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The Carbon in Arctic Reservoirs Vulnerability Experiment (CARVE): Measurements of Seasonal to Interannual Variability in Alaskan CO_2 and CH4 Fluxes

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CARVE is a NASA Earth Ventures (EV-1) investigation designed to quantify correlations between atmospheric and surface state variables for the Alaskan terrestrial ecosystems through intensive seasonal aircraft campaigns, ground-based observations, and analysis sustained over a 5-year mission. CARVE campaigns across 2012-2014 growing seasons have established a baseline for monthly, regional scale estimates for surface-atmosphere fluxes of carbon dioxide (CO_2) and methane (CH4), and revealed large interannual variability in arctic and boreal carbon cycle dynamics. We find that measurements during the freeze/thaw shoulder seasons, especially the fall refreeze, are critical to accurate evaluation of the annual carbon budget for Alaska. Additionally, we find that Alaskan carbon fluxes exhibit responses to environmental forcings that extend across multiple growing seasons. In 2014 we initiated flights to the Mackenzie Delta and will compare the CO_2 and CH4 fluxes from this region with those observed over Alaska. We provide lessons learned from CARVE to guide future investigations of carbon cycling and ecosystem vulnerability in the Arctic-Boreal region.