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# Long-term EC measurements over a pre-alpine lake

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Recent research indicates that inland waters are significant contributors to the global carbon cycle. However, up to now long-term measurements of carbon dioxide ($CO_2$) and methane (CH4) fluxes above freshwater ecosystems are sparse and the knowledge on the magnitude of the fluxes and the involved processes needs to be improved. Most of the research has focused on tropical and boreal regions. Furthermore, many findings were based on short-term measurements or relied on non-continuous floating chamber measurements.
This study is part of a cooperation project with the overarching aim to study possible effects of past, present and future hydrological extremes on carbon fluxes at catchment scale. The first step is to establish the complete carbon balance of a lake and therefore also to measure $CO_2$ exchange between the atmosphere and the surface of a temperate lake for the first time continuously all year round.
The eddy covariance method is a technique widely used for long-term, continuous measurements of energy and trace gas exchange between the atmosphere and terrestrial ecosystems. Here, we employ this method for year-round monitoring of $CO_2$-, sensible and latent heat fluxes above Lake Lunz, a small pre-alpine lake in lower Austria. In addition, the water temperature profile was measured with high temporal resolution in order to capture the heat storage change of the lake during the ice free period. This together with measurements of the net radiation allows us to also evaluate the energy balance closure.
The measurements started in December 2014 and here we present flux data as well as data on the energy balance closure of the first year. A preliminary analysis of the data indicated that the lake acts as a net source of $CO_2$ with stronger emissions during night. The monthly mean amplitudes of the sensible (H) and latent (LE) heat flux were highest during the summer month (July, August), with a clear peak of H in the early morning hours. The water temperature profile shows the development of a thermocline during the summer and it has to be analyzed how the water column below contributes to the heat storage change of the lake.