

Jennifer D. Watts

Woodwell Climate Research Center,
149 Woods Hole Road,
Falmouth, MA 02540-1644

Cell: (406) 581-8449
jwatts@woodwellclimate.org

Research Appointments

08/2019 – present	Assistant Scientist	Woodwell Climate Research Center, Falmouth, MA
09/2017 – 08/2019	Post-doctoral Fellow	Woodwell Climate Research Center, Falmouth, MA
01/2017 – 08/2017	Post-doctoral Fellow	University of Montana, Missoula, MT
06/2010 – 12/2016	Research Assistant	University of Montana, Missoula, MT
06/2009 – 05/2010	Research Assistant	Montana State University, Bozeman, MT
07/2008 – 05/2009	Research Assistant	United States Geological Survey, Bozeman, MT
06/2006 – 06/2008	Research Assistant	Montana State University, Bozeman, MT

Academic Courtesy Appointments

2017 – present Affiliate Assistant Professor of Remote Sensing, Department of Land Resources & Environmental Sciences, Montana State University, Bozeman, MT

Education

2017	Ph.D. Systems Ecology	University of Montana
2008	M.S. Land Rehabilitation	Montana State University
2006	B.S. Geospatial Analysis	Montana State University

Peer-Reviewed Publications

Mentored students indicated by*

A complete list can be found on Google Scholar.

Manuscripts Submitted & In Prep

1. A. Mullen, **J.D. Watts**, B.M. Rogers, et al. Ultra-high spatial resolution water maps detect rapid changes in pond area within Alaska terrains. Submitted to *Geophysical Research Letters*.
2. B. Gay, A.A. Armstrong, N.J. Pastick, H. Genet, **J.D. Watts**. Quantifying feedback sensitivities of permafrost degradation and carbon release with Earth observation data and feedback neural networks. *In Prep*.
3. C. Minions* and **J.D. Watts**, S. Natali, et al. A chamber observation network in tundra and boreal communities reveals dynamic year-round CO₂ loss from permafrost-affected soils. **In prep** for *Nature Geosciences*.
4. **J.D. Watts**, S. Potter, B. Rogers, A. Virkkala, K. Arndt, S.M., Natali, et al. Regional hotspots of arctic change as informed by observations from space. **In prep** for *Geophysical Research Letters*.
5. J. Ramage, ... **J.D. Watts**, et al. Permafrost region greenhouse gas budgets for 2000–2020 based on ecosystem upscaling, process-based models, and atmospheric inversions. **In prep** for *Global Biogeochemical Cycles*.

6. M. Farina*, **J.D. Watts**, et al. Northern carbon stocks and budgets, 2003–2021, reveal regionally divergent trends in CO₂ and CH₄ sink/source activity. **In prep** for *Nature Climate Change*.
7. M. Farina*, **J.D. Watts**, et al. Complexity of ecosystem conditions driving methane sink and source in a permafrost-impacted boreal wetland complex. **In prep** for *Scientific Reports*.
8. Y. Xia, **J.D. Watts**, J. Sanderman, et al. Remote-sensing informed model tracking of carbon fluxes and soil carbon storage in U.S. rangelands. **In prep**.

First Authored and Selected Publications

9. **J.D. Watts**, M. Farina*, J.S. Kimball, L.D. Schiferl, Z. Liu, K.A. Arndt, D. Zona, A. Ballantyne, E. Euskirchen, F.-J. W. Parmentier, M. Helbig, O. Sonnentag, T. Tagesson, J. Rinne, H. Ikawa, M. Ueyama, H. Kobayashi, T. Sachs, D.F. Nadeau, J. Kochendorfer, M. Jackowicz-Korczynski, A. Virkkala, M. Aurela, R. Commane, B. Byrne, L. Birch, M.S. Johnson, N. Madani, B. Rogers, J. Du, A. Endsley, K. Savage, B. Poulter, Z. Zhang, L.M. Bruhwiler, C.E. Miller, S. Goetz, W.C., Oechel. Carbon uptake in Eurasian boreal forests dominates the high latitude net ecosystem carbon budget. *Global Change Biology*. Doi: 10.1111/gcb.16553, **2023**.
10. Y. Yang, B.M. Rogers, G. Fiske, **J.D. Watts**, S. Potter, T. Windholz, A. Mullen, I. Nitze, S.M. Natali. Mapping retrogressive thaw slumps using deep neural networks. *Remote Sensing of Environment*, 288, **2023**.
11. L.D. Schiferl, **J.D. Watts**, E.J.L., Larson, K.A., Arndt, S.C. Biraud, E.S. Euskirchen, J.M. Henderson, K. McKain, M.E. Mountain, J.W. Munger, W.C. Oechel, C. Sweeney, Y. Yi, D. Zona, R. Commane. Using atmospheric observations to quantify annual biogenic carbon dioxide fluxes on the Alaska North Slope. *Biogeosciences*, 19: 5953-5972, **2022**.
12. D. Zona, P.M. Lafleur, K. Hufkens, B. Gioli, B. Bailey, G. Burba, E.S. Euskirchen, **J.D. Watts**, et al. Pan-Arctic soil moisture control on tundra carbon sequestration and plant productivity. *Global Change Biology*. <https://doi.org/10.1111/gcb.16487>, **2022**.
13. Y. Xia, **J.D. Watts**, M.B. Machmuller, J. Sanderman. Machine learning based estimation of field-scale daily, high resolution, multi-depth soil moisture for the Western and Midwestern United States. *PeerJ*, 10, e14275, **2022**.
14. Z. Liu, J.S. Kimball, A.P. Ballantyne, N.C. Parazoo, W.J. Wang, A. Bastos, N. Madani, S.M. Natali, **J.D. Watts**, B.M. Rogers, P. Ciais, K. Yu, A.-M. Virkkala, F. Chevallier, W. Peters, P.K. Patra, N. Chandra. Respiratory loss during the late-growing season determines the net carbon dioxide sink in permafrost regions. *Nature Communications*, 13: 1-13, **2022**.
15. J. Du, J.S. Kimball, R. Bindlish, J.P. Walker, **J.D. Watts** Local scale (3-m) soil moisture mapping using SMAP and Planet SuperDove. *Remote Sensing*, 14, 3812, **2022**.
16. D. Zona, P.M. Lafleur, K. Hufkens, B. Bailey, B. Gioli, G. Burba, J.P. Goodrich, A.K. Liljedahl, E.S. Euskirchen, **J.D. Watts**, et al. Earlier snowmelt may lead to late season declines in plant productivity and carbon sequestration in Arctic tundra ecosystems. *Scientific Reports*, 12: 1-10, **2022**.
17. E.S. Euskirchen, L.M. Bruhwiler, R. Commane, F.-J., W. Parmentier, C. Schadel, E.A.G. Schuur, **J.D. Watts**. Current knowledge and uncertainties associated with the Arctic greenhouse gas budget. *Balancing Greenhouse Gas Budgets*. Pp. 159-201. Elsevier. **2022**
18. A.-M. Virkkala, S.M. Natali, B.M. Rogers, **J.D. Watts**, et al. The ABCflux database: Arctic-boreal CO₂ flux observations and ancillary information aggregated to monthly time steps across terrestrial ecosystems. *Earth System Science Data*, 14: 179-208, **2022**

19. **J.D. Watts**, S. Natali, et al. Soil respiration strongly offsets carbon uptake in Alaska and Northwest Canada. *Environmental Research Letters*, 16, 084051, **2021**
20. A.M. Virkkala, J. Aalto, B.M. Rogers, T. Tagesson, C.C. Treat, S.M. Natali, **J.D. Watts**, et al. Statistical upscaling of ecosystem CO₂ fluxes across the terrestrial tundra and boreal domain: regional patterns and uncertainties. *Global Change Biology*, 27: 4040-4059, **2021**
21. L. Birch, C.R. Schwalm, S. Natali, D. Lombardozzi, G. Keppel-Aleks, **J.D. Watts**, et al. Addressing biases in Arctic-boreal carbon cycling in the Community Land Model Version 6. *Geoscientific Model Development*, 14: 3361-3382, **2021**
22. N. Madani, N.C. Parazoo, J.S. Kimball, R.H. Reichle, A. Chatterjee, **J.D. Watts**, et al. The impacts of climate and wildlife on ecosystem gross primary productivity in Alaska. *Journal of Geophysical Research: Biogeosciences*, 126, e2020JG00607, **2021**
23. J. Du, J.S. Kimball, J. Sheffield, I. Velicogna, M. Zhao, M. Pan, C.K. Fisher, H.E. Beck, **J.D. Watts**, E.F. Wood. Synergistic satellite assessments of global vegetation health in relation to ENSO-induced droughts and pluvials. *Journal of Geophysical Research: Biogeosciences*, 126, e2020JG006006, **2021**
24. D. Olefeldt, ... **J.D. Watts**. The Boreal-Arctic wetland and lake dataset (BAWLD). *Earth System Science Data*, 13: 5127-5149, **2021**
25. A.P. Ballantyne, A. Liu, W.R.L. Andregg, Z. Yu, P. Stoy, B. Poulter, J. Vanderwall, **J.D. Watts**, K. Kelsey, J. Neff. Reconciling carbon-cycle processes from ecosystem to global scales. *Frontiers in Ecology and the Environment*, 19: 57-65, **2021**
26. K.A. Endsley, J.S. Kimball, R.H. Reichle, **J.D. Watts**. Satellite monitoring of global surface soil organic carbon dynamics using the SMAP level 4 carbon product. *Journal of Geophysical Research: Biogeosciences*, 125, e2020JG006100, **2020**
27. Y. Yi, J.S. Kimball, **J.D. Watts**, S.M. Natali, D. Zona, J. Liu, M. Ueyama, et al. Investigating the sensitivity of soil respiration to recent snow cover changes in Alaska using a satellite-based permafrost soil carbon model. *Biogeosciences Discussions*, 1-38, **2020**
28. S. Natali & **J.D. Watts**; B. Rogers, S. Potter, S.M. Ludwig*, A.-K. Selbmann, P. Sullivan, B.W. Abbott, K.A. Arndt, L. Birch, M.P. Bjorkman, A. Bloom, G. Celis, T.R. Christensen, C.T. Christiansen, R. Commane, E.J. Cooper, P. Crill, C. Czimcik, S. Davydov, J. Du, J.E. Egan, B. Elberling, et al. Large loss of CO₂ in winter observed across the northern permafrost region. *Nature Climate Change*, 9, 852-857, **2019**
29. Z. Liu, J.S. Kimball, N. Parazoo, A.P. Ballantyne, W. Wang, N. Madani, C.G. Pan, **J.D. Watts**, R.H. Reichle, O. Sonnentag, P. Marsh, M. Hurkuck, M. Helbig, W.L. Quinton, D. Zona, et al. Increased high-latitude photosynthetic carbon gain during an anomalously warm spring offset by respiration carbon loss during winter in high latitudes. *Global Change Biology*, <https://doi.org/10.1111/gcb.14863>, **2019**
30. B.N. Duncan, L.E. Ott, J.B. Abshire, L. Brucker, M.L. Carroll, J. Carton, J.C. Comiso, E.P. Dinnat, B.C. Forbes, A. Gonsamo, W.W. Gregg, D.K. Hall, I. Ialongo, R. Jandt, R.A. Kahn, A. Karpechko, S.R. Kawa, S. Kato, T. Kumpula, E. Kyrola, T. V. Loboda, K.C. McDonald, P.M. Montesano, R. Nassar, C.S.R. Neigh, Claire L. Parkinson, B. Poulter, J. Pulliainen, K. Rautainen, B.M. Rogers, C.S. Rousseaux, A.J. Soja, N. Steiner, J. Tamminen. P.C. Taylor, M.A. Tzortziu, H. Virta, J.S. Wang, **J.D. Watts**, D.M. Winker, D.L. Wu. Space-based observations for understanding changes in the Arctic-Boreal Zone. *Reviews of Geophysics*, <https://doi.org/10.1029/2019rg000652>, **2019**
31. J. Du, **J.D. Watts**, L. Jiang, H. Lu, X. Cheng, C. Duguay, M. Farina*, Y. Qiu, Y. Kim, J.S. Kimball, P. Tarolli. Remote sensing of environmental changes in cold regions: methods,

- achievements and challenges. *Remote Sensing*, 11, 1952, **2019**
32. J. Du, J.S. Kimball, I. Velicogna, M. Zhao, L.A. Jones, **J.D. Watts**, Y. Kim. Multicomponent satellite assessment of drought severity in the contiguous United States from 2002 to 2017 using AMSR-E and AMSR2. *Water Resources Research*, <https://doi.org/0.1002/wrcr.v9999.9999>, **2019**
 33. J. Du, J.S. Kimball, J. Galantowicz, S.-B. Kim, S.K. Chan, R.R. Reichle, L.A. Jones, **J.D. Watts**. Assessing global surface water inundation dynamics using combined satellite information from SMAP, AMSR2 and Landsat. *Remote Sensing of Environment*, 213, 1-17, **2018**
 34. J. Du, J.S. Kimball, L.A. Jones, Y. Kim, J. Glassy, **J.D. Watts**. A global satellite environmental data record derived from AMSR-E and AMSR2 microwave earth observations. *Earth System Science Data*, 9, 791, **2017**
 35. A. Hursh*, A. Ballantyne, L. Cooper, M. Maneta, **J.D. Watts**. The sensitivity of soil respiration to soil temperature, moisture and carbon supply at the global scale. *Global Change Biology*, 23, 2090-2109, **2017**
 36. D. Zona, B. Gioli, R. Commane, J. Lindaas, S.C. Wofsy, C.E. Miller, S.J. Dinardo, S. Dengel, C. Sweeney, A. Karion, R.Y.-W. Chang, J.M. Henderson, P.C. Murphy, J.P. Goodrich, V. Moreaux, A. Liljedahl, **J.D. Watts**, J.S. Kimball, D.A. Lipson, W. Oechel. Cold season emissions dominate the Arctic tundra methane budget. *Proc. Nat. Acad. Sci.*, 113, 40-45, **2016**
 37. S.J. Davidson, M.J. Santos, V.L. Sloan, **J.D. Watts**, G.K. Phoenix, W.C. Oechel, D. Zona. Remote sensing of arctic tundra vegetation communities along a latitudinal gradient in North Alaska, USA. *Remote Sensing*, 8, 1-14, **2016**
 38. J. Du, J.S. Kimball, L.A. Jones, **J.D. Watts**. Implementation of satellite based fractional water cover indices in the pan-Arctic region using AMSR-E and MODIS. *Remote Sensing of Environment*, 184, 469-481, **2016**
 39. **J.D. Watts**, J.S. Kimball, A. Bartsch, K.C. McDonald. Surface water inundation in the boreal-Arctic: impacts on regional methane emissions. *Environmental Research Letters*, 9, 1-13, **2014**
 40. **J.D. Watts**, J.S. Kimball, F.-J.W. Parmentier, T. Sachs, J. Rinne, D. Zona, W. Oechel, T. Tagesson, M. Jackowicz-Korczyński, A. Aurela, et al. A satellite data driven biophysical modeling approach for estimating northern peatland and tundra CO₂ and CH₄ fluxes. *Biogeosciences*, 11, 1961-1980, **2014**
 41. **J.D. Watts**, J.S. Kimball, L.A. Jones, R. Schroeder, K.C. McDonald. Satellite microwave remote sensing of contrasting surface water inundation changes within the Arctic-Boreal region. *Remote Sensing of Environment*, 127, 223-236, **2012**
 42. **J.D. Watts**, R.L. Lawrence, P. Miller, C. Montagne. An analysis of cropland carbon sequestration estimates for North Central Montana. *Climatic Change*, 108, 301-331, **2011**
 43. **J.D. Watts**, S. Powell, R.L. Lawrence, T. Hilker. Improved classification of conservation tillage adoption using high temporal and synthetic satellite imagery. *Remote Sensing of Environment*, 115, 66-75, **2011**
 44. **J.D. Watts**, R.L. Lawrence, P. Miller, C. Montagne. Monitoring of cropland practices for carbon sequestration purposes in north central Montana by Landsat remote sensing. *Remote Sensing of Environment*, 113, 1843-1852, **2009**

Other Publications

45. S.M. Miller, M.A. Taylor, **J.D. Watts**. Understanding high-latitude methane in a warming

- climate. *Earth & Space Science News*, <https://doi.org/10.1029/2018EO091947>, **2018**
46. **J.D. Watts**, et al. Integrating remote sensing and field measurements to identify environmental nonstationarity on interior Alaska DoD training lands. *Report to DoD SERDP*, RC18-L2-1486, 166 pp., **2019**

Published Geospatial and Field Observation Datasets

- Farina, M., **J.D. Watts**. **2022**. Gridded CO₂ and CH₄ Flux Estimates for Pan-Arctic and Boreal Regions, 2003–2015. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/2021>.
- Mullen, A., **J.D. Watts**, B.M. Rogers, M.L. Carroll, J.A. Caraballo-Vega, J. Noomah, Z.W. Williams, J.K.Y. Hung. **2022**. Lake and Pond Extent for Alaskan Boreal and Tundra Subregions, 2019–2021. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/2134>.
- **Watts, J.D.**, et al. **2021**. Soil Respiration Maps for the ABoVE Domain, 2016-2017. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/1935>
- **Watts, J.D.**, S. Natali, S. Potter, B.M. Rogers. **2019**. Gridded Winter Soil CO₂ Flux Estimates for pan-Arctic and Boreal Regions, 2003-2100. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/1683>
- Natali, S., **J.D. Watts**, S. Potter, B.M. Rogers, S. Ludwig, A. Selbmann, et al. **2019**. Synthesis of Winter In Situ Soil CO₂ Flux in pan-Arctic and Boreal Regions, 1989-2017. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/1692>
- Natali, S., S. Ludwig, C. Minions, **J.D. Watts**. **2018**. ABoVE: Thaw Depth at Selected Unburned and Burned Sites Across Alaska, 2016-2017. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/1579>
- Minions, C., S. Natali, S. Ludwig, **J.D. Watts**. **2018**. ABoVE: Year-round Soil CO₂ Efflux in Alaskan Ecosystems. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/1620>
- Du, J., J.S. Kimball, **J.D. Watts**. **2016**. ABoVE: Fractional Open Water Cover for Pan-Arctic and ABoVE-Domain Regions, 2002-2015. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/1362>

PI/Co-I for Environmental Field Sites

- Soil Respiration Stations, Alaska: vegetation phenology cameras, temperature and soil moisture sensors, CO₂ chambers. NASA ABoVE and Woodwell Climate Research Center. See <https://doi.org/10.3334/ORNLDAAC/1620> for site locations. With Dr. Sue Natali and Christina Minions (Woodwell Climate).
- Hess Creek, Alaska: paired burned and unburned CO₂ flux and radiocarbon experimental boreal site. With Dr. Claudia Czimczik (UC Irvine).
- Caribou-Poker Creek forest, Alaska: National Ecological Observatory Network (NEON) sensor augmentation site. Solar induced fluorescence (SIF) monitoring stations, GNSS microwave-based vegetation water tracking, soil carbon flux and stock surveys. With Drs. Howie Epstein and Xi Yang (U. Virginia) and Dr. Nick Parazoo (JPL).
- Howland forest, Maine: Wetland to upland methane emission and uptake experiment site. With Kathleen Savage (Woodwell), Dr. Debjani Sihi (Emory), Dr. Hinsby Cadillo-Quiroz (Arizona State U.), Dr. Shawn Fraver (U. Maine), Dr. Xiaofeng Xu (UC San Diego).

- Conscience Bay Ranches, western Colorado: Soil carbon and flux monitoring sites on working ranches and grazing leases in western Colorado. With Jon Sanderman, Yushu Xia (Woodwell) and Colorado State University.

Current and Pending Support

Current Support

- **01/2023-12/2026** General support for the Rangeland program. Mighty Arrow Foundation. PI Jon Sanderman, *Jennifer Watts* (Co-I). \$150k
- **01/2023-12/2025** General support for the Rangeland program. Kaplan Foundation. PI Jon Sanderman, *Jennifer Watts* (Co-I). \$95k
- **10/2022-09/2025** NASA Terrestrial Ecology Arctic Boreal Vulnerability Experiment (ABoVE) Phase 3. Contributions of tundra and boreal systems to radiative forcing in North America and Russia under Contemporary and Future Conditions. PI *Jennifer Watts*. \$800K
- **10/2022-09/2025** National Science Foundation. Collaborative research: understanding biophysical drivers of the CH₄ source-sink transition in Northern Forests. PI *Jennifer Watts*. \$532K
- **08/2022-07/2022** Fund for Climate Solutions. Gaining new insights into drivers of carbon emissions from Alaska permafrost by integrating radiocarbon, VLF, and soil respiration monitoring. PI *Jennifer Watts*. \$80k
- **08/2021-09/2022** NASA SmallSat Program. Developing high spatiotemporal resolution inundation maps to detect rapid changes in surface hydrology and methane hotspots across ecosystem gradients in Alaska. PI *Jennifer Watts* \$199k
- **08/2021-08/2022** Fund for Climate Solutions. A rangeland carbon monitoring platform for the Western United States. PI *Jennifer Watts*, Woodwell Climate Research Center \$120k
- **09/2020-08/2024** National Science Foundation, Office of Polar Programs. Collaborative research: environmental and biological controls on carbon uptake phenology in permafrost affected boreal forests. PI *Jennifer Watts*, Woodwell Climate. \$550k
- **01/2021-12/2023** Conscience Bay Research. Robust soil carbon monitoring, reporting, and verification for rangelands. PI Jon Sanderman, *Jennifer Watts* (Co-I). \$318k
- **04/01/20-02/28/23** Fund for Climate Solutions Very high-resolution remote sensing mapping of surface water, vegetation, and carbon emissions for the WHRC Yukon-Kuskokwim Delta Research Watershed. PI *Jennifer Watts*; Sue Natali (Co-I) \$146K
- **10/01/19-09/30/23** NASA ABoVE: Winter respiration in the Arctic. PI Sue Natali, Woodwell Climate Research Center; *Jennifer Watts* (Co-I) \$160k
- **09/01/19-08/31/24** Gordon and Betty Moore Foundation: Arctic monitoring and change detection system. PI Sue Natali, Woodwell Climate Research Center; *Brendan Rogers & Jennifer Watts* (Co-Is) \$2M
- **09/01/18-10/31/23** NASA New Investigator: NNX17AF16G. Reconciling carbon flux

budgets in Alaska and northwest Canada through integrated satellite, airborne, and field measurements. PI **Jennifer Watts**, Woodwell Climate Research Center \$270k

Pending Support

- NASA NNH22ZDA001N-AA4RA:A.51 NASA SmallSat Stakeholder supplement: High spatiotemporal mapping of surface water and wet lands within the Alaska Yukon-Kuskokwim Delta, for wildlife, carbon monitoring, and community vulnerability applications. Submitted November 20, 2022. PI **Jennifer Watts** \$190k
- National Fish and Wildlife Foundation (NFWF) Development Plan to Improve Estimates of Carbon Sequestration in Grasslands. Submitted Nov. 28, 2022. Co-I **Jennifer Watts**. \$70k
- NSF DEB: Collaborative Research: BII-Implementation: BioGas: the BioInstitute for the Biological Production of Greenhouse gases. Submitted February 21, 2023. Woodwell PI **Jennifer Watts** (lead Institute: Yale). \$1M
- DOE: The CH₄-centered classification of Amazon peatlands for assessing hydro-geochemical effects on regional hotspots. Submitted February 25, 2023. Co-I **Jennifer Watts** (lead Institute: Arizona State U.). \$64k
- NASA CO₂ and CH₄ Satellite Mission. CarbonFox. Submission June 2023. Co-I **Jennifer Watts** (lead Institute: Columbia University/Goddard).

Student Advising

Developed research projects for and supervised the work of undergraduate and graduate students. *Posters and Presentations at conference or symposium, and articles by student (*)*. ** Indicates National Science Foundation Research Experience for Undergraduate Students participant.

Undergraduate Supervision

2022 ***Giselle Elise Jimenez*****, ***Earth Sciences, U. California Irvine, CA***

12/2022 G. Jimenez*, ***J.D. Watts***, C.I. Czimczik, et al. Patterns and controls of ecosystem carbon sequestration and emissions along a hillslope-gradient of boreal forest stands in Alaska. AGU Fall Meeting, December 2022, Chicago, IL.

2022 ***Carmen Petras*****, ***Environmental Sciences, U. Virginia, VA***

12/2022 C. Petras*, A. Jablonski, W. Dawson III, ***J.D. Watts***, et al. Comparative patterns of intraspecific variability in canopy structure and foliar traits. AGU Fall Meeting, December 2022, Chicago, IL.

2021 ***Hector Delgadillo***, ***Marine Biology Dept., California State U., CA***

07/2021 H. Delgadillo*, **J.D. Watts**. Investigating the biotic and abiotic controls on Alaskan soil CO₂ emissions. PEP Final Presentation, July, 2021, Woods Hole, MA.

10/2021 H. Delgadillo*, **J.D. Watts**. Investigating the biotic and abiotic controls on Alaskan soil CO₂ emissions. SACNAS. October 25-90, 2021.

2021 Lyric Carter, Environmental Science. Tennessee State U., TN

07/2021 L. Carter*, **J.D. Watts**. Investigating permafrost controls on Alaskan soil carbon emissions. PEP Final Presentation, July, 2021, Woods Hole, MA.

2017 Stephen Shirley, Geography Department, University of Montana, MT

12/2017 S. Shirley*, **J.D. Watts**, J.S. Kimball, Z. Zhang, B. Poulter, A.E. Klene. Regional comparison of tundra carbon budget response over the Alaska North Slope to varying environmental conditions. AGU Fall Meeting, December 2019, New Orleans, LA.

09/2017 S. Shirley*, **J.D. Watts**. Tracking changing soil temperature, moisture and carbon in the Arctic. <https://earthobservatory.nasa.gov/blogs/fromthefield/category/above/>

09/2017 S. Shirley*, **J.D. Watts**. Regional carbon budget assessment for Alaska. Montana IoE Undergraduate Summer Research Project

Graduate Supervision and Advising

2021– present Wayne Dawson III, University of Virginia, VA

12/2022 W. Dawson III, A. Jablonski, **J.D. Watts**, H.E. Epstein, X. Yang. Angular effects on SIF observations in deciduous and evergreen boreal forest stands. AGU Fall Meeting, December 2022, Chicago, IL

2018– present Mary Farina, Land Resources & Env. Sci., Montana State University, MT

12/2022 M. Farina*, **J.D. Watts**, et al. Exploring fine-scale drivers of methane sources and sinks in a boreal wetland. AGU Fall Meeting, December 2022, Chicago, IL

12/2021 M. Farina*, **J.D. Watts**, et al. Exploring environmental conditions driving high spatial variability in CO₂ and CH₄ fluxes in a boreal wetland. AGU Fall Meeting, December 2021, Virtual

12/2020 M. Farina*, **J.D. Watts**, et al. The resilience and vulnerability of the regional carbon sink in Alaska and Canada. AGU Fall Meeting, December 2020, Virtual

09/2019 M. Farina*, **J.D. Watts**, S. Powell, R. Commane, M. Powell, L. Schiferl, C. Elder, N. Barnes, H. Webb, et al. Understanding drivers of spatial variability in Alaska's wetland methane budget. NASA Terrestrial Ecology Meeting, September 2019, College Park, MD

12/2019 M. Farina*, **J.D. Watts**, S.L. Powell, S. Natali, R. Commane, M. Powell, L. Schiferl, N. Jacobs, C.E. Miller, et al. Assessment of spatiotemporal variability in Arctic-boreal carbon flux budgets. AGU Fall Meeting, December 2019, San Francisco, CA

2020-2021 Kendall Morgan Wojcik, Land Resources, Montana State U., MT

12/2021 M.S. Professional Paper, *Assessing soil organic carbon cycling on semiarid grasslands using soil organic carbon inventories, C₄ grass establishment, and delta 13 (carbon) and 15 (nitrogen) values.*

2017– 2018 Brianna Rick, Geography Department, University of Montana, MT

05/2018 M.S. Thesis for B. Rick, *Greening of the Arctic: Plot-scale analysis of interactions between climate, vegetation, and permafrost at Toolik Lake, Alaska (1995-2017)*

Selected Oral Presentations

2/2023 “Carbon in the Arctic: understanding linkages and feedbacks between biosphere and atmosphere during times of rapid change”, Earth Science Symposium, Palisades, NY, *Invited*

2/2023 “Increasing dangers of carbon emissions in the Arctic Boreal Zone”, WMO Greenhouse Gas Monitoring Symposium, Geneva, CH, *Invited*

1/2023 “Integrating field observations, remote sensing and models for high latitude CH₄ budget assessments”, AMPAC-CH₄ NASA/ESA joint meeting, Helsinki, FI, *Invited*

12/2022 “Understanding the northern carbon budget”, AGU Fall Meeting, Chicago, IL, *Invited*

10/2022 “Rangelands as natural climate solutions in the U.S.”, Briefing for the House Select Committee on the Climate Crisis, Virtual, *Invited*

9/2022 “Opportunities to use rangelands as natural climate mitigatory in the U.S.”, Protect Our Winters Summit, Reno, NV, *Invited*

6/2022 “Rangeland carbon monitoring in the western U.S.”, Woodwell Board Meeting, Falmouth, MA, *Invited*

5/2022 “Arctic-boreal methane: observations, models and scaling”, NASA CMS-iLEAPS Wetland Workshop, Virtual, *Invited*

5/2022 “Arctic-boreal methane: observations, models and scaling”, NASA CMS-iLEAPS Wetland Workshop, Virtual, *Invited*

5/2022 “Arctic-boreal carbon budgets: reducing uncertainty through integrated monitoring”, NASA ABoVE Science Team Meeting Keynote, Fairbanks, AK, *Invited*

2/2022 “Understanding the large impact of soil respiration on ecosystem carbon budgets in Alaska”, UAF Life Science Seminar, Virtual, *Invited*

2/2022 “Arctic-boreal carbon budgets: reducing uncertainty through integrated monitoring”, NASA Goddard 7th CABS Quarterly Update, Virtual, *Invited*

12/2021 “New Insights into patterns and drivers of soil respiration in Alaska and Canada”, AGU Fall Meeting, New Orleans, LA

10/2021 “Unstable Ground: Using data visualization and storymaps to communicate how the Arctic is Changing”, NEARC Conference, Virtual, *Invited*

03/2021 “Arctic time bomb? The uncertain role of methane in high latitude carbon budgets”, Yale Climate Seminar, Virtual, *Invited*

12/2019 “Soil CO₂ flux in the permafrost zone: new insight from a year-round chamber network in Alaska and Canada”, AGU Fall Meeting, San Francisco, CA

10/2019 “Winter carbon emissions from permafrost”, Congressional Briefing. Washington DC

03/2019 “Detecting and modeling CH₄ emissions from boreal wetlands”, Yale Investments Office Wetlands Meeting, New Haven, CT, *Invited*

12/2018 “The problem with wetlands and methane: challenges in understanding regional biophysical drivers and spatial distributions of emissions”, AGU Fall Meeting, Washington DC, *Invited*

04/2018 “The disparate north: using remote sensing and ground observations to characterize northern carbon flux”, NASA JPL, Pasadena, CA, *Invited*

03/2018 “Challenges in scaling soil carbon flux”, NCEAS, Santa Barbara, CA, *Invited*

12/2017 “Detecting recent changes in the Arctic-Boreal Carbon Sink”, AGU Fall Meeting, New Orleans, LA

- 11/2017 “Microwave mapping of wetland properties”, Global Carbon Project Wetland Meeting, Stanford in Washington, Washington DC, *Invited*
- 10/2017 “Opportunities and challenges for citizen science in Alaska”, Woods Hole Research Center, Falmouth, MA, *Invited*
- 03/2017 “Carbon sink or source? Northern wetland response to climate warming”, LRES Seminar Series, MSU, MT, *Invited*
- 03/2017 “Understanding scaling of wetland methane emissions”, International Workshop to Reconcile Methane Budgets, Seattle, WA, *Invited*
- 11/2016 “Quantifying the pan-Arctic methane budget: a multi-scale approach”, Woods Hole Research Center, MA, *Invited*
- 06/2016 “Monitoring a decade of change in pan-Arctic CO₂ and CH₄ exchange through integrated satellite remote sensing”, International Conference on Permafrost, Potsdam, DE, *Invited*
- 11/2015 “Integrating tower eddy covariance, satellite remote sensing and ecosystem modeling to identify changes in hydrology and carbon fluxes across the Alaskan Arctic”, Arctic Observing Open Science Meeting, Seattle, WA, *Invited*
- 12/2014 “Satellite microwave detection of boreal-Arctic wetland inundation changes and their impact on regional methane emission estimates”, AGU Fall Meeting, San Francisco, CA, *Invited*
- 06/2014 “Using satellite remote sensing to monitor changing CO₂ and CH₄ emission constraints in Boreal-Arctic wetland regions”, International Association of Landscape Ecology Meeting. Anchorage, AK, *Invited*

Selected Conference Presentations

- 12/2022 Q. Ying, Z. Zhang, B. Poulter, S. Natali, H. Sullivan, B.M. Rogers, **J.D. Watts**. “Methane fluxes in the Arctic wetland: finer resolution upscaling using machine learning and remote sensing.” AGU Fall Meeting, Chicago, IL
- 12/2022 A. Mullen, **J.D. Watts**, B.M. Rogers, M. Carroll, C. Elder, S.W. Cooley “Developing high spatiotemporal resolution inundation maps to detect rapid changes in surface hydrology and methane emissions across ecosystem gradients in Alaska.” AGU Fall Meeting, Chicago, IL
- 12/2022 Y. Xia, J. Sanderman, **J.D. Watts**, H. Henandez, M. Machmuller, S. Ewing. “Developing a rangeland carbon tracking and monitoring tool using remote sensing imagery and process-based monitoring approach.” AGU Fall Meeting, Chicago, IL
- 5/2022 M. Pallandt, M. Jung, S. Natali, B. Rogers, A. Virkkala, **J.D. Watts**, M. Gockede. “Extrapolation error quantification of the Arctic flux network across space and time, with data driven network optimization.” EGU General Assembly Conference, Vienna, AT
- 12/2021 D. Olefeldt, M.K.A. Kuhn, D. Bastviken, P.M. Crill.. **J.D. Watts**. “Warming, permafrost thaw, and altered hydrology: predictions and sources of uncertainty for future boreal-arctic methane emissions.” AGU Fall Meeting, New Orleans, LA
- 12/2021 N. Parazoo, A.A. Bloom, X. Yang, T. Magney, J. Stutz, Z. Pierrat, K. Grossmann, P. Levine, A. Norton, **J.D. Watts**, U. Seibt. “A data-model integration framework to study carbon uptake phenology in tropical and boreal forests.” AGU Fall Meeting, New Orleans, LA
- 12/2021 S. Ma, A.A. Bloom, G. Quetin, **J.D. Watts**, Z. Dona, E. Euskirchen, A. Norton. “Resolving the carbon-climate feedback potential of high latitude wetland CO₂ and CH₄ exchanges.” AGU Fall Meeting, New Orleans, LA

12/2020 B.M. Rogers, A.M. Virkkala, S. Natali, **J.D. Watts**, K.E. Savage, S.J. Giacomini. “Estimating the terrestrial ecosystem CO₂ flux budget for the Arctic-boreal zone using a synthesis of field observations and statistical upscaling.” AGU Fall Meeting, Virtual

12/2020 S. Reault, L.D. Schiferl, R. Commane, **J.D. Watts**. “Methane emissions in the North Slope: Identifying the source of model and observation disagreement.” AGU Fall Meeting, Virtual

12/2020 J.M. Poe, E.E. Hoy, L.D. Schiferl, R. Commane, E.S. Euskirchen, E. Larson, N. Madani, N. Parazoo, O. Sonnentag, J. Wang, **J.D. Watts**, D. Zona, A. Chatterjee. “Performance of carbon flux models across the ABoVE domain using eddy covariance measurements.” AGU Fall Meeting, Virtual

12/2020 C. Rivard, J. Sanderman, **J.D. Watts**, S.A. Ewing, K. Wojcik, M. McLeod. “Developing a new geospatial approach for rangeland carbon monitoring.” AGU Fall Meeting, Virtual

12/2020 N. Madani, N. Parazoo, J.S. Kimball, A. Chatterjee, **J.D. Watts**, S. Saatchi, et al. “Post-fire recovery of ecosystem productivity in Arctic and boreal forests of Alaska.” AGU Fall Meeting, Virtual

12/2020 S. Potter, S. Natali, B.M. Rogers, A. Burrell, T. Shestakova, E. MacDonald, R. Treharne, A.-M., Virkkala, C.E. Frye, S. Breyer, **J.D. Watts**. “Detecting ecosystem changes by merging multiple satellite remote sensing platforms across the Arctic-boreal zone.” AGU Fall Meeting, Virtual

12/2020 M. Farina, **J.D. Watts**, S.L. Powell, K.E. Savage, S. Natali, J.S. Kimball, Z. Liu, J. Du. “The resilience and vulnerability of the regional carbon sink in Alaska and Canada.” AGU Fall Meeting, Virtual

12/2019 M. Farina, **J.D. Watts**, S.L. Powell, S. Natali, R. Commane, M. Powell, L. Schiferl, N. Jacobs, C.E. Miller, et al. “Assessment of spatiotemporal variability in Arctic-boreal carbon flux budgets.” AGU Fall Meeting, San Francisco, CA

12/2019 L.D. Schiferl, M. Powell, S. Biraud, E.S. Euskirchen, M. Farina, J. Henderson, E. Larson, J.W. Munger, C. Sweeney, **J.D. Watts**, D. Zona, R. Commane. “Insights into changing regional-scale carbon dioxide and methane fluxes from arctic tundra ecosystems.” AGU Fall Meeting, San Francisco, CA

12/2019 N. Jacobs, W.R. Simpson, F. Hase, T. Blumenstock, Q. Tu, M.K. Dubey, H.A. Parker, **J.D. Watts**, M. Farina, S. Heerah. “Regional CH₄ column gradients over Tanana Flats wetlands in interior Alaska.” AGU Fall Meeting, San Francisco, CA

12/2019 L. Birch, C.R. Schwalm, G. Keppel-Aleks, D.L. Lombardozzi, S. Natali, X. Lin, **J.D. Watts**, B.M. Rogers. “Improving simulation of carbon cycle fluxes in Arctic-boreal vegetation in the Community Land Model.” AGU Fall Meeting, San Francisco, CA

12/2019 **J.D. Watts**, S. Potter, J.S. Kimball, T. Douglas, B.M. Rogers, et al. “Integrating remote sensing and field measurements to identify environmental nonstationarity on Interior Alaska DoD Training Lands.” DoD SERDP-ESTCP Symposium, Washington DC

10/2019 J. Luo, M. Ueyama, M. Okamura, **J.D. Watts**, H. Iwata, E. Euskirchen, M. Goeckede, O. Sonnentag, et al. “Estimating northern ecosystem methane flux based on a satellite data driven model, TCF.” AsiaFlux2019, Takayama, Japan

09/2019 M. Farina, **J.D. Watts**, S. Powell, R. Commane, M. Powell, L. Schiferl, C. Elder, N. Barnes, H. Webb, et al. Understanding drivers of spatial variability in Alaska’s wetland methane

budget. NASA Terrestrial Ecology Meeting, College Park, MD

05/2019 *J.D. Watts*, et al. “Quantifying cold season CO₂ emissions in Alaska and Northwest Canada”. NASA ABoVE Science Team Meeting, La Jolla, CA

12/2018 *J.D. Watts*, et al. “Quantifying cold season CO₂ emissions in Alaska and Northwest Canada.” AGU Fall Meeting, Washington, DC

01/2018 *J.D. Watts*, et al. “Mapping cold season soil CO₂ emissions in the Arctic-boreal region.” NASA ABoVE Team Meeting, Seattle, WA

12/2016 *J.D. Watts*, et al. “Monitoring regional changes in Alaskan boreal-Arctic carbon flux and underlying biophysical processes using in situ observations, models and satellite remote sensing.” AGU Fall Meeting, San Francisco, CA

06/2016 *J.D. Watts*, et al. “Monitoring dynamic changes in pan-Arctic land surface water coverage.” International Conference on Permafrost, Potsdam, Germany

04/2015 *J.D. Watts*, et al. “Monitoring surface water changes across North American Arctic-boreal regions and impacts on ecosystem carbon fluxes.” NASA Carbon Cycle & Ecosystems Joint Science Workshop, Hyattsville, MD

400-level Teaching

Spring 2020 –Lecturer. GPHY 426/429, Remote Sensing, Montana State University. Class Leads, Jennifer Watts and William Kleindl; Lab Instructor, Mary Farina

Student Teaching

2008 – LRES 525, Applied Remote Sensing, Montana State University

2007 – LRES 426, Remote Sensing, Montana State University

2006 – LRES 454, Landscape Pedology (incl. lab), Montana State University

Invited Lecturer

2022 – Advanced Remote Sensing, University of Washington

2019 – Climate Change & Environment, Pringry School, New Jersey

2013 – Geography 487, Remote Sensing/Raster Analysis, University of Montana

Professional Activities and Service

Workshop/Meeting Organizing Committees (Recent, External):

2019-present: NASA ABoVE Science Team Meeting Organizing Committee

2023: WMO International GHG Symposium, Observations & Models Session Chair

2023: 103rd AMS High-latitude Water and Carbon Cycles in a Warming World Session Co-chair

2022: Woodwell/Turner/Montana State Rangeland Carbon Workshop, Co-Lead Organizer

2020: Woodwell Arctic Carbon Workshop Co-organizer

2019: NASA ABoVE Data and Model Synthesis Group Co-chair

2019: Permafrost Carbon Network Organizing Committee

2017-2019: NASA ABoVE Hydrology & Permafrost Group Co-chair

2018: NASA ABoVE/Goddard/JPL Carbon Group Workshop Organizing Chair

2016: International Conference on Permafrost, Co-convener

Woodwell Committees and Other Service:

2023: Woodwell 270 Time working group member
2022-2023: Woodwell Internal Seminar series lead organizer
2019-present: Woodwell Rangeland Carbon Program co-lead (with Jon Sanderman)
2019-present: Woodwell Arctic-boreal weekly lab group meeting co-organizer
2020-present: Woodwell Arctic-boreal group and Carbon group participant

Science Team and Professional Membership

NASA ABoVE Science Teams (Carbon; Permafrost & Hydrology; Citizen Science), American Geophysical Union (AGU), Association of Polar Early Career Scientists (APECS), US Permafrost Association (USPA), Permafrost Carbon Network (PCN), Arctic Research Consortium of the United States (ARCUS), Interagency Arctic Research Policy Committee

Guest Editor *Environmental Research Letters; Remote Sensing*

Journal Reviewer

Science; Nature; Global Change Biology; Remote Sensing of Environment; Remote Sensing; Biogeosciences; Wetlands Ecology & Management; Environmental Research Letters

Proposal and Panel Reviewer

*USDA Small Business Innovation Research Program;
NASA Experimental Program to Stimulate Competitive Research (EPSCoR);
NASA Earth and Space Science Fellowship (now FINESST);
NASA Terrestrial Ecology;
NSF Polar Programs;
NSF DEB;
DOE Earth Sciences*

Science Outreach

2023: MountainFilm, Natural climate solutions panel & fundraiser co-organizer.
2022-present: Protect Our Winters, science alliance team.
2022-present: Science advisor and coordinator for Boreal Forest photography and multi-media art installation (led by Gabrielle Russomagno; russomagno.com). Planned for late 2023.
2022-present: Science advisor and coordinator for Thawing Permafrost multi-media art installation (led by Michaela Grill; migrill.klingt.org). Planned for 2024.
2022-present: Arctic Basecamp science team.
2022-2023: PolarTREC project lead, with Eric Filardi (Principal, Anderson School, AK).
2020-2022: T-MOSAIC Remote Sensing Action Group.
2018: PolarTREC project lead, with Kim Young (Weston High School, MA).
2016-2018: ARCUS, The Arctic in the Classroom Project Lead for Atqasuk, AK project.

Professional Training

- 2019 – Training and Retaining Leaders in STEM – Geospatial Sciences (TRELIS) training and fellowship program for early career faculty. Washington, DC
- 2018 – Training for effective leadership, employee development and conflict management. Woods Hole Research Center, Falmouth, MA
- 2016 – Alaska Science Communication Workshop (NSF sponsored). Sitka Sound Science Center, Sitka, AK
- 2016 – ARCUS (Arctic Research Consortium of the United States) Make an Impact: The Arctic in the Classroom Workshop. Fairbanks, AK
- 2015 – FluxCourse Training Program. Niwot Ridge LTER, CO
- 2015 – Arctic Permafrost Training Program. North Central Siberia, RU
- 2014 – Greenhouse Gas Data Workshop. Observatoire de Haute-Provence, France. Hosted by the International Carbon Observing Program (ICOS) and the US National Ecological Observatory Network (NEON)
- 2014 – Summer Field Campaign, North Slope, Alaska. CO₂ and CH₄ carbon flux measurements at NASA SMAP partner Cal./Val. and Amerflux tower eddy covariance sites
- 2013 – Circumpolar Active Layer Monitoring (CALM) Network, AK
- 2012 – NASA SMAP-VEX12 Field Campaign, Winnipeg, CN
- 2012 – LI-COR Eddy Covariance Training Workshop. Berkeley, CA
- 2011 – Arctic Climate System Modeling Summer Program. International Arctic Research Center (IARC), Fairbanks, AK

Awards, Post-Graduate

International Arctic Science Committee (IASC) \$1,500 (2018)

Awards, Graduate

NASA Earth and Space Science Fellowship (NESSF) \$90,000 (2013-2016)

Title: *Potential Contrasts in CO₂ and CH₄ Flux Response under Changing Climate Conditions: Satellite Driven Analysis of the Net Ecosystem Carbon Budget for Arctic and Boreal Regions.*

Award ID: 14-EARTH14R-25.

United States Permafrost Association Travel Grant \$2,000 (2016)

ARCUS Travel Grant (Make An Impact Workshop) \$1,300 (2016)

NASA Montana EPSCoR Visiting Speaker/Scientist \$500 (2016)

NASA Montana EPSCoR Research Travel Grant \$500 (2016)

International P.E.O. Scholar Award \$15,000 (2015)

AmeriFlux Training Award \$2,500 (2015)

NASA Montana EPSCoR Research Travel Grant \$900 (2015)

University of Montana Office of Sponsored Programs Travel Grant \$150 (2012)

Awards, Undergraduate

Montana Access Grant (2005-2006): \$2,000

Montana Baker Grant (2005-2006): \$900

Montana State University Scholars Program Research Grant (2003-2004): \$3,000

Montana State University Scholars Program Travel Grant (2004): \$1,000

Bryson L. James Student Competition Research Award (2004): \$300