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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Mobile open dynamic chamber measurement of methane macroseeps in lakes" *by* Frederic Thalasso et al.

Anonymous Referee #1

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This ms covers at least four important research issues on greenhouse gases (GHG) in freshwater systems:

1. Seepages in freshwater lake's sediments 2. Estimation of emissions in systems with unevenly distributed hotspots 3. Development of an easy-to-use instrument with high precision in a wide concentration range 4. Measurements in remote areas

The development and successful use of a newly developed flux chamber is in the center of the paper by F. Thalasso et al., the so-called Mobile open dynamic chamber (MOD). A permanent flow of gas makes the chamber to an open system, the gas of interest (CH4, CO2) is emitted across the air-water-interface (AWI) into a cavity, from where it is transported by the continuous flow of ambient air to the GHG-analyser (no matter of which brand). The chamber can be connected to a boat manned or unmanned

and moved along a system of transects across the interesting area of an aquatic system, e.g. a lake with seeps. The authors represent a set of equations to calculate the emission rates for systems based on data generated by MOD, as well as assembly instructions for the chamber. The ms will allow interested scientists to build and use a MOD and further on, to calculate gas emissions. This easy-to build design and the abandonment of special gases in tanks allow usage in remote places, like the tested Alaskan lake. For test and calibration purposes, a second lake in Mexico as well as a very specific gas trap were involved. While L. Guadalupe represents another system with low or medium ebullition rates, the tested trap is unique, already by its trapping area of 45 m^2. It is interesting that the results fit between MOD and "giant trap", for the idea of using simple repeatable techniques with low man power in a remote area, a few simple inverted funnels would have been more useful. As mentioned by the authors, new small and reasonable sensors (CH4 and CO2) become more and more available and could replace expensive gas-analysers soon. I can imagine that in near future slightly modified MODs equipped with sensors and data-storages and connected to remote vehicles will help to solve the problem of spatial and temporal resolution of emission rates from freshwater lakes. Following equations S4-6 (supporting information) the authors calculate the spherical diameter of gas bubbles rising to the AWI, based on the methane content in bubbles. This content has to be analysed in parallel (here by gas chromatography). From my point of view these calculation simplifies the bubble size calculation and additionally, as it is known that GHG content within bubbles can vary by several per cent, another unknown is in the equation. Perhaps I oversee it, but I am missing water depth/pressure at depth in these equations as well as size when leaving the sediment. I recommend to rewrite this paragraph to clarify the calculation pathway. The ms is well written without typos. In conclusion, all four approaches mentioned above, are treated in this manuscript and contribute to these fields in GHG research.

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