Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Observations of Thermodynamic and Kinematic Properties During the Morning Transition in a Wind Turbine Array Boundary Layer Using an Instrumented Unmanned Aerial Vehicle KEVIN ADKINS, Embry-Riddle Aeronautical University, ADRIAN SESCU, Mississippi State University, CHRISTOPHER SWINFORD, NIKOLAUS RENTZKE, Embry-Riddle Aeronautical University — Observation, simulation and modeling have shown that wind farms alter downstream atmospheric properties as turbulent wakes generated by turbines enhance vertical mixing. With a large portion of wind farms hosted within an agricultural setting, changes to the wind turbine array boundary layer (WTABL) are important as they can potentially impact crop productivity, along with inflow to downstream turbines. The authors, and others, have demonstrated changes to thermodynamic properties within the WTABL during daylight observations made by small unmanned aerial systems (sUAS). The obtainment of permission to fly at night and at higher altitudes, along with the enhancement of the sUAS instrumentation suite with fast-response three-dimensional sonic anemometers, enabled observations during predawn hours and through the morning transition. This work details observed changes to thermodynamic and kinematic properties during a series of overnight field campaigns undertaken during the summer of 2019 around a utility-scale wind turbine.

Kevin Adkins
Embry-Riddle Aeronautical University

Date submitted: 31 Jul 2019 Electronic form version 1.4