Dr. Kathryn I. Wheeler

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EDUCATION

Boston University Boston, MA
Doctor of Philosophy in Earth and Environment (GPA: 3.95) Jan. 2023
Certificate in Biogeosciences
Dissertation: "Cold-deciduous broadleaf phenology: monitoring using a geostationary satellite and predicting using trigger-less dynamic models"
Advised By: Dr. Michael Dietze
Academic Awards: National Science Foundation Graduate Research Fellowship and Dean's Fellowship
Relevant Courses: Remote sensing, multivariate statistics, Bayesian statistics, ecological forecasting, terrestrial carbon

University of Delaware Newark, DE
Bachelor of Science in Environmental Science (GPA: 3.95) May 2017
Honors with Distinction, summa cum laude
Academic Awards: Full four-year merit scholarship, NOAA Hollings Scholarship, UD American Association of University Professors Outstanding Senior, and Outstanding Senior in Environmental Science
Relevant Courses: GIS, soil science, plant physiology, ecosystem ecology, computer science, data structures

RELEVANT EXPERIENCE

Industrial Economics, Incorporated Cambridge, MA
Environmental Consulting Associate June 2023 – Present
- Processed and analysed spatial and temporal environmental data to assist with Natural Resource Damage Assessments for several Superfund sites using R, Python, and ArcGIS Pro
- Improved efficiency of a Shiny app to display spatial data to clients by 5x
- Performed advanced statistical models of spatial and spatial-temporal Inverse Distance Weighting, distributed lag for time series, PCA, mixed effects, generalized estimating equations, and non-negative matrix factorization to estimate contaminant impacts on fish populations
- Presented to clients who have limited technical knowledge
- Conducted cost benefit analysis to help clients select restoration projects
- Wrote Python code to use WinAppDriver to automate the running of client-prefered application, improving efficiency and saving 120+ hours
- Mentored two research analysts

Massachusetts Institute of Technology Cambridge, MA
NOAA Climate and Global Change Postdoctoral Fellow Sep. 2022 – June 2023
- Funded through a highly competitive 2-year fellowship ($200k) selected through a written research proposal
- Utilized Google Earth Engine and MODIS data to assess drought impacts on tropical forest biomass
- Used LiDAR and eddy covariance flux data to investigate relationship between forest structure and productivity
- Led a multidisciplinary team of 43 to conduct ecological forecasts of tree leaf growth timing
- Coded Bayesian and random forest machine learning models to analyze impacts of soil properties and biota on leaf seasonality
- Mentored four undergraduate students and earned a mentorship certificate through a course

Boston University Boston, MA
Research Assistant Sep. 2017 – Aug. 2022
- Created novel Bayesian statistical models in R to predict tree leaf seasonality
- Conducted field work at Harvard Forest to investigate the link between senescence and photosynthesis
- Developed automation pipeline to download, clean, organize, and condense 30 TB of satellite data from MODIS and GOES using a high-performance distributed system
- Maintained lab safety compliance of Professor Michael Dietze's research lab

Teaching Fellow and Lab Instructor Jan. 2022 – May 2022

- Led weekly lab based in R for 30 students in an environmental modeling course

University of Delaware Newark, DE

Delaware Environmental Institute Environmental Scholar Aug. 2014 – May 2017

- Analyzed water quality data using MATLAB to fit advanced statistical and machine learning models to available data
- Collected and analyzed 1,700 measurements of hyperspectral observations on leaves using a portable spectrophotometer and Python
- Conducted lab work using a Vario EL cube to analyze nitrogen concentrations in collected leaves
- Presented research at AGU and won two student presentation awards in hydrology and biogeoscience (top 5%)

General Computer Science for Engineers Course Teacher Assistant Aug. 2014 – Dec. 2016

- Provided teaching assistance for a weekly lab based in Python and MATLAB

PUBLICATIONS

1. **Wheeler** et al. (2024). "Predicting spring phenology in deciduous broadleaf forests: NEON Phenology Forecasting Community Challenge." *Agr Forest Meteorol* 345: 109810.
2. Thomas et al.[+] (2023). "The NEON Ecological Forecasting Challenge." *Front Ecol Evol* 21(3): 112–113.
3. Halpern et al.[+] (2023) "Priorities for synthesis in ecology and environmental science." *Ecosphere* 14(1):e4342.
4. **Wheeler** & Dietze (2021). "Improving the monitoring of deciduous broadleaf phenology using the Geostationary Operational Environmental Satellite (GOES) 16 and 17." *Biogeosciences* 18: 1971-1985.
5. Iida[*] & **Wheeler**[*] et al. (2021). "Canopy structure metrics governing stemflow funneling differs between leafed and leafless states: Insights from a large-scale rainfall simulator". *Hydrol Processes* 35:e14294.
   [*]**These authors contributed equally to this paper**
6. Woelmer et al.[+] (2021). "10 Simple Rules for training yourself in an emerging field" *PLoS Comput Biol* 17(10): e1009440. https://doi.org/10.1371/journal.pcbi.1009440
7. Rollinson et al.[+] (2021) "Working across space and time: nonstationarity in ecological research and application." *Front Ecol Evol* 19(1): 66-72.
8. **Wheeler** et al. (2020). "Visible and near-infrared hyperspectral indices explain more variation in lower-crown leaf nitrogen concentrations in autumn than in summer." *Oecologia*. 192:13-27.
   Award: Highlighted Student Paper
9. **Wheeler** & Dietze (2019). "A statistical model for estimating midday NDVI from the Geostationary Operational Environmental Satellite (GOES) 16 and 17." *Remote Sensing* 11(21):2507.
10. Dietze et al.[+] (2018). "Ecological Forecasting." *Oxford Bibliographies.*
11. Hudson et al.[+] (2018). "American beech leaf-litter leachate chemistry: effects of geography and phenophase." *J Plant Nutr Soil Sci* 181(2):287-295.
12. **Wheeler** et al. (2017). "Tracking senescence-induced patterns in leaf litter leachate using parallel factor analysis modeling (PARAFAC) and self-organizing maps." *J. Geophys Res Biogeosci* 122(9):2233-2250.

13. Preprint: **Wheeler** & Dietze (2023). "A trigger may not be necessary to cause senescence in deciduous broadleaf forests." *bioRxiv* 10.1101/2023.06.07.544057.

[+]Includes K.I. Wheeler

SKILLS AND INTERESTS

Programming Languages: R (Expert), Python (Intermediate), MATLAB (Intermediate), Java (Familiar), C++ (Familiar)

Geospatial Tools: spatial R packages (Expert: sf, terra, raster), Google Earth Engine (Intermediate), ArcGIS (Intermediate), spatial and spatial-temporal Inverse Distance Weighting

High-Performance Computing Tools: Git (expert), shared clusters, parallelization, shell scripting (Unix, Bash), Slurm and Open Grid schedulers

Data Analysis Knowledge: Bayesian statistics (MCMC, state space, hierarchical models), frequentist statistics (distributed lag time series, Principal Component Analysis, mixed effects models, generalized estimating equations,

non-negative matrix factorization, generalized additive models), machine learning (random forest, self-organizing maps), power analysis, sensitivity analysis, propagating and analyzing uncertainty, model assessment, data assimilation (Kalman Filter, Extended Kalman Filter, Ensemble Filters, Particle Filters)

Domain Knowledge: remote sensing, ecological forecasting, geospatial analysis, environmental modeling, forest ecology, carbon cycle, data science

Communication Skills: proposal writing, technical presentations, teaching, project management, leadership, and mentorship

Interests: Running, hiking, cycling, backpacking, and reading