Integrated Remote and In-Situ Sensing

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Seeing the world in 4D with unmanned aircraft systems (UAS)-enabled sensing systems, integrated with ground-based and orbital observation systems, will enable informed forecasting, planning, real-time decision making and planning to address emerging issues such as crop failure, anthropogenic global warming, social and ecological vulnerability, disaster and risk reduction, and conservation and protection of cultural and historical resources. UAS span the range of aircraft size and performance from a wide-body passenger jet to a hummingbird. Because no human pilot is on board, UAS can be designed for tasks too "dull, dirty, or dangerous" for a manned mission. Employing aircraft technologies developed for long-endurance manned aircraft, large UAS can provide observation platforms spatial reach twice, or more, of similarly sized manned aircraft, and endurance measured in days, instead of the 8-12 hr limits for manned missions. Innovations in data processing and high-density information storage have enabled the miniaturization of UAS components to create affordable, easily deployable aerial platforms capable of carrying active and passive sensors, already in use in many fields of research, applied technology, and entertainment. The emergence of UAS and a myriad of accompanying sensors is rapidly modifying research practices and driving a new cycle of technological innovation.

This presentation will describe a new initiative to develop an integrated remote and in-situ sensing (IRISS) system comprised of unmanned aircraft coupled with ground- and space-based sensors. The presentation will focus on atmospheric science applications including planetary boundary layer profiling, sampling the outflow of severe thunderstorms, and observations of supercells in order to understand tornado formation. System design and flight test results from a variety of field campaigns will be described.