Ryan Scott

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Education

2024 **Ph.D. Mechanical Engineering, Portland State University**
Advisor: Professor Raúl Bayoán Cal
Dissertation: *Consequences of Spatial Heterogeneity for Turbulent Wake Development*

2019 **M.Sc. Mechanical Engineering, Portland State University**
Thesis: *Characterizing Tilt Effects on Wind Plants*

2017 **B.S. Mechanical Engineering, Portland State University Honors College**
Thesis: *Autonomous Navigation and Hazard Evasion Platform for Personal UAV's*

Active Research

Wind Plant Wake Interactions	Identify underlying mechanisms of plant wake evolution and model wake losses between neighboring wind plants.
Wind Turbine Wake Modeling	Quantify relationship between wake structure and high order turbulence statistics for wind turbine wakes.
Turbulent Canopy Flows	Link canopy spatial structure to local boundary layer development and turbulent transport phenomena.

Employment History

Graduate Research Participant
June 2021 – September 2024
40 Hours/Week Summer; 20 Hours/Week Academic Year
National Renewable Energy Laboratory, Boulder, CO
Duties and accomplishments:

- Developed processing pipeline for wind plant operating data in Python to standardize and quality control operating data from six data sources. Maintained repository of prepared wind plant data and facilitated data transfer with project collaborators. Used processed data to address US Department of Energy project milestones and define international wind plant benchmarks.
- Created eight wind turbine reference models for NREL and Sandia National Laboratories and maintained model repository. Implemented turbine design pipeline in Python using WISDEM, WEIS, and OpenFAST on the NREL Eagle and Kestrel high-performance computers.
- Authored project summary reports and published a wind plant optimization study on improving wind plant performance as first author.
- Analyzed wind turbine operating and measurement data from the AWAKEN field campaign to assess wind plant response to atmospheric conditions.
- Gave five presentations at national and international conferences on renewable energy and collaborated on four additional presentations as a supporting author. Lead projects summary reports and presentations for the US Department of Energy and industry partners.

Employment History (continued)

Graduate Research Assistant
October 2018 – June 2024
20 Hours/Week Summer; 40 Hours/Week Academic Year
Portland State University, Portland, OR
Duties and accomplishments:

- Lead experimental campaigns involving collaborations with national laboratories and international academic institutions.
- Published eight journal articles as lead author and contributed to four additional articles as a supporting author.
- Gave eleven presentations at national and international conferences on renewable energy and fluid dynamics.
- Served as teaching assistant for multiple courses. Responsible for lectures, student labs, feedback on assignments, and additional tutoring outside of lecture hours.
- Mentored junior graduate students in research group. Assisted with experimental design, data collection, data analysis, writing and presenting results. Trained students on multiple experimental techniques including high-performance computing, hot wire anemometery, stereo particle image velocimetry, particle tracking velocimetry, and laser safety.
- Designed experimental apparatus including functional model wind turbines and an operational wind tunnel. Designed systems in SolidWorks, fabricated components with a combination of machining and 3D printing, performed hands on assembly.

Graduate Student Summer Intern
June 2017 – August 2017
40 Hours/Week
National Renewable Energy Laboratory, Golden, CO
Duties and accomplishments:

- Developed portable thermocouple and hot wire anemometer system to enable on-site convection measurements in active solar arrays. Designed system in SolidWorks, machined all sub-components, performed hands-on assembly, calibrated and operated sensors in field.
- Implemented data pipeline in MATLAB to reduce data processing times from days to hours.
- Created a hybrid thermal camera with data logger and touch screen interface for remote temperature monitoring in active solar arrays. Designed physical housing in SolidWorks, programmed user interface and camera operating system in C++ and Python, performed hands-on assembly, calibrated and operated sensors in field.

Employment History (continued)

Engineering Intern
April 2016 – April 2017
40 Hours/Week Summer; 20 Hours/Week Academic Year
Olympus Controls, Tualatin, OR
Duties and accomplishments:

- Assembled industrial machine vision systems for same-day customer demonstrations. Designed prototype machines in SolidWorks, programmed user interfaces in Python and C++, and completed hands-on assembly of machine systems on accelerated timeline.
- Manage prototype systems inventory for engineering team. Created automated bill of materials plugin for SolidWorks using Excel and Visual Basic to streamline ordering process.
- Manufactured automated saw and loading system to improve workplace safety and halve material processing times. Designed loading bays in SolidWorks, programmed saw user interface in Visual Basic, performed hands-on assembly of saw and loading systems, and lead employee training sessions on saw use and safety.

Undergraduate Research Assistant
June 2014 – June 2015
40 Hours/Week Summer; 20 Hours/Week Academic Year
Center for Climate and Aerosol Research, Portland State University, Portland, OR
Duties and accomplishments:

- Develop model and program user interface in MATLAB for simulating atmospheric nanoparticle formation under different atmospheric conditions.
- Gave one poster presentation on findings and contributed to a second as a supporting author.

Awards and Achievements

2023 **Excellence in Research**, Portland State University Department of Mechanical Engineering recognition of exceptional student research.

2018 **NSF GRFP**, Recipient of the National Science Foundation Graduate Research Fellowship Program.

2017 **Honors Graduate**, Graduated *cum laude* from the Honors College at Portland State University.

Research Publications

Journal Articles

1. Hendrickson, E., **Scott, R**, Holt, D., Cal, R. B., & Cruzan, M. (2024). Pollen and seed dispersal in a continuous and clear-cut ponderosa pine forest. *In prep*.
2. Hendrickson, E., Warner, R., **Scott, R**, Williams, R., & Cruzan, M. (2024). Fine-scale phenotypic variation of seed traits in a wind-dispersed species. *Under consideration for the American Journal of Botany*.
3. **Scott, R**, Hamilton, N., & Cal, R. B. (2024a). Graph network heterogeneity predicts interplant wake losses. *Under consideration for Renewable and Sustainable Energy*.
4. **Scott, R**, Hamilton, N., & Cal, R. B. (2024b). Spatial heterogeneity as a measure of curled wake dynamics. *in prep*.

5. **Scott, R**, Hamilton, N., Cal, R. B., & Moriarty, P. (2024). Wind plant wake losses: Disconnect between turbine actuation and plant wake controllability. *Under consideration for Renewable and Sustainable Energy*.

6. **Scott, R**, Hendrickson, E., Cabrera-Booman, F., Cruzan, M., & Cal, R. B. (2024). Canopy structure drives turbulence and particle transport. *in prep*.

7. **Scott, R**, Hendrickson, E., Cabrera-Booman, F., Taylor, K., Cruzan, M., & Cal, R. B. (2024). Characterizing turbulent flow over a live moss canopy: Comparison to surrogate models. *in prep*.

8. Sadek, Z., **Scott, R**, Hamilton, N., & Cal, R. B. (2023). A three-dimensional, analytical wind turbine wake model: Flow acceleration, empirical correlations, and continuity. *Renewable Energy*.

9. **Scott, R**, Martínez-Tossas, L., Bossuyt, J., Hamilton, N., & Cal, R. B. (2023). Evolution of eddy viscosity in the wake of a wind turbine. *Wind Energy Science*, *8*(3), 449–463.

10. Bossuyt, J., **Scott, R**, Ali, N., & Cal, R. B. (2021). Quantification of wake shape modulation and deflection for tilt and yaw misaligned wind turbines. *Journal of Fluid Mechanics*, *917*. doi:https://doi.org/10.1017/jfm.2021.237

11. **Scott, R**, Kadum, H., Salmaso, G., Calaf, M., & Cal, R. B. (2021). A lacunarity based index for spatial heterogeneity. *Earth and Space Science*, e2021EA002180.

12. **Scott, R**, Bossuyt, J., & Cal, R. B. (2020). Characterizing tilt effects on wind plants. *Journal of Renewable and Sustainable Energy*, *12*(4), 043302. doi:https://doi.org/10.1063/5.0009853

13. **Scott, R**, Viggiano, B., Dib, T., Ali, N., Hölling, M., Peinke, J., & Cal, R. B. (2020). Wind turbine partial wake merging description and quantification. *Wind Energy*, *23*(7), 1610–1618. doi:https://doi.org/10.1002/we.2504

Conference Proceedings

1. **Scott, R**, Hamilton, N., & Cal, R. B. (2023). Spatial heterogeneity as an indicator of multiple wind plant performance. In *Nawea/windtech 2023*. NAWEA.

2. **Scott, R**, Hamilton, N., & Cal, R. (2022). Characterizing spatially heterogeneous wind turbine wakes under yaw and tilt misalignment. In *Bulletin of the american physical society*, APS.

3. **Scott, R**, Martínez-Tossas, L., Hamilton, N., & Cal, R. B. (2022). Wind turbine wake evolution of eddy viscosity. In *Nawea/windtech 2022*. NAWEA.

4. **Scott, R**, Martínez-Tossas, L., Hamilton, N., & Cal, R. B. (2021). Downstream evolution of eddy viscosity in the wake of a wind turbine. In *Division of fluid dynamics meeting abstracts* (E22–009). APS.

5. **Scott, R**, Kadum, H., Calaf, M., & Cal, R. B. (2020). Considerations for spatially heterogeneous forest canopies. In *Spatial heterogeneity in land-atmosphere interactions and boundary-layer development*. University of Wisconsin.

6. **Scott, R**, Kadum, H., Salmaso, G., Calaf, M., & Cal, R. B. (2020). A spatial heterogeneity parameter for canopy flows. In *Division of fluid dynamics meeting abstracts* (P16–008). APS.

7. **Scott, R**, Kadum, H., Salmaso, G., Higgins, C. W., Calaf, M., & Cal, R. B. (2020). Spatial heterogeneity as a bridge between canopy turbulence and numerical weather prediction. In *Fall meeting 2020*. AGU.

8. **Scott, R**. (2019). Characterizing tilt effects on wind plants. In *Wind energy science conference*. EAWE.

9. **Scott, R**, Falih, H., Smith, S., Ali, N., Bossuyt, J., Calaf, M., & Cal, R. (2019). Considering spatial inhomogeneities in forest canopies. In *Division of fluid dynamics meeting abstracts* (G18–007). APS.

10. **Scott, R**, Viggiano, B., Dib, T., Ali, N., Hölling, M., Peinke, J., & Cal, R. B. (2018). Wind turbine wake merging descriptions and quantification. In *Division of fluid dynamics meeting abstracts* (pp. L29–010). APS.