



The Carbon in Arctic Reservoirs Vulnerability Experiment (CARVE) FTS: Results From the 2012/13 Alaska Campaigns

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The Carbon in Arctic Reservoirs Vulnerability Experiment (CARVE) is an aircraft-based Earth Venture 1 mission to study the carbon balance of the Alaskan Arctic ecosystem, with a particular focus on carbon release from melting permafrost. Operating from its base in Fairbanks, AK, the CARVE aircraft covers a range of principle flight paths in the Alaskan interior, the Yukon River valley, and the northern Alaska coast around Barrow and Dead Horse. Flight paths are chosen to maximize ecosystem variability and cover burn-recovery/regrowth sequences. CARVE observations cover the Arctic Spring/Summer/Fall seasons, with multiple flights per season and principle flight path. Science operations started in May 2012 and are currently envisaged to continue until 2015.

The CARVE suite of instruments includes flask measurements, *in situ* gas analyzers for CO₂, CH₄ and CO observations, and a three-band polarizing Fourier Transform Spectrometer (FTS) for column measurements of CO₂, CH₄, CO, their interfering species (*e.g.*, H₂O), and O₂. The FTS covers the spectral regions of 4,200-4,900 cm⁻¹, 5,800-6,400 cm⁻¹, and 12,900-13,200 cm⁻¹, with a spectral resolution of 0.2 cm⁻¹. Aircraft-based FTS science observations in Alaska have been performed since 23-05-2012. First-version data products from all CARVE instruments derived from observations during the 2012 campaign were publicly released earlier in 2013.

The FTS has performed well during flight conditions, particularly with respect to vibration damping. Outstanding challenges include the need for improved spectral and radiometric calibration, as well as compensating for low signal-to-noise spectra acquired under Alaskan flight conditions. We present results from FTS column observations of CO₂, CH₄, and CO, observed during the 2012 and 2013 campaigns, including preliminary comparisons of CARVE FTS measurements with satellite observations of CO₂ from TANSO/GOSAT and CO from MOPITT.