

DEPARTMENT OF MECHANICAL ENGINEERING

WILLIAM MAXWELL REED SEMINAR SERIES

“Uncrewed Aircraft System (UAS) Data Assimilation Experiment for Improved Localized Weather Prediction to Support Air Traffic Management eXploration (ATMx).”

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Presentation Abstract

The goal of this work is to support the development of new weather guidance products that will aid in transforming air traffic management to accommodate new air vehicles and demand for increased mobility. Unexpected variations in winds and visibility (caused by fog) can impact the safety and efficiency of ATMx operations including off airport UAS Traffic Management (UTM), Urban Air Mobility (UAM) and advanced airport operations. Such variations are often associated with sharp gradients in surface conditions and/or topography which can exert a strong influence on the development and evolution of local wind patterns and fog. While UAS are vulnerable to these variabilities, UAS can also collect observations in data sparse areas to improve their own weather guidance. This has been demonstrated using UAS observations collected during the 2018 LAPSE-RATE field experiment in the San Luis Valley of Colorado. Observing System Experiments were conducted to evaluate the impact of assimilating UAS observations on the prediction of finescale flows and the evolution of the boundary layer. Results of these OSEs will be presented. Additional work toward improving the localized prediction of fog using UAS observations is underway with an FAA-funded field experiment called Frequent *in situ* Observations above Ground for Modeling and Advanced Prediction of fog (FOGMAP) planned for early 2021. This study is a collaboration between NCAR and the University of Kentucky. Initial assessments of the High Resolution Rapid Refresh (HRRR) and other guidance products indicate the challenges associated with predicting fog for airports situated within a river valley like Cincinnati/Northern Kentucky International (CVG). In preparation for FOGMAP, the sensitivity of predictions of fog to model assumptions is assessed for two cases that occurred during the 2020 winter season. Details of the field experiment design will also be discussed.

Speaker Bio

Dr. Pinto is currently the Science Deputy for the Aviation Application Program within the Research Applications Laboratory (RAL) at NCAR. He has been a Research Scientist at NCAR for over 20 years and has authored or co-authored over 60 peer-reviewed journal articles. At the University of Colorado Dr Pinto gained valuable experience providing forecast support and developing mission plans using small UAS to collect *in situ* measurements within harsh environments over the Arctic and tropical Atlantic Oceans. Recently, he led development and demonstration of a real-time atmospheric modeling system that provided ultra-fine resolution weather predictions to support small UAS operations that was used during LAPSE-RATE. Using data collected during LAPSE-RATE, Pinto led research into quantifying the value of UAS data assimilation in short term prediction of UAS weather hazards. Dr Pinto also leads several projects to develop systems that support the analysis and short term prediction of aviation weather hazards (fog, low ceilings, precipitation and thunderstorms). Dr Pinto received his PhD in the Program for Atmospheric and Oceanic Sciences from the University of Colorado, a Master's in Atmospheric Science from the Pennsylvania State University and his Bachelor's degree from Cornell University. For fun, James enjoys playing competitive beach volleyball, hiking in the Front Range of Colorado, and watching his two children grow as student athletes in college.

Date: Friday, November 5, 2021

Place: Whitehall Classroom Building 114

Time: 3:00 PM EST

Contact: Dr. Alexandre Martin 257-4462

Attendance open to all interested persons