

RAL SEMINAR SERIES

Supercells to Supersonics: Aerospace Engineering Applied to Atmospheric & Weather Research

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In June 2010, the University of Colorado Boulder and the University of Nebraska-Lincoln collaborated for the first measurements of thermodynamic properties in a supercell thunderstorm using a small unmanned aircraft system (UAS) as part of the “Second Verification of the Origins of Rotation in Tornadoes Experiment” (VORTEX-2). In spring 2019, the CU-NU UAS team again deployed to the Great Plains with improved small UAS technologies and storm-intercept strategies for the NSF-sponsored “Targeted Observations by Radars and UAS of Supercells” (TORUS). The 13 May – 16 June 2019 TORUS field campaign was highlighted with intercepts of 15 supercells, including seven tornadic storms, with three UAS teams simultaneously deployed into supercell left-flank, right-flank and near-inflow. A portion of the TORUS field campaign was augmented with a high-altitude balloon campaign to collect in-situ turbulence measurements in the stratosphere near supercells. These measurements were made as part of the AFOSR-sponsored Hypersonic Flight in the Turbulent Stratosphere (HYFLITS) project. The objectives of HYFLITS research include to measure turbulence and particulates to characterize the stratosphere up to 40 km, to refine and couple atmospheric and high-speed flow simulations to predict boundary-layer transition on hypersonic aircraft. This talk will discuss the small UAS and high-altitude balloon technologies, data collected, to date, in the TORUS and HYFLITS field campaigns, and the logistical, operational, and personal-safety challenges in the dynamic environment of supercell thunderstorms.