



## **Challenges and benefits on long-term eddy covariance measurements over lakes**

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Eddy Covariance (EC) data on carbon dioxide fluxes is presently available on about 30 lakes but the time series are mostly short, order of one year. Longer EC series together with chamber measurements and appropriate auxiliary data on water column allow for more accurate estimates of the aquatic component in terrestrial carbon balance and analysis of the environmental controls. We discuss on challenges for long-term EC measurements over freshwater ecosystems and demonstrate the benefits of EC data for carbon cycle studies via examples from long-term sites EC sites in Finland. We discuss on the auxiliary measurements needed and the general design of the whole measurement set-up to get representative information. We discuss on challenges related to the CO<sub>2</sub> flux partitioning for freshwater ecosystems and introduce a new method to estimate the net primary productivity (NPP) on EC data, which is superior to more traditional methods (bottle incubations, <sup>14</sup>C technique) with a poor temporal resolution. Finally, we collected and analyzed CO<sub>2</sub> fluxes from 19 globally distributed lakes and reservoirs representing six climate zones. The mean flux was c. 0.3 micro mole / m<sup>2</sup> s. We applied a simple upscaling to the direct observations and ended up to the estimate which is about half of the current emission estimate for lentic systems.