Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Monitoring of Carbon Dioxide and Methane Plumes from Combined Ground-Airborne Sensors[1] JAMEY JACOB, TAYLOR MITCHELL, WES HONEYCUTT, NICHOLAS MATERER, TYLER LEY, PETER CLARK, Oklahoma State University — A hybrid ground-airborne sensing network for real-time plume monitoring of CO_2 and CH_4 for carbon sequestration is investigated. Conventional soil gas monitoring has difficulty in distinguishing gas flux signals from leakage with those associated with meteorologically driven changes. A low-cost, lightweight sensor system has been developed and implemented onboard a small unmanned aircraft and is combined with a large-scale ground network that measures gas concentration. These are combined with other atmospheric diagnostics, including thermodynamic data and velocity from ultrasonic anemometers and multi-hole probes. To characterize the system behavior and verify its effectiveness, field tests have been conducted with simulated discharges of CO_2 and CH_4 from compressed gas tanks to mimic leaks and generate gaseous plumes, as well as field tests over the Farnsworth CO_2-EOR site in the Anadarko Basin. Since the sensor response time is a function of vehicle airspeed, dynamic calibration models are required to determine accurate location of gas concentration in space and time. Comparisons are made between the two tests and results compared with historical models combining both flight and atmospheric dynamics.

[1]Supported by Department of Energy Award DE-FE0012173

Jamey Jacob
Oklahoma State University

Date submitted: 01 Aug 2016 Electronic form version 1.4