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Interactive Comment

Interactive comment on "Technical Note: Constraining stable carbon isotope values of microphytobenthos (C_3 photosynthesis) in the Arctic for application to food web studies" *by* L. E. Oxtoby et al.

Anonymous Referee #2

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Technical Note: Constraining stable carbon isotope values of microphytobenthos (C3 photosynthesis) in the Arctic for application to food web studies L. E. Oxtoby, J. T. Mathis, L. W. Juranek, and M. J. Wooller

The aim of the paper was to have first estimates of the carbon stable isotopic composition of microphytobenthos in the Artic coastal ocean. These primary producers have been neglected in the Artic and this type of data could be very useful in future studies on the role of these primary producers in the carbon cycle and food web. d13C ratios in DIC from water samples taken 5 m above the seafloor were determined and

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the model of Laws and Popp was used to estimate d13C ratios of various groups of benthic microalgae. The main conclusion is that microphytobenthos may have similar d13C ratios as phytoplankton, and that the two sources would therefore be difficult to differentiate. As such this is interesting, except that there are major flaws and problems with the approach and assumptions.

These are as follows: 1. There are substantial problems with the DIC composition that was used as a starting point in the calculations. Stable isotopic composition of DIC was determined 5 meters above the seafloor, and it is very unlikely that the benthic microalgae would see DIC with this isotopic composition. The d13C ratio of DIC in the sediment-water interface is affected by DIC from mineralization processes and benthic photosynthesis. As a result, porewater DIC can be substantially more different than overlying waters. 2. The model that was used for estimating isotopic fractionation factors in marine microalgae, has been developed for phytoplankton ie. cells suspended in water. Benthic microalgae are however growing in dense biofilms that operate more as a closed system. As a result, CO2 availablilty will be restricted and actual isotopic fractionation factors reached in benthic microalgae may therefore be much lower than for phytoplankton. 3. Although d13C data may not be available for the Artic, the data available for more temperate systems suggest that benthic microphytobenthos is heavier (say -11 to -18 o/oo) than phytoplankton (around -21 o/oo). Several approaches have been used to study the isotopic composition of benthic microalgae: several studies isolated mobile diatoms (e.g. Riera and Richard (1996) Estuarine Coastal And Shelf Science 42: 347-360) and others studied FA biomarkers (as proposed by the authors, e.g. Evrard et al (2012) Marine Ecology Progress Series 455: 13-31). Non of this literature is used in this paper, and would directly indicate that the approach used here is probably flawed. 4. Algal growth rates that were used in the model are derived from phytoplankton. Are these relevant for benthic microalgae?

Basically one can conclude that the authors estimated the isotopic composition of phytoplankton in the Artic, and not surprisingly they indeed came up with numbers close to actual phytoplankton values.

Interactive comment on Biogeosciences Discuss., 10, 18151, 2013.

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