Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2019-499-RC2, 2020

Biogeosciences
Discussions

Interactive comment on "Technical note: Facilitating the use of low-cost methane (CH_4) sensors in flux chambers – calibration, data processing, and an open source make-it-yourself logger" *by* David Bastviken et al.

Anonymous Referee #2

Received and published: 20 February 2020

The technical note describes comprehensive laboratory tests of a low-cost methane sensor for potential application in flux chamber measurements in aquatic systems. The results are of high relevance for enhancing the spatial and temporal resolution of methane flux measurements and for improving our understanding of their environmental controls. The results and conclusion are comprehensible and well backed-up by data. Moreover, the note provides detailed instructions and procedures for implementing and calibrating such sensor in future applications. It is generally well written and presented. I have a few detailed, minor suggestions for improving the clarity of the

note, which are listed below:

- the authors generally refer to "methane levels", which are reported in ppm. I suggest to clarify at some point what exactly is meant by this – mol fraction, mixing ratio?

- similarly, the authors state that the tested sensor is measuring "methane concentration", however, all results are reported in ppm. Could it be that the sensor responds to the abundance of CH4 molecules, rather than the mixing ratio (as it has been found for humidity in the present manuscript)? The difference between a concentration (as mols or mass per volume) and mol fraction is the temperature and pressure dependence (as it could be described by the ideal gas law).

- the range of relative humidity used in the experiments was 18-70%. Depending on deployment time, humidity in a flux chamber can become much higher than this. Could you add a remark on sensor performance at higher humidity?

- the proposed Arduino-based logger includes a humidity/temperature sensor in addition to the CO2 sensor, which already includes sensors for both parameters. What is the reason for adding this additional sensor? Does it have higher accuracy?

- line 195: "However, results indicate that the relative change of CH4 levels over time, which is the core of flux chamber measurements, can be assessed efficiently with the sensors if calibrated properly." I do not see how this conclusion can be made is this point. Consider adding a justification.

- An important conclusion of the study was that "Sensor-specific calibration is required". Could you add some information about the stability of the calibration obtained for a specific sensor over extended time periods? What calibration intervals would you suggest?

- Table 1: the symbol n is used as a coefficient in equation V1 and also for number of samples. I suggest to use separate symbols. The parameter h (listed in the caption) seems not to be used in the table.