DEPARTMENT OF MECHANICAL ENGINEERING
WILLIAM MAXWELL REED SEMINAR SERIES

"Robotic Weather Sampling: Or How I Learned to Stop Worrying and Love the Drone"

Phillip B. Chilson, Ph.D.
University of Oklahoma

Abstract: Fixed monitoring sites, such as those in the US National Weather Service Automated Surface Observing System (ASOS) and the Oklahoma and Kentucky Mesonets provide valuable, high temporal resolution information about the atmosphere to forecasters and the general public. The deployment of small unmanned aircraft to collect in-situ vertical measurements of the atmospheric state in conjunction with surface conditions has a potential to significantly expand weather observation capabilities. This concept can enhance the safety of individuals and support commerce through improved observations and short-term forecasts of the weather and other environmental variables in the lower atmosphere. We briefly report on a concept of adding the capability of collecting vertical atmospheric measurements (profiles) through the use of unmanned aerial systems (UAS) at surface observing sites deemed suitable for this application. While there are a number of other technologies currently available that can provide measurements of one or a few variables, the proposed UAS concept will be expandable and modular to accommodate several different sensor packages and provide accurate in-situ measurements in virtually all weather conditions. Such a system would facilitate off-site maintenance and calibration and would provide the ability to add new sensors as they are developed or as new requirements are identified. There are engineering and regulatory challenges. The small UAS must be capable of accommodating the weight of all sensor packages and have lighting, communication, and aircraft avoidance systems necessary to meet existing or future FAA regulations. Moreover, the system must be able to operate unattended, which necessitates the inclusion of risk mitigation measures such as a detect and avoid radar and the ability to transmit and receive transponder signals. It is also necessary for the system to be capable of assessing local weather conditions (visibility, surface winds, and cloud height) and the integrity of the vehicle (system diagnostics, fuel level) before takeoff. We refer to a network of such systems as a "3D Mesonet". The presentation begins by outlining some of the fundamental and high-impact science questions and sampling needs driving the development of the 3D Mesonet. This is followed by a notional concept of what a 3D Mesonet might look like and a description of the technical configuration for one such station in the network. We then report on progress being made at OU to develop and test a prototype 3D Mesonet station and show preliminary measurements and discuss how such measurements from an operational network could be utilized to better characterize the atmospheric boundary layer, improve weather forecasts, and help to identify threats of severe weather.

Bio: Dr. Chilson obtained a BS in Physics from Clemson University in 1985, an MS in Physics (ultra-low temperature physics) from the University of Florida in 1990, and a PhD in Physics (atmospheric physics) from Clemson University in 1993. He spent one year in Germany on Fulbright Scholarship (1985-1986) working in nuclear solid-state physics. He completed a postdoc in Germany at the Max Planck Institute for Aeronomy (currently the Max Planck Institute for Solar System Research) during 1994-1997. He then worked as a research scientist at the Swedish Institute of Space Physics (1997-2000). Dr. Chilson returned to the US to assume a research scientist position at the Cooperative Institute for Research in the Environmental Sciences (2000-2004). He has been with the University of Oklahoma since 2005 as a Professor in the School of Meteorology and with the Advanced Radar Research Center.

Date: Friday, October 5th
Place: CB 114

Time: 3PM
Contact: Dr. Alexandre Martin 257-4462

Meet the speaker and have refreshments
Attendance open to all interested persons

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UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY