6.038 Development of a Economic, Portable Sensor Network for the Monitoring of Trace Tropospheric Gases.

Early Career Scientist

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Abstract:

Local variations in volatile organic compound (VOCs) and trace oxidizer concentrations can significantly impact haze and aerosol formation, albedo, and radiative forcing on a regional level. The use of unmanned aerial vehicles (UAVs) can be employed to sample trace gases in previously underrepresented regions of the troposphere. In order to put instrumentation on these UAVs, the use of lightweight, miniature sensors is critical to gather the necessary data yet meet weight requirements. This work will present the development of such a portable system with low-power requirement to track trace tropospheric gases. The sensors are first been evaluated under laboratory conditions to calibrate their response to target gases. We expect to present the first datasets for this system, which will be gathered during July 2016 in flights over Oklahoma that will quantify profiles of several gases (e.g., O_3 and NO_2), together with humidity, temperature, and pressure. An altimeter and real time clock provides correlation of the measurements to global positioning systems (GPS) alongside the sensing platform. Contour maps with the information gathered will be presented to display variations in each species over the area sampled. The presentation will provide the evolution of each species, which can be related to potential emission sources and effective exposure at ground level. In summary, the development and utilization of portable, sensitive sensor devices provides new perspectives in atmospheric sensing and quantification of trace gases.