Nathaniel W. Chaney

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Research Interests

Hydrology, Earth system science, soil science, ecology, geomorphology, numerical modeling, high performance computing, machine learning, environmental data delivery, and data assimilation.

Education

Princeton University

Ph.D., Civil and Environmental Engineering 6/2015
M.A., Civil and Environmental Engineering 6/2012

UC Berkeley

B.A., Applied Mathematics 5/2010
B.A., *cum laude*, Earth and Planetary Sciences: Atmospheric Sciences 5/2010

Experience

Postdoctoral Research Associate, Princeton University 7/2015 – Present
Visiting Research Scientist, Geophysical Fluid Dynamics Laboratory 7/2015 – Present
Supervisor Elena Shevliakova.

Research Assistant, Princeton University 9/2010 – 6/2015
Advisor Eric F. Wood.

Assistant Instructor, Princeton University Fall 2014
Fundamentals of Environmental Studies: Population, Land Use, Biodiversity, and Energy (ENV 201).

Visiting Scholar, University of Sydney 4/2014
Supervisor Alex McBratney.

Research Assistant, UC Berkeley 2008 – 2010
Supervisor Inez Fung.

Awards

Wu Prize for Excellence, Princeton University 2014
Awarded to engineering graduate students who perform at the highest level as scholars and researchers.

Publications

Refereed Journal Articles

Chaney, N. W., M. Van Huijgevoort, E. Shevliakova, S. Malyshev, P.C.D. Milly, P. Gauthier, and B. Sulman: Harnessing Big Data to Rethink Land Heterogeneity in Earth System Models. *Hydrology and Earth System Sciences*, *In review*, Manuscript is available at `https://www.hydrol-earth-syst-sci-discuss.net/hess-2017-603`.

Chaney, N. W., J. D. Herman, M. Ek, E. F. Wood, 2016: Deriving Global Parameter Estimates for the Noah Land Surface Model using FLUXNET and Machine Learning. *Journal of Geophysical Research - Atmospheres.*, **121**, 13,218-13,235.

Chaney, N. W., P. Metcalfe, E. F. Wood, 2016: HydroBlocks: A Field-scale Resolving Land Surface Model for Application Over Continental Extents. *Hydrological Processes*, **30**, 3543-3559.

Chaney, N. W., E. F. Wood, J. W. Hempel, A. McBratney, T. Nauman, C. Brungard, N. Odgers, 2016: POLARIS: A 30-meter probabilistic soil series map of the contiguous United States. *Geoderma*, **274**, 54-67.

Chaney, N. W., J. D. Herman, P. M. Reed, E. F. Wood, 2015: Flood and Drought Hydrologic Monitoring: The Role of Model Parameter Uncertainty. *Hydrology and Earth System Sciences*, **19**, 3239-3251.

Chaney, N. W., J. K. Roundy, Julio E. Herrera Estrada, E. F. Wood, 2014: High-Resolution Modeling of the Spatial Heterogeneity of Soil Moisture: Applications in Network Design. *Water Resources Research*, **51** (1), 619-638.

Chaney, N. W., J. Sheffield, G. Villarini, E. F. Wood, 2014: Development of a High-Resolution Gridded Daily Meteorological Dataset over Sub-Saharan Africa: Spatial Analysis of Trends in Climate Extremes. *Journal of Climate*, **27**, 5815-5835.

Cai, X., M. Pan, **N. W. Chaney**, A. Colliander, S. Misra, M. H. Cosh, W. T. Crow, T. J. Jackson, E. F. Wood, 2017: Validation of SMAP soil moisture for the SMAPVEX15 field campaign using a hyper-resolution model. *Water Resources Research*, **53**, 3013-3028.

He, X., **N. W. Chaney**, M. Schleiss, J. Sheffield, 2016: Spatial Downscaling of Precipitation using Adaptable Random Forests. *Water Resources Research*, **52**, 8217-8237.

Pan, M., X. Cai, **N. W. Chaney**, D. Entekhabi, E. F. Wood, 2016: An Initial Assessment of SMAP Soil Moisture Retrievals Using High Resolution Model Simulations and In-situ Observations. *Geophysical Research Letters*, In press.

Estes, L. D., Searchinger, T., Spiegel, M., Tian, D., Sichinga, S., Mwale, M., Kehoe, L., Kuemmerle, T., Berven A., **Chaney, N.**, Sheffield, J., Wood, E. F., Caylor, K. K., 2016: Reconciling agriculture, carbon, and biodiversity in a savanna transformation frontier. *Philosophical Transactions B.*, **371**, 1703.

Pan, M., Fisher, C. K., **Chaney, N. W.**, Zhan, W., Crow, W. T., Aires, F., Entekhabi, D., Wood, E. F, 2015: Triple collocation: Beyond three estimates and separation of structural/non-structural errors. *Remote Sensing of Environment.* **171**, 299-310.

Reed, P. M., **N. W. Chaney**, J. D. Herman, M. P. Ferringer, E. F. Wood, 2015: Internationally Coordinated Multi-Mission Planning is Critical for Space-based Rainfall Observations to Aid Flood Risk Adaptation. *Environmental Research Letters*, **10** (10).

Bierkens, M., V. A. Bell, P. Burek, **N. W. Chaney**, L. Condon, C. H. David, A. Roo, P. Dll, N. Drost, J. S. Famiglietti, M. Flrke, D. J. Gochis, P. House, R. Hut, J. Keune, S. Kollet, R. Maxwell, J. T. Reager, L. Samaniego, E. Sudicky ,E. H. Sutanudjaja, N. Gielsen, H. Winsemius, E. F. Wood., 2014: Hyper-resolution global hydrological modelling: what's next?. *Hydrological Processes*, **29** (2), 310-320.

Estes, L. D., **N. W. Chaney**, J. Herrera-Estrada, K. K. Caylor, J. Sheffield, E. F. Wood, 2014: Changing Water Availability during the African maize-growing season, 1979-2010. *Environmental Research Letters*, **9** (7).

Xia, Y., J. Sheffield, M. B. Ek, J. Dong, **N. W. Chaney**, H. Wei, J. Meng, E. F. Wood, 2014: Evaluation of multi-model simulated soil moisture in NLDAS-2. *Journal of Hydrology*, **512**, 107-125.

Enenkel, M., L. See, R. Bonifacio, V. Boken, **N. W. Chaney**, P. Vinck, L. You, E. Dutra, M. Anderson, 2014: Drought and food security-Improving decision-support via new technologies and innovative collaboration. *Global Food Security*, **4**, 51-55.

Yuan, X., E. F. Wood, **N. W. Chaney**, J. Sheffield, J. Kam, M. Liang, and K. Guan, 2013: Probabilistic Seasonal Forecasting of African Drought by Dynamical Models. *Journal of Hydrometeorolgy.*, **14** (6), 1706-1720.

Sheffield, J., E. F. Wood, **N. W. Chaney**, K. Guan, S. Sadri, X. Yuan, L. Olang, A. Amani, A. Ali, S. Demuth, and L. Ogallo, 2013: A Drought Monitoring and Forecasting System for Sub-Sahara African Water Resources and Food Security. *Bulletin of the American Meteorological Society*, **95**, 861-882.

Ershadi, A., M.F. McCabe, J. P. Evans, **N. W. Chaney**, E. F. Wood, 2013: Multi-site evaluation of terrestrial evapotranspiration models using FLUXNET data. *Agricultural and Forest Meteorology*, **187**, 46-61.

Articles in preparation

Chaney, N. W., M. Van Huijgevoort, E. Shevliakova, S. Malyshev, P.C.D. Milly: Unraveling the Role of Multi-scale Land Heterogeneity in the Earth System.

Chaney, N. W., A. McBratney, E. F. Wood, C. Morgan, Y. Yimam, T. Nauman, C. Brungard: Building on POLARIS: A 30-meter probabilistic soil properties map of the contiguous United States.

Oral Presentations and Workshops

AGU, New Orleans, LA 12/2017
Using Unsupervised Learning to Unlock the Potential of Hydrologic Similarity (Contributed talk)

CUAHSI cyberseminar series on Hillslope Hydrology in Earth System Models 5/2017
Harnessing Big Data to Integrate Hillslope Hydrology into Earth System Models (Invited Talk)

U.T. Austin, Austin, TX 3/2017
Harnessing Big Data to Rethink Heterogeneity in Global Hydrology (Invited Talk)

Cornell University, Ithaca, NY 2/2017
Harnessing Big Data to Rethink Heterogeneity in Global Hydrology (Invited Talk)

U.C. Davis, Davis, CA 1/2017
Harnessing Big Data to Rethink Heterogeneity in Global Hydrology (Invited Talk)

ASA, CSSA, and SSSA meeting, Phoenix,AZ 11/2016
Polaris: Towards an Improved Representation of Spatial Heterogeneity in Land Surface Models (Invited Talk)

Lawrence Berkeley National Laboratory, Berkeley, CA 9/2016
Harnessing Big Data to Rethink Heterogeneity in Global Hydrology (Invited Talk)

U.C. Davis, Davis, CA 9/2016
Harnessing Big Data to Rethink Heterogeneity in Global Hydrology (Invited Talk)

CUAHSI Biennial Colloquium, Shepherdstown, WV 7/2016
The role of Big Data in building and applying the next generation of hydrologic models and soil databases over the globe (Invited Talk)

UNESCO, Santiago, Chile 5/2016
Training of the Latin American and Caribbean Flood and Drought Monitor

ISMC, Austin, Texas 3/2016
A 30-meter soil properties map of the contiguous United States for use in environmental models (Contributed talk and poster)

NCSS national conference, Duluth, Minnesota 6/2015
Completion of a soils layer (Not SSURGO) for all unmapped western lands (Contributed talk)

EGU, Vienna, Austria 4/2015
dSSURGO: Development and validation of a 30 meter digital soil class product over the 8-million square kilometer contiguous United States (Contributed talk)

AGU, San Francisco, CA 12/2014
Development and Implementation of the DTOPLATS-MP land surface model over the Continental US at 30 meters (Contributed talk)

UNESCO, Santiago, Chile 11/2014
Installation and Training of the Latin American and Caribbean Flood and Drought Monitor

ASA, CSSA, and SSSA meeting, Long Beach, CA 11/2014
Spatial Disaggregation and Harmonization of gSSURGO (Invited Talk)

EGU, Vienna, Austria 4/2014
Development of an Improved Surface Conductance Scheme for Penman-Monteith using FLUXNET (Contributed talk)

HyperHydro Workshop, Utrecht, Netherlands 2/2014
Macroscale Land Surface Models: Improving Spatial Heterogeneity

ASA, CSSA, and SSSA meeting, Tampa, FL 11/2013
Soil Heterogeneity in Macroscale Land Surface Models: Unresolved Challenges (Invited Talk)

AGRHYMET, Niamey, Niger 10/2013
Installation and Training of the African Flood and Drought Monitor: AGRHYMET

Model Complexity vs. Model Uncertainty of Catchment models, Berlin, Germany 6/2013
Hydrologic Modeling: VIC, TOPLATS, and beyond

EGU, Vienna, Austria 4/2013
Assimilation of In-Situ Measurements into Gridded Data Products through State-Space Estimation: Application over Sub-Saharan Africa (Contributed talk)

NGEE-Arctic, Oak Ridge, TN 4/2013
High-Resolution Land Surface Modeling: Potential and Challenges

SWALIM, Nairobi, Kenya 11/2012
Princeton African Drought Monitor: Greater Horn of Africa (Invited Talk)

ICPAC, Nairobi, Kenya 6/2012
Development and Implementation of the African Drought Monitor: ICPAC

AGRHYMET, Niamey, Niger 1/2012
Development and Implementation of the African Drought Monitor: AGRHYMET

Other Presentations

EGU, Vienna, Austria 4/2016
Poster: How to represent 100 meter spatial heterogeneity in Earth system models.

AGU Fall Meeting, San Fransisco, CA 12/2015
Poster: Assessing deficiencies of soil moisture networks using a field-scale land surface model.

AGU Fall Meeting, San Fransisco, CA 12/2014
Talk as co-author: Evolution of Global-Scale Hydrology over the Last 25 Years.

Satellite Soil Moisture Validation and Application Workshop, Frascati, Italy 7/2013
Talk as co-author: High-Resolution Land Surface Modeling: Improved Validation and Downscaling of Soil Moisture Retrievals.

Ezio Todini 70th Symposium, Bologna 6/2013
Talk as co-author: Continental Scale Hyper-Resolution Land Surface Modeling: Challenges and Initial Results.

EGU, Vienna, Austria 4/2013
Talk as co-author: Global products of evapotranspiration: the GEWEX LandFLUX Initiative.

AGU Fall Meeting, San Fransisco, CA 12/2012
Poster: Validation of a suite of process-based models of evapotranspiration using FLUXNET.
Talk as co-author: Development of an Experimental African Drought Monitoring and Seasonal Forecasting System: A First Step Towards a Global Drought Information System.

AGU Fall Meeting, San Fransisco, CA 12/2011
Talk as co-author: Assessment of large scale and regional scale models for application to a high resolution global land surface model.

Poster: Development of an operational African Drought Monitor prototype.

AGU Fall Meeting, San Fransisco, CA 12/2009
Poster: Relationship between Fracture Mechanics and Heat Transfer in Moulin Formation.

Mentoring

Noemi Vergopolan, Ph.D. student 2016 – Present

Jivahn Moradian, Undergraduate student 2017 – Present

Patents

E. F. Wood, J. Sheffield, M. Pan, C. K. Fisher, **Chaney, N. W.**, J. D. Herman, H. E. Beck: System and Method for Performing Accurate Hydrologic Determination using Disparate Weather Data Sources, 2017, U.S. Provisional Patent No. 62/530,948.

Technical Skills

Graduate certificate in computational science, Princeton University 2015

Python, FORTRAN, C, C++, Matlab, R, HTML, Javascript, Perl, ArcGIS, and QGIS

Released Software

African Flood and Drought Monitor	http://stream.princeton.edu
HydroBlocks	https://github.com/chaneyn/HydroBlocks
Geospatialtools	https://github.com/chaneyn/geospatialtools

Professional Activities

Reviewer for *Water Resources Research*, *Geophysical Research Letters*, *Journal of Hydrometeorology*, *Remote Sensing*, *Journal of Hydrology*, *Hydrological Processes*, *Journal of Geophysical Research - Atmospheres*, *Scientific Reports*, *International Journal of Climatology*, *Water*, *Hydrology and Earth System Sciences*, *Remote Sensing of Environment*, *Ambio*, and *Global Environmental Change*.

Member, American Geophysical Union	2009 – Present
Member, Soil Science Society of America	2014 – Present
Member, American Meteorological Society	2017 – Present
NASA Grant Review Panel	2016
NSF Ad-hoc reviewer	2017

Volunteering

Assistant scoutmaster in local Boy Scouts of America Troop	2014 – Present
Youth leader at local community church	2014 – 2017
Mentor for Princeton University's chapter of Engineers Without Borders	2015