed computing

Tools & Platforms GitHub, AI/ML frameworks, Dojo (DARPA World Modelers program), Inkscape, collaborative research platforms