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Biogeosciences Discussions

Interactive comment on "TECHNICAL NOTE: Coupling infrared gas analysis and cavity ring down spectroscopy for autonomous, high temporal resolution measurements of DIC and δ^{13}C-DIC" *by* Mitchell Call et al.

Anonymous Referee #1

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Review of Call et al. Coupling infrared gas analysis ..

The brief technical note by Call et al. presents an interesting case of coupling two commercially available instruments for combined analysis of [DIC] and δ13C-DIC analysis that may have a wide range of applications under both lab and field conditions. This team has been very active in these novel applications and the technical aspects of the study appear to be very sound and the intercalibration with IRMS measurements is promising. I also welcome the fact that the authors made ample technical information and scripts available for those who wish to implement this approach. My main con-

cern is their interpretation of the data resulting from the 8-day incubation experiments which is used as an example application. The Keeling approach used is in my opinion not appropriate to apply to this dataset since it is only applicable to period where only respiration occurs: then you have a situation where a 2-source mixing model applies. During periods of illumination, when primary production is important, this principle does not hold and applying a Keeling approach is not valid, what is happening here is a case of isotope fractionation, not isotope mixing.

The authors should thus only apply the Keeling approach to 'nighttime' data. Also, more information should be added on how the Keeling method was applied, i.e. what type of regressions were used. There is a wealth of literature on the importance of using a correct regression method, Pataki et al. (2003) and Zobitz et al (2006) are a good start:

Zobitz JM, Keener JP, Schnyder H, & Bowling DR (2006) Sensitivity analysis and quantification of uncertainty for isotopic mixing relationships in carbon cycle research. Agricultural and Forest Meteorology 136: 56-75

Pataki, D.E., Ehleringer, J.R., Flanagan, L.B.D.Y., Bowling, D.R., Still, C.J., Buchmann, N., Kaplan, J.O., Berry, J., 2003b. The application and interpretation of Keeling plots in terrestrial carbon cycle research. Global Biogeochem. Cycles 17 (1), 1022, doi:10.1029/2001GB001850

Minor suggestions:

-p3: why is 'instrument air' needed or used, and not a CO2-free carrier gas ? Would this not simplify and improve measurements, or is there a reason I'm overlooking that a certain background level of CO2 is required ? If not, you could simply strip out the CO2 with either a cold trap or a CO2 scrubber.

-p5: explain in more detail how the standards were prepared – preparing these requires some precautions in terms of removing all dissolved CO2 prior to dissolving

your powdered standards etc.

-p5: salinity has no units, remove 'ppt'

-p7 and further throughout the ms: use correct terminology when referring to higher or lower d13C values, e.g. L19: 'depleted d13C-DIC' should be 'lowered d13C-DIC', L23: 'enriching d13C-DIC values' should be 'increasing d13C-DIC values', L27: 'enrichment of d13C-DIC' should be 'increase of d13C-DIC' etc.

-p8: see initial commens on Keeling plot approach: (i) provide details on regression techniques, and (ii) should not be applied on data from periods with primary production.

-P8 L21: ulva → Ulva sp. (capital, italics)

P8 L22 : use one decimal only for d13C data

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