



Dissolved greenhouse gas concentrations as proxies for emissions: First results from a survey of 43 Alpine lakes

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Up to very recently, freshwater ecosystems were neglected in assessments of the global carbon cycle and considered merely as passive 'pipes' which transport carbon from the land to the oceans. This view has been challenged by an increasing number of studies showing that freshwater ecosystems may negate a substantial fraction of the carbon sink through carbon dioxide (CO₂) and in particular methane (CH₄) emissions and thus rather should be viewed as 'reactors' which process a large fraction of the terrigenous carbon. Most of our knowledge on freshwater CO₂ and CH₄ emissions to date derives from studies in tropical and boreal regions, while temperate freshwater ecosystems are understudied.

This study is focused on lakes from the Alpine area and their content in dissolved greenhouse gases, CH₄ and CO₂. We mostly aim to assess the content of dissolved methane and carbon dioxide from the Alpine lakes in order to understand whether Alpine lakes could be potential CH₄ and CO₂ emitters. We also would like to relate concentrations to lake characteristics and potential biotic and abiotic driving forces.

A diverse set of 43 lakes, from Trentino, South Tirol (Italy) and North Tirol (Austria), was selected resulting in a gradient with respect to elevation (from 240 to 1700 m a.s.l.) and latitude (from 45.52° to 47.38°). Complementary to dissolved CH₄ and CO₂ surface water samples, dissolved oxygen and temperature were measured. Only water surface samples were considered. Analyses were done with a gas chromatographer equipped with a flame ionization detector (FID) for CH₄ and a thermal conductivity detector (TCD) for CO₂ determination.

The first results show that all the sampled lakes were super-saturated in dissolved methane and carbon dioxide concentrations, at least partly to a degree that in the literature has been shown to result in substantial emissions to the atmosphere. To estimate emissions, CO₂ and CH₄ fluxes will be quantified using the eddy covariance and floating chamber technique on a subset of the investigated lakes in a next step. Results will indicate which parameters lead to greenhouse gases emissions in the Alpine area.