

AIRBORNE EDDY COVARIANCE MEASUREMENTS OF METHANE OVER MID-LATITUDE AND SUB-ARCTIC WETLANDS

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Methane fluxes between terrestrial ecosystems and the atmosphere are highly variable in space and time. This is especially valid for wetlands, which are often characterized by extremely small-scale spatial heterogeneity. While closed chambers and eddy covariance methods are well suited for identifying individual contributions from micro-sites, for local process studies, for controlled experiments, and for investigating the temporal variability of fluxes, they may not necessarily be representative of larger spatial scales and of resolving interactions between methane emissions and boundary layer processes. A comprehensive assessment of the role of natural wetlands in atmospheric CH₄ dynamics would thus benefit greatly from regional, i.e. airborne flux and concentrations measurements. Airborne measurements allow sufficiently large spatial coverage and may therefore be significantly more representative than sparse ground-based measurements, especially in remote and extensive northern wetlands and permafrost areas.

In June 2011 we used a Los Gatos RMT-200 Fast Methane Analyzer and the onboard turbulence nose boom of the Polar-5 research aircraft to conduct airborne eddy covariance measurements of methane emissions over a variety of anthropogenic and natural targets. These included rewetted areas in northeastern Germany and extensive boreal and sub-Arctic wetlands in near Hyytiälä, Sodankylä, and Kaamanen in Finland. We will present preliminary results obtained during repeated survey flights along flight tracks of several kilometers to tens of kilometers.