MEASUREMENTS OF CARBON DIOXIDE FLUXES OVER AN OLIGOTROPHIC BOREAL RIVER IN NORTHERN SCANDINAVIA

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Abstract
Carbon dioxide (CO_2), as one of the major anthropogenic greenhouse gases, is widely acknowledged to contribute to global warming and climate change. Historically, the major focus on the role of the aquatic environment in the carbon cycle has been on the atmosphere-ocean exchange. More recent findings suggest the importance of freshwater (lakes, rivers and streams) as a source for atmospheric CO_2. The freshwater contribution is, however, poorly understood, mainly due to a paucity of data, especially from running waters.

To address this issue, eddy covariance (EC) measurements in a large boreal river in Northern Sweden (Indalsälven), are being made as part of a two-year long continual study of the carbon dioxide fluxes between the air and water. This is one of the first known studies of its kind where EC measurements are conducted in a river setting. Continual data acquisition began in April 2018, monitoring a variety of general meteorological parameters, turbulent fluxes of carbon dioxide, latent, and sensible heat, together with water-side measurements of CO_2. The aim of the study is to investigate the temporal control on river carbon dioxide fluxes covering timescales from hours to seasons.

This paper describes the ongoing work, and reports on the present status of the project. The primary focus lies on data that indicates a dependence of carbon dioxide flux on wind-speed. Wind speed demonstrates a positive correlation with the measured fluxes, with the highest fluxes measured corresponding to the directions where the upwind distance to land was greatest, indicating that the wind-generated turbulence has a strong influence on the carbon dioxide fluxes over a boreal river.

Keywords: Carbon flux, Eddy covariance measurements, Boreal river

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