Full Column Greenhouse Gas Profiles Measured with AirCore at the Atmospheric Radiation Measurement (ARM) Southern Great Plains (SGP) Site

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The vertical distributions of CO_2, CH_4, and other greenhouse gases (GHGs) provide important constraints for the determination of terrestrial and ocean sources and sinks of carbon and other biogeochemical processes in the Earth system. *In situ* measurements of vertical profiles of GHGs also have high value for evaluating accuracy and clear-sky bias of remote sensing from ground-based and satellite-borne platforms. Here, we report results from a collaborative measurement campaign between the Department of Energy (DOE) Biological and Environmental Research Program, and the NOAA Earth System Research Laboratory to quantify the vertically resolved distribution of atmospheric carbon-cycle gases (CO_2, CH_4, and CO) throughout 99% of the atmospheric column. To accomplish these measurements, a long coiled tube (or Aircore) is lofted to the stratosphere (~ 30km) on a weather balloon, and then collects a vertically resolved sample of air on descent. In 2012, we conducted 6 successful Aircore flights from the DOE/ARM Southern Great Plains Facility near Lamont, Oklahoma. Comparisons show good agreement collocated profiles obtained with ARM aircraft in the lower half of the atmospheric column, and with column-averaged mixing ratios from ground-based Total Carbon Ccolumn Observing Network remote-sensing. In the coming year, we plan to continue observations and begin a transition from research-mode to operational balloon-borne sampling including semi-automated recovery and on-site gas analysis at ARM-SGP.

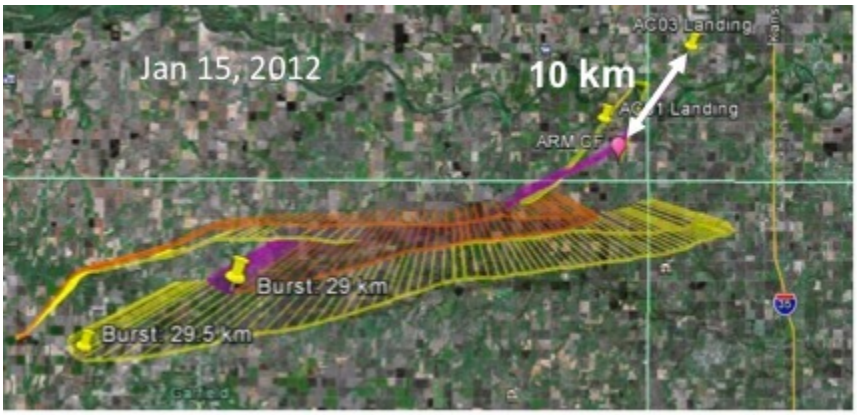

Figure 1. Flight profiles for two AirCore packages launched on January, 15, 2012. Pre-flight planning provided for landing locations within 10 km of desired location.