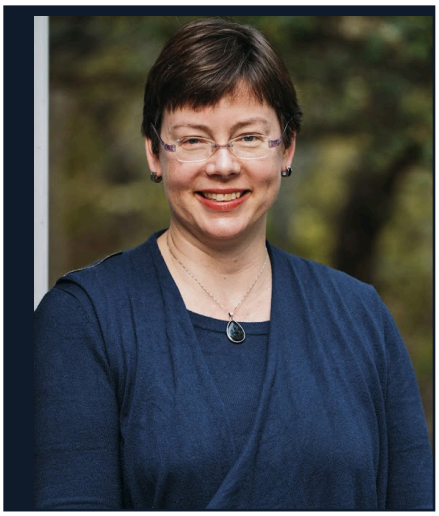
NCAR | EARTH OBSERVING LABORATORY

development • deployment • *data* • discovery

2020 EOL Seminar Series

Turbulence in complex terrain: insights from the Perdigão field campaign

Professor Julie Lundquist
Department of Atmospheric & Oceanic Sciences
University of Colorado, Boulder



DATE: February 25, 2020

TIME: 3:30 - 4:30 pm

LOCATION: NCAR Foothills Laboratory
3450 Mitchell Lane, Building 2
FL2-1022 Large Auditorium

ABSTRACT

In 2017, after a decade of preparation, a consortium of US and European and U.S. research groups conducted a field campaign 1 May–15 June 2017 in the Vale do Cobrão in central Portugal to explore microscale processes in complex terrain. This valley is nestled within a parallel double ridge near the town of Perdigão. Further, an isolated 2-MW wind turbine (rotor diameter 82 m) is located on one ridge. Typical wind directions measured at the ridgetops are normal to the ridges, suggesting a simple yet natural setting for studies of flow and turbulence in complex terrain, as well as interactions with the wind turbine wake.

Over twenty-five remote sensing instruments (lidars, sodars, radars, radiometers, including 8 scanning lidars) and 45+ meteorological towers were deployed in a 4km x 4km region to closely document flow over, through, and around the Vale do Cobrão. Profiling lidars, scanning lidars and airborne hotwire anemometers provide new insights into the onset and decay of turbulence within the valley and above the ridges, especially occurrences of topographically-driven flow reversal. Lidar analysis coupled with radiosonde profiles document the conditions leading to lee wave generation across the valley. Routine scanning lidar transects across the valley document the occurrences of flow recirculation. Other scanning lidar measurements document the behaviour of the wind turbine wake.

The density of measurements offers new insights into the variability of flow in complex terrain. These insights are both applied, such as new rules of thumb for wind turbine deployment in complex terrain, and fundamental, regarding improved methods for the parameterization of turbulence in complex terrain. Current and ongoing data analysis, as well as large-eddy simulations of specific case studies, will be highlighted.

Live Webcast: www.ucar.edu/live

For more information, contact Melissa Ward: mward@ucar.edu x8713

The National Center for Atmospheric Research is sponsored by the National Science Foundation. Any opinions, findings and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.