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The impacts of water clarity to lake thermal stratification based on 1-D lake modeling

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Lakes as net heterotrophic systems have an opposite role than oceans in global carbon balance. Even though lakes cover only 2 % of the world's land surface, it has been estimated that lakes release about 10 % of the carbon fixed annually by the terrestrial ecosystems back to the atmosphere. Water clarity is related to the thermal stratification of a lake, which in turn affects lake-atmosphere heat exchange and further gas transfer.

The aim of our study was to assess the role of water clarity in seasonal stratification and processes in air-water interface. The unique full ecosystem scale measurement platform called Lake-SMEAR which is connected to SMEARII station at the Hyytiälä Forestry Field Station of Helsinki University was used for conducting the field studies. To improve future predictions of gas evasion from lakes, we focused on the changes in water clarity and how they affect water column physics and processes in the air-water interface. We used two 1-D lake models, FLake and LAKE to estimate the impacts of changes in water clarity to stratification and lake-atmosphere interaction.

Water clarity was a significant parameter defining the thermal stratification of the lake: a change from clear to dark water would lead to shorter stratification period and lower water column temperatures in small lakes and therefore have significant impact on the lake-atmosphere exchange processes.