Airborne measurements of greenhouse gas fluxes in subarctic regions

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Ground-based eddy covariance measurements provide continuous in-situ observations of the surface-atmosphere exchange of greenhouse gases. However, airborne greenhouse gas measurements provide essential constraints for estimating surface emissions as they add to the knowledge of horizontal and vertical variations of GHG exchange.
The small research aircraft Sky Arrow 650 ERA (environmental research aircraft) is a slow and low flying aircraft with pushing propeller. It is equipped with a Mobile Flux Platform (MFP) which includes a variety of instruments built around the Best Atmospheric Turbulence (BAT) probe, developed by the National Oceanic and Atmospheric Administration (NOAA, USA), in conjunction with Airborne Research Australia (ARA). In the past, this type of aircraft with similar equipment has been frequently used to derive CO2 and H2O fluxes over various ecosystems and proved to show reasonable results compared to ground-based flux measurements. In 2013, a flight-ready gas analyser (Picarro G2301-m) was added to the aircraft's equipment. The combination of the fast open path gas analyser (CO2, H2O) and the slow closed path gas analyser (CO2, H2O, CH4) allow to calculate airborne methane fluxes. Results from the InGOS TNA campaigns at Kiruna (Swedish Lapland) and Sodankylä (Finnish Lapland), will be shown.