Ocean Sci. Discuss.,
https://doi.org/10.5194/os-2020-52-RC1, 2020

Ocean Science Discussions

Interactive comment on "Glider-Based Observations of CO_2 in the Labrador Sea" *by* Nicolai von Oppeln-Bronikowski et al.

Anonymous Referee #1

Received and published: 4 September 2020

General comments: This is a timely article given the necessity for direct CO2 measurements and the rising importance of cross comparison between various platforms. In particular it recognises the importance of subsurface measurements as well as temporal and spatial variability to examine drivers of surface CO2 flux. Direct CO2 measurements made by gliders would be a useful outcome to measure CO2 at depth and in a dynamic environment. The paper deals with comparisons of a novel fast response CO2 sensor with a more established slower response membrane-based sensor. With gliders 100s of profiles are produced for comparison with the step profile of a fully equilibrated sensor. Ultimately, we would hope to increase confidence in the direct fast response CO2 measurements and this paper goes some way towards characterising and validating such measurements. Specific comments: Interesting to learn of a whole

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Discussion paper

tank validation of gliders and the close attention paid to calibrating sensor foils. I am not convinced that the CO2-CV sensor is ideal for validating data against (and is not necessarily the model referred to in the reference to Jiang et al., 2014). Ideally the tank comparisons would also involve validation with state-of-the-art equilibrator systems. Attention should also be paid to errors in CO2 estimates arising from indirect CO2 estimates (using CO2sys). The paper could also be improved with increased use of tables and attention to detail on the figures (eg: colour legend when required). I have also listed some of the typos (repeated/missing words). After this the paper would be acceptable for publication. Technical: L3. Remove repeat of 'capable' L43. Use carbon sink (not carbon sinks) L44. Plural gliders to remove L53. May not be necessary to spell out CTD but it is an acronym? L56. 'Periods' L59. Inset 'a' (from a..) L87. Fall of 2016 L91. VITALS is an acronym? Fig1 caption requires more detail L102. Clarify that 4797 is the CO2 optode L106. Selected stop depths L108. Validate rather than calibrate L114. Would be good to know precision too? L124. Is CO2 accuracy really 2-75 uatm? It seems a large range (and may depend on the concentration?) L130. Would benefit from putting the dominant current flow onto the map perhaps? L136. Use cold instead of frigid L141. Profile of temperature to capture this? L158. You present T,S,O2 offsets – what about the other variables? A table would help Fig3. Put T and S on the axis (titles and units) L195. Remove duplicate of 'the' L239. Could tabulate some of the response time findings Fig5. Caption could be clearer on what VITALS is so the figure can stand alone L270. To a depth of large change in O2 and CO2? L272. Compared 'to' O2.. Fig6 and Fig7. You switch to DO2 without explanation or reference elsewhere in the text and use just O2 in the caption. Also colour bars/legend required L318. Change 'another' to 'from each other' L327 add year to the Chatfield reference (1998) L337. Its OK to switch to T and O2 but be consistent (in full again on L334)

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