

Susan Hubbard, PhD

Curriculum Vitae

Deputy Laboratory Director, Science and Technology
Oak Ridge National Laboratory
<https://www.ornl.gov/staff-profile/susan-s-hubbard>

As the Deputy for Science and Technology at Oak Ridge National Laboratory (ORNL), Susan oversees one of the nation's most extensive fundamental science and energy research portfolios. In partnership with other ORNL leaders, Susan contributes to the planning and execution of Laboratory-level policies and initiatives. She also serves as ORNL's chief research liaison with the University of Tennessee, other national laboratories, ORNL core universities, and other institutional partners.

Susan's research focuses on quantifying terrestrial processes that govern water availability, water quality, carbon cycling, and agriculture through advancing geophysical and data fusion methods. She is recognized for her leadership in developing the field of hydrogeophysics. She is a member of the National Academy of Engineering, and an elected Fellow of the American Academy of Arts and Sciences, the American Geophysical Union, and the Geological Society of America. She has an extensive service record for the scientific professional community and the Department of Energy.

Dr. Hubbard is committed to fostering a diverse and inclusive culture, and to the development of early-career scientists.

PROFESSIONAL POSITIONS

2022-present, Deputy Director for Science and Technology, Oak Ridge National Laboratory
2015-2022, Founding Associate Laboratory Director, Berkeley Lab Earth & Environ. Sciences
2015-2022, Full Professor Adjunct, UC Berkeley, Environmental Science, Policy and Mgmt.
2010-2015, Director & Deputy Director Earth Sciences Division, Berkeley Lab
2007-2010, Founding Associate Director, UC Berkeley Water Center
1998-2022, Earth Scientist, Berkeley Lab
1990-1993, Geophysicist, Industry
1985-1987, Geologist, U.S. Geological Survey

EDUCATION

Ph.D. Civil and Environmental Engineering, Hydrogeology focus, UC Berkeley
M.S. Geophysics, Virginia Tech.
B.S. Geology, University of California, Santa Barbara.

AWARDS AND RECOGNITIONS (SELECT):

2022, Society of Geophysicists Global Lecturer Award, Near Surface Geophysics
2020, Elected Member, National Academy of Engineering
2019, Elected Fellow, American Academy of Arts and Sciences
2019, American Institute of Hydrology Robert G. Wetzel Award on Water Quality

2019, Distinguished Alumni, UC Santa Barbara Earth Sciences Department
2019, Alameda County CA Women's Hall of Fame, Science Award
2017, Elected Fellow, American Geophysical Union
2016, Hal Mooney Award, Society of Exploration Geophysicists
2014, Distinguished Alumni, Civil and Environmental Engineering Academy, UC Berkeley
2014, Soc. for Technical Communication, Distinguished Technical Communication Award
2013, Outstanding Women @ Berkeley Lab recognition
2011, Elected Fellow, Geological Society of America
2010, Birdsall-Dreiss Distinguished Lecturer Award, Geological Society of America
2009, Top Associate Editor Award, Journal of Hydrology
2009, Frank Frischknecht Leadership Award, Society of Exploration Geophysicists
2008, Most influential article, SEG Leading Edge

PROFESSIONAL SERVICE (SELECT):

Advisory / Board Roles

2022-present, UT Knoxville External Adv. Council for Research, Innovation and Econ. Dev.
2022-present, Georgia Inst. Tech. Woodruff School of Mechanical Engineering Advisory Board
2022-present, ORNL Center for Bioenergy Innovation Science Advisory Board
2021-present, Board of the Distinguished Alumni Academy, UC Berkeley C&E Engineering
2021-2022, Board of Directors, California Council of Science and Technology (CCST)
2000-2022, Member, Council of Energy, Climate and Environmental Deans, UC Berkeley
2020-2022, Chair and Member, Governance Board, DOE-AMO NAWI Hub (National Alliance for Water Innovation)
2020, Review Committee, Manaaki Whenua Landcare, New Zealand Natl. Lab
2019, Review Committee, Virginia Tech Geosciences
2017-present, Advisory Board, International Soil Modeling Consortium
2017-present, Advisory Board, EPA Superfund Program 'Exposome' UCB
2017-2019, Partnership Board, DOE-BER Environmental System Science Cyberinfrastructure
2016-2019, Scientific Advisory Board, NSF Arctic Data Center UCSB
2016-2019, Advisory Board, Civil and Environmental Engineering Dept, UC Berkeley
2015-2020, Council member, California Council on Science and Technology (CCST)
2015-2019, Director's Council, University of California Water Science
2015-2018, Advisory Board, Interoperable design extreme scale software (IDEAS; DOE-BER)
2014-2018, Advisory Board, Radionuclide Waste Disposal, EPSCoR Program, South Carolina
2014-2017, Sr Advisor, DOE Advanced Simulation Capability for Env. Mgmt (ASCEM, DOE-EM)
2013, External Review Committee, Helmholtz Association Terrestrial Program, Germany
2012, External Review Committee, Stanford Dept of Energy Resources Engineering
2011, Advisory Board, SmartGeo NSF IGERT, Colorado School of Mines
2010-2015, Federal Advisory Committee, DOE-BER (BERAC)
2010, Technical Advisory Committee, DOE-EM
2006, Advisory Committee, Forschungszentrum Jülich National Laboratory, Germany

Editorial Boards:

2010-2015, Associate Editor JGR-Biosciences
2007-2013, Co-Editor Vadose Zone Journal
2007-2010, Associate Editor, Journal of Hydrology
2001-2005, Associate Editor Water Res. Research

Select Professional Community and DOE Service:

2022-present, Co-chair, Brookhaven Laboratory Director Search Committee
2021-present, Member, Special Nominating Committee, National Academy of Engineering
2020-2022, Chair Elect, Chair and Retiring Chair, AAAS Atmospheric and Hydrospheric Section
2021, University of California Wildfire, CA Agency Engagement Leader
2020-2021, Member, National Academy of Engineering Search Committee, Section 11
2020-2022, Member, Program Committee, California Council of Science and Technology (CCST)
2020-2021, Member, DOE LOB Working Group: Examining Opportunities for Improvements and Flexibilities Enhance Recruitment and Retention
2020, External reviewer, select DOE National Lab Diversity Programs/Plans
2020-2021, Canvassing Committee, American Geophysical Union
2019-2021, Nominations Committee, American Geophysical Union
2019-2022, Senior Leader, International Early Career Critical Zone Science Consortium
2019-2020, Steering Committee, Interagency Conference on Research in Watersheds (ICRW)
2018- 2020, Member, Macelwane Award Committee, American Geophysical Union
2018- 2020, Member, Nominations Committee, Geological Society of America
2018-2019, Member, California AB1281 Produced Water Executive Committee, CCST
2018, Member, Executive Committee, California Water-Data AB1755 Governance & Funding
2017, Co-chair, Fall meeting session, American Geophysical Union
2018, Organizer, Collaborative Watershed Science Workshop, Crested Butte CO
2017, Organizer, Open and Transparent California Water Data Capstone Workshop, Berkeley,
2017, Writer, DOE-BER Grand Challenges in Biological and Environmental Sci. Chapter Report
2017, Co-Organizer, Environmental Knowledgebase Workshop, BIDS, Berkeley
2016, Co-Chair, DOE-BES Basic Research Needs Workshop Water-Energy, Wash DC
2015, Panel Lead and Writer, DOE-BES Basic Research Needs for Environmental Mgmt.
2015, Technical lead, DOE Subsurface Science Crosscut, National Laboratory Engagement Day
2015, Committee member and Writer, DOE-BES Basic Research Needs for Water-Energy
2014-2016 UC Global Food Initiative, Berkeley Lab Representative
2014-2018, Co-lead, National Subsurface DOE 'crosscut' Initiative
2014, Session Chair, Subsurface fracture control, Rock and Fluid Physics Conference, Shell Technology Center
2014, Co-Chair, Complex Soil Systems SSSA/Bouyoucos Conference, Berkeley
2013, Chair, Geological Society of America, Birdsall Dreiss Search Committee
2012, Chair, Geophysical Characterization of Permafrost Systems Special Session, Fall AGU, San Francisco
2012, Contributor/writer, DOE-BER Technology Innovation 'Virtual Laboratory' Report (DOE/SC-0156)

2010, Contributor/writer, DOE-BER “Grand Challenges for Biological and Environmental Research: A Long-Term Vision” (DOE/SC-1035, 2010)

2010, Co-lead and co-author, DOE-BER “Complex System Science for Subsurface Fate and Transport” (DOE/SC0123, 2010) and workshop

2010, Writer, DOE-EM Long-Range Deep Vadose Zone Program Plan (DOE/RL-2010-89)

2010, Session chair, Computational Methods in Water Res., Barcelona, June 2010,

2010, Session Chair, Goldschmidt conference, Session Chair Knoxville, TN, June 2010.

2010, Co-author, DOE-EM Scientific Opportunities to Reduce Risk in Groundwater and Soil Remediation (PNNL-18516).

2008, Co-organizer, Computational Methods in Water Resources Conference, San Francisco

2008, Co-organizer, Chapman Conference, Biogeophysics, Portland Maine

2006, Contributor, DOE-BES Basic Research Needs for Geosciences: Facilitating 21st Century Energy Needs

2002-2006, Chair, AGU Hydrogeophysics Technical Committee

2002, Founder, AGU Hydrogeophysics Technical Committee

2002-2006, US representative, International Ass. Hydrological Sci. “2020 “Working Group

2004, Panelist, DOE-BES workshop noninvasive Earth monitoring, Houston Tx

2005, Panelist, DOE EM Geop. Characterization and monitoring workshop.

2005, Chair, Watershed Characterization Special Session, Fall AGU, San Fran.

2004, Chair, Hydrogeophysics Special Session, Fall AGU, San Francisco.

2003, Chair, Hydrogeophysics Special Session, Fall AGU, San Francisco

2003, Organizer, Coupled Processes DOE-BER Workshop, Berkeley CA, LBNL

2003, Chair, Coupled Processes DOE-BER Subsurface Science Session, DOE EMSP, WA

2002, Co-Organizer, NATO Hydrogeophysics Advanced Study Inst., Czech Republic

2000, Chair, Breakthroughs in Field Scale Bacterial Transport, Fall AGU, S.F.

INVITED SPEAKING ENGAGEMENTS (SELECT):

2022, Secretary of Energy Advisory Board (SEAB) annual meeting, ‘Climate resilient water systems’

2022, SEG Global Lecturer Award, ‘A Watershed Moment for Watershed Science’

2021, Panelist, DOE-BER Mountainous Hydroclimate Workshop

2021, Plenary speaker, DOE-BER ESS PI Meeting

2021, CUASHI Critical Zone - Watershed Seminar Series

2021, Moderator with California Agency Leaders, UC Wildfire Virtual Symposium

2021, University of California, Davis

2021, University of Washington, St. Louis

2021, University of Idaho and Washington State

2020, American Geophysical Union

2020, Interagency Conference on Research in Watersheds

2020, AAAS Panel Moderator, Wildfire Resilience through Science and Technology

2019, Commencement Speech, Virginia Tech, Geoscience Department

2019, American Geophysical Union Fall Meeting, San Francisco

2019, Stanford University, Geophysics Dept Seminar

2019, CA Contemporary Groundwater Issues Council Panelist, UC Davis

2019, Moderator, Wildfire Panel for CA Legislators, CCST, Sacto CA
2019, University of Wyoming, Laramie, WY
2019, Soil Science Society of America, San Diego, CA
2018, American Geophysical Union Fall Meeting, San Francisco, CA
2018, Tsinghua University, China
2018, Peking University, China
2018, Chinese Academy of Sciences, Tibetan Research Inst Beijing, China
2018, Chinese Academy of Sciences, Env. and Ecosys. Science, Beijing Normal University, China
2017, CA Department of Water Resources, Sacto CA
2017, American Chemical Society, California Water Resiliency, Washington DC
2017, American Geophysical Society Union Fall Meeting, Session H32D, New Orleans, LA
2017, American Geophysical Society Union Fall Meeting, Session H31J, New Orleans, LA
2017, Urbana Champaign Illinois University, Distinguished seminar, Urbana Champaign, Ill
2018, OZCAR France Critical Zone meeting, Frejus, France
2018, Colorado School of Mines Heiland Distinguished Speaker, Golden CA
2018, National Academies Review, Washington DC
2017, UC Berkeley Civil and Environmental Engineering Seminar, Berkeley CA
2017, 27th Annual Intern. Conf. on Soil, Water, Energy, & Air, San Diego, CA
2017, University of Southern California Distinguished Seminar, Los Angeles, CA
2016, American Geophysical Union Fall Meeting, San Francisco
2016, France National Polytechnical Institute, Bordeaux, Distinguished Seminar
2016, University of Saskatchewan Saskatoon Distinguished Lecturer series, Saskatoon, Canada
2016, UC Merced Distinguished Seminar, Merced CA
2016, CUAHSI Big Data Workshop, Shepherdstown, WV
2016, Geotech/Geoengineering Distinguished Lecture, UC Berkeley, CA
2016, KOPRI Polar Science Symposium, Plenary Speaker, Seoul Korea
2016, Waterloo Distinguished 'Watertalks' Lecture Series, Waterloo, Ontario, Canada
2015, Water Resource Sustainability Issues on Tropical Islands Conference, Hawaii
2015, American Geophysical Union Fall Meeting, B52C-04, San Francisco, CA
2015, American Geophysical Union Fall Meeting, Union Session Invited San Francisco, CA
2015, European Geophysical Union Invited Speaker, Vienna Austria
2014, CUAHSI Big Data Bi-Annual Conference, Shepherdstown, WV
2014, University of Wyoming Geology and Geop. Distinguished Lecturer Series, Laramie, WY
2014, Complex Soils Systems 2014 Conference, Berkeley, CA
2014, Jason Group, 'State of Stress in the Engineered Subsurface', Los Angeles, CA
2014, US Energy Association, Research needs in Subsurface Energy Science, Arlington, VA
2014, Shell Subsurface Complexity Workshop, Amsterdam, Netherlands
2014, Env. Science and Policy Mgmt UCB Berkeley Seminar Series, Berkeley CA
2014, DOE Subsurface Biogeochemistry and Terrestrial Ecosystems PI Meeting, Maryland
2013, American Geophysical Union Fall Meeting, San Francisco, CA
2013, Energy Biosciences Institute Seminar Series, Berkeley, CA
2013, Keynote Presentation, Washington Hydrology Symposium, Tacoma, WA
2013, Stanford Environmental Fluid Mechanics and Hydrology Colloquium
2012, American Geophysical Union H53F-1586 AGU, San Francisco, CA

2012, American. Geophysical Union, H33N-01 Fall Meeting, AGU, San Francisco, CA,
2012, Water Research Horizon Conference, Berlin, Germany
2012, European Geophysical Union Vienna, Austria
2012, Battelle Chlorinated Conference Keynote, Monterey CA
2011 Dept of Energy Biological and Env Advisory Committee, Washington DC
2011, New Frontiers in Engineering Science for Sustainability, Texas A&M Water Scholar Seminar
2011, University of Nevada, Seminar Speaker, Las Vegas Nevada
2011, Duke University Distinguished Seminar, North Carolina
2011, Advanced Dept of Energy Simulation Capability Workshop, Washington, DC
2011, Rensselaer University Invited Seminar, NY
2011, NSF Water Scholar Seminar Series Keynote, Texas A&M, College Station TX
2010, University of Wisconsin, Madison Invited Seminar, Wisconsin
2010, Argonne National Laboratory Distinguished Speaker, Illinois
2010, Northern Illinois University, Dekalb, Distinguished Seminar, Illinois
2010, Michigan State, East Lansing Michigan
2010, Grand Valley University, Michigan
2010, Groundwater Research Association Distinguished Speaker, Sacramento, CA
2010, Inland Geological Society Invited Speaker, Riverside, CA
2010, Computational Methods in Water Resources Keynote, Barcelona Spain
2010, UC Davis Hydrological Seminar Series, Davis CA
2010, National Groundwater Summit Keynote, Denver, CO
2010, UC Berkeley Civil and Environmental Eng. Seminar Series, Berkeley CA
2010, Dept of Energy Env Remediation Science Program Platform Presentation, Washington, DC,
2010, Distinguished Environmental Lecture, Florida International University, Miami FLA
2010, University of Florida Spring Seminar Series, Gainesville, FLA
2010, Delaware Environmental Institute Distinguished Lecture
2010, UMass Environmental Lecture Series, Amherst, Massachusetts
2010, K. Douglas Nelson Lecture Series, Syracuse University, New York
2009, Semi-Annual Dawdy Invited Lecture, Department of Geos., San Francisco State University
2010, Oregon State University Geoscience Seminar Series
2010, Portland Environmental Geology Seminar Series, Oregon
2009, New Mexico Tech Hydrology Seminar, Socorro, NM
2009, Frontiers in Geosciences' Distinguished Colloquium, Los Alamos Natl Laboratory
2009, American Geophysical Union Fall Meeting, San Francisco
2009, American Geophysical Union Spring Meeting, Toronto, Canada
2009, Association for Env. Health and Sciences Invited platform speaker, San Diego
2008, Stanford Environmental and Fluid Mechanics Invited Seminar
2008, U.S.G.S. Water Research Division Seminar Series, Menlo Park, CA
2008, Gordon Conference Flow in Porous Media, Oxford England
2007, NRC Workshop on Uncertainty, sensitivity and parameter estimation Wash DC
2007, American Geophysical Union Fall Meeting, San Francisco, CA
2007, UC Davis Engineering Seminar Series, Davis CA
2006 American Geophysical Union, Fall Meeting San Francisco, CA
2006 Geological Society of America, Philadelphia, PA

2006, Groundwater Resources of California, Long Beach, CA
2006, Oregon State University 'World-Class Women in Water' seminar series, Corvallis, OR
2006, Seismological Laboratory Seminar Series, Berkeley CA
2006, Computational Methods in Water Resources (CMWRC), Platform Speaker, Copenhagen
2005, IWAGPR Conference Keynote, Delft, Netherlands
2004, UC Merced Environmental Seminar Series, Merced CA
2004, Univ of Texas at Austin, Austin, TX
2004, Waste Management Conference Keynote, Tuscon AZ
2005, American Geophysical Union Frontier Lecture, Spring Meeting Montreal, Canada
2004, Dept of Energy Characterization and Monitoring Workshop Keynote, Salt Lake City
2004, Univ of Buffalo, UB Geology Pegrem Speaker Series, New York
2004, University of Kansas at Lawrence, Seminar Speaker, Lawrence Kansas
2004, USGS Water Resources Seminar, Menlo Park, CA
2003, Heiland Distinguished Lecturer, Colorado School of Mines, Golden, CO
2003, Vadose zone characterization Series, University of Arizona, Tuscon, AZ
2003, NRC-180 Precision Agriculture Conference, UC Davis, CA
2002, American Geophysical Union Spring Meeting Washington DC
2001, Geological Society of America Annual Meeting, Boston, MA
2001, UC Berkeley Environmental Engineering Series, Berkeley CA
2001, American Geophysical Union Fall Meeting, San Francisco
2001, Kovacs Colloquium Speaker: Groundwater Resources at Risk, IAHS, Paris, France
2001, American Geophysical Union Spring Meeting, Washington, DC
2000, Boise State Geology Seminar Series, Boise, ID
2000, UC Davis Hydrology Seminar Series, Davis, CA

MEMBERSHIPS

National Academy of Engineering
American Geophysical Union
American Academy of Arts and Sciences
American Association for Women in Science
Geological Society of America
Society of Exploration Geophysicists
American Association for the Advancement of Science
Soil Science Society of America

PUBLICATIONS

[Researcher ID/Publons E-9508-2010](#); [Google Scholar](#)

Journal Papers

1. Dafflon, B., Wielandt, S., Lamb, J., McClure, P., Shirley, I., Uhlemann, S., Wang, C., Fiolleau, S., Brunetti, C., Akins, F. H., Fitzpatrick, J., Pullman, S., Busey, R., Ulrich, C., Peterson, J., & S.S. Hubbard, (2022). A distributed temperature profiling system for vertically and laterally dense acquisition of soil and snow temperature. <https://doi.org/10.5194/tc-2021-292>

2. Uhlemann, S. et al. (2022). Surface parameters and bedrock properties co-vary across a mountainous watershed: Insights from Machine Learning and Airborne EM, *Science Advances*, DOI: 10.1126/sciadv.abj2479
3. McLachlan, P. et al., (2022). Estimating grapevine-relevant physicochemical soil zones using apparent electrical conductivity and in-phase data from EMI methods, *Geoderma*, Volume 426, 2022, <https://doi.org/10.1016/j.geoderma.2022.116033>.
4. Springer, M. et al., (2022). Variability of snow and rainfall partitioning into evapotranspiration and summer runoff across nine mountainous catchments. *Geophysical Research Letters*, <https://doi.org/10.1029/2022GL099324>
5. Dwivedi, D. et al. (2022). Imputation of contiguous gaps and extremes of subhourly groundwater time series using random forests, *Journal of Machine Learning for Modeling and Computing*. DOI: 10.1615/JMachLearnModelComput.2021038774
6. Varadharajan, C. et al., (2022). BASIN-3D: A brokering framework to integrate diverse environmental data, *Computers and Geosciences*, <https://doi.org/10.1016/j.cageo.2021.105024>
7. Shirley, I.A. et al. (2022), Rapidly changing high-latitude seasonality: implications for the 21st century carbon cycle in Alaska, *Environmental Research Letters* 17(1), DOI 10.1088/1748-9326/ac4362
8. Dwivedi, D. et al., (2022). From Legacy Contamination to Watershed Systems Science: A Review of Scientific Insights and Technologies Developed through DOE-Supported Research in Water and Energy Security. *Environmental Research Letters*, 17 043004
9. Carroll, R. et al. (2022). Variability in observed stable water isotopes in snowpack across a mountainous watershed in Colorado, *Hydrological Processes*. <https://doi.org/10.1002/hyp.14653>
10. Shirley, I. A., Mekonnen, Z. A., Wainwright, H., Romanovsky, V. E., Grant, R. F., Hubbard, S. S., et al. (2022). Near-surface hydrology and soil properties drive heterogeneity in permafrost distribution, vegetation dynamics, and carbon cycling in a Sub-Arctic watershed. *Journal of Geophysical Research: Biogeosciences*, 127, e2022JG006864. <https://doi.org/10.1029/2022JG006864>
11. Shirley, I. et al., (2022). Rapidly changing high-latitude seasonality: implications for the 21st century carbon cycle in Alaska. *Environmental Research Letters* 17 (1), 014032
12. Wainwright, H. et al. (2022), Watershed zonation through hillslope clustering for tractably quantifying above-and below-ground watershed heterogeneity and functions, *Hydrology and Earth System Sciences* 26(2), <https://doi.org/10.5194/hess-26-429-2022>
13. Chen, J. A., B. Dafflon, H.M. Wainwright, A. Tran and S.S. Hubbard (2021). A Subseasonal Regime Approach for Assessing Intra-annual Variability of Evapotranspiration and Application to the Colorado River Basin, *Frontiers in Water*, 2021
14. Cantor, A., Kiparsky, M., Hubbard, S. S., Kennedy, R., Pecharroman, L. C., Guivetchi, K., Darling, G., McCready, C., & Bales, R. (2021). Making a water data system responsive to information needs of decision makers. *Frontiers in Climate*, 2021, <https://doi.org/10.3389/fclim.2021.761444>
15. Varadharajan, C., V.C. Hendrix, D.S. Christianson, M. Burrus, C. Wong, S.S. Hubbard, D.A. Agarwal, (2021), BASIN-3D: A brokering framework to integrate diverse environmental data, *Computers and Geosciences*, 2021, 105024, ISSN 0098-3004, doi: 10.1016/j.cageo.2021.105024
16. Dafflon, B., Uhlemann, S., Hubbard, S.S., (2021) Permafrost-Through-Canopy Investigation of Thermal and Ecohydrological Processes in Arctic Systems, *Technical Articles*, Vol. 26. 3 *Climate Change and Critical Zone Geophysics*, *EEGS Fast Times*, <https://fasttimesonline.co/permafrost-through-canopy-investigation-of-thermal-and-ecohydrological-processes-in-arctic-systems/>
17. Yan, Q., Wainwright, H., Dafflon, B., Uhlemann, S., Steefel, C. I., Falco, N., Kwang, J., & Hubbard, S. S. (2021). A hybrid data–model approach to map soil thickness in mountain hillslopes. *Earth Surface Dynamics*, 9(5), 1347–1361. <https://doi.org/10.5194/esurf-9-1347-2021>

18. Chen, J., Dafflon, B., Tran, A. P., Falco, N., & Hubbard, S. S. (2021). A deep learning hybrid predictive modeling (HPM) approach for estimating evapotranspiration and ecosystem respiration. *Hydrology and Earth System Sciences*, 25(11), 6041–6066. doi: 10.5194/hess-25-6041-2021
19. Dwivedi, D., Mital, U., Faybishenko, B., Dafflon, B., Varadharajan, C., Agarwal, D., Williams, K. H., Steefel, C., & Hubbard, S. (2021). Imputation of contiguous gaps and extremes of subhourly groundwater time series using random forests. *Journal of Machine Learning for Modeling and Computing*. <https://doi.org/10.1615/jmachlearnmodelcomput.2021038774>
20. Revil, A., Schmutz, M., Abdulsamad, F., Balde, A., Beck, C., Ghorbani, A., & Hubbard, S. S. (2021). Field-scale estimation of soil properties from spectral induced polarization tomography. *Geoderma*, 403, 115380. doi: 10.1016/j.geoderma.2021.115380
21. Wan, J., Tokunaga, T. K., Brown, W., Newman, A. W., Dong, W., Bill, M., Beutler, C. A., Henderson, A. N., Harvey-Costello, N., Conrad, M. E., Bouskill, N. J., Hubbard, S. S., & Williams, K. H. (2021). Bedrock weathering contributes to subsurface reactive nitrogen and nitrous oxide emissions. *Nature Geoscience*, 14(4), 217–224. doi: 10.1038/s41561-021-00717-0
22. Matheus Carnevali, P.B. et al (2021). Meanders as a scaling motif for understanding of floodplain soil microbiome and biogeochemical potential at the watershed scale. *Microbiome*, 9(1). doi: 10.1186/s40168-020-00957-z
23. Wainwright, H. et al. (2021), High-resolution Spatiotemporal Estimation of Net Ecosystem Exchange in Ice-Wedge Polygon Tundra Using In Situ Sensors and Remote Sensing Data, *Land*, <https://doi.org/10.3390/land10070722>
24. Hubbard, S.S., Schmutz, M., Balde, A. et al. (2021) Estimation of soil classes and their relationship to grapevine vigor in a Bordeaux vineyard: advancing the practical joint use of electromagnetic induction (EMI) and NDVI datasets for precision viticulture. *Precision Agric.* doi: 10.1007/s11119-021-09788-w
25. Rogers, D.B., Newcomer, M.E., Raberg, J.H., Dwivedi, D., Steefel, C., Bouskill, N., Nico, P., Faybishenko, B., Fox, P., Conrad, M., Bill, M., Brodie, E., Arora, B., Dafflon, B., Williams, K.H. and Hubbard, S.S. (2021) Modeling the Impact of Riparian Hollows on River Corridor Nitrogen Exports. *Front. Water* 3:590314. doi: 10.3389/frwa.2021.590314
26. Kakalia, Z., Varadharajan, C., Alper, E., Brodie, E. L., Burrus, M., Carroll, R. W. H., Christianson, D. S., Dong, W., Hendrix, V. C., Henderson, M., Hubbard, S. S., Johnson, D., Versteeg, R., Williams, K. H., & Agarwal, D. A. (2021). The Colorado East River Community Observatory Data Collection. *Hydrological Processes*, 35(6), e14243. doi: 10.1002/hyp.14243
27. Falco, N., Wainwright, H. M., Dafflon, B., Ulrich, C., Soom, F., Peterson, J. E., Brown, J. B., Schaettle, K. B., Williamson, M., Cothren, J. D., Ham, R. G., McEntire, J. A., & Hubbard, S. S. (2021). Influence of soil heterogeneity on soybean plant development and crop yield evaluated using time-series of UAV and ground-based geophysical imagery. *Scientific Reports*, 11(1). doi: 10.1038/s41598-021-86480-z
28. Uhlemann, S., Dafflon, B., Peterson, J., Ulrich, C., Shirley, I., Michail, S., & Hubbard, S. S. (2021). Geophysical Monitoring Shows that Spatial Heterogeneity in Thermohydrological Dynamics Reshapes a Transitional Permafrost System. *Geophysical Research Letters*, 48, e2020GL091149. <https://doi.org/10.1029/2020GL091149>
29. Newcomer, M. E., Bouskill, N. J., Wainwright, H., Maavara, T., Arora, B., Siirila-Woodburn, E. R., Dwivedi, D., Williams, K. H., Steefel, C., & Hubbard, S. S. (2021). Hysteresis Patterns of Watershed Nitrogen Retention and Loss Over the Past 50 years in United States Hydrological Basins. *Global Biogeochemical Cycles*, 35(4). doi: 10.1029/2020gb006777
30. Hubbard, S.S., et al., (2020), Emerging technologies and radical collaboration to advance predictive understanding of watershed hydro-biogeochemistry, *Hydrological Processes*, 1-8. <https://doi.org/10.1002/hyp.13807>
31. Peruzzo, L. et al., Imaging of Plant Current Pathways for Non-invasive Root Phenotyping using a newly developed Electrical Current Source Density Approach (2020), *Plant and Soil*, <https://doi.org/10.1007/s11104-020-04529-w>

32. Mary, B., Peruzzo, L., Boaga, J., Cenni, N., Schmutz, M., Wu, Y., Hubbard, S.S., and Cassiani, G., (2020), Time-lapse monitoring of root water uptake using electrical resistivity tomography and mise-à-la-masse: a vineyard infiltration experiment, *Soil*, v. 6, p. 95–114, doi: 10.5194/soil-6-95-2020.
33. Wainwright, H.M., C. Steefel, S. Trutner, A. Henderson, E. Nikolopoulos, K. Chadwick, Katherine; N. Falco, C. Wilmer, H. Steltzer, K. Williams, S. Hubbard, K. Schaettle, J. Brown, B. Enquist, (2020), Satellite-derived Foresummer Drought Sensitivity of Plant Productivity in Rocky Mountain Headwater Catchments: Spatial Heterogeneity and Geological-Geomorphological Control, *Env. Research Letters*, 15, 084018
34. Sorensen, P.O et al., The Snowmelt Nice Differentiates Three Microbial Life Strategies that Influence Soil Nitrogen Availability During and After Winter (2020), *Frontiers in Microbiology*, doi: 10.3389/fmicb.2020.00871
35. Arora, B. et al., (2020), Differential C-Q Analysis: A new approach to inferring lateral transport and hydrologic transients within multiple reaches of a mountainous headwater catchment, *Frontiers in Water*, <https://doi.org/10.3389/frwa.2020.00024>
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