Biogeosciences Discuss., 10, C8625–C8627, 2014
www.biogeosciences-discuss.net/10/C8625/2014/

Biogeosciences Discussions
Open Access

Interactive comment on "Greenland Ice Sheet exports labile organic carbon to the Arctic oceans" *by* E. C. Lawson et al.

Anonymous Referee #1

Received and published: 12 February 2014

Review of BG submission bg-2013-576

Title: Greenland Ice Sheet exports labile organic carbon to the Arctic oceans Author(s): E. Lawson et al.

General comments This contribution studies the flux of dissolved and particulate organic carbon from the Greenland Ice Sheet (GrIS). Earlier studies from glaciers elsewhere have shown that the organic carbon exported in melt waters is bioavailable (i.e. can be consumed by heterotrophic microbes). GrIS is the largest "glacial" system and as far as I know, the flux of carbon has not been estimated before. This study includes measurements on bioavailable carbon fractions (carbohydrates and amino acids) and incubation experiments assessing the bioavailability. In this light I find it a novel study and of relevance to the readership. However, a vast amount of information is pre-

sented and every detail in the data is discussed. This makes for slow reading and for the overall message, organic carbon flux and availability, being overwhelmed. So in summary I find this paper suitable for publication but recommend that it is edited to be more focused on the major findings. Try to trim its length down and delete unnecessary sentences (also applies to the supplementary information).

Specific comments Introduction In general it is adequate as is. Not too long and provides a suitable overview of the topic, organic carbon export from GrIS.

Methods, 1. What were the units of the suspended sediment concentration measurements? How were these SSC from the grab samples quantified? Dry weight or ashed? Filter pore size? It is fine to put the details in the Supplementary info. 2. Might be a good idea to keep the carbon units in mols or mg rather than mix for DOC and POC data. Makes it easier to compare. 3. The POC estimates seem to most likely have a large error associated with them. There are several stages in the calculation SSC to turbidity then the subtraction of two large numbers (TC and IC). The lack of a relationship between POC and SSC is probably not surprising, bearing all this in mind. So this results in a first estimate of the POC fluxes, but I wouldn't argue that it is proof that the inorganic to organic ratio for particulates is fixed across the hydrograph. 4. What delta value did you have for the fluorescence measurements? E.g. the excitation at 280 in your synchronous scan corresponds to an emission at ??? Additionally, why normalise to the max fluorescence in the whole dataset. If you are only interested in using it as a qualitative indicator it is better to normalise to the integral, then plot to compare the different shapes. 5. Try to avoid repletion with the supplementary information. 6. Be more to the point. E.g. First two sentences of 2.4 Flux Calculations, essentially do not provide any information. There is no need to explain that flux is the combination of flow and concentration. Etc. . .basically just state whether you used a discharge weighted mean or a linear interpolation approach, or . . .

Results Section 3.1 OK. Section 3.2 line 5. How can POC export have units of concentration? Should it not be mass per time? Section 3.2 and 3.3. Try not to bring in

BGD
10, C8625–C8627, 2014

discussion into this results section. Just present the data as is. Then in the discussion you can bring in the references and relate to other studies.

Discussion There are some very long sentences which make for heavy reading. E.g. line 5-10 and 10-14 in Section4.1 Split section 4.2 up. Discuss first what the amino and carb analysis shows, then how the fluorescence backs this up. Discuss up the bioavailability results and how they compare with other studies separately Section 4.5 I am unsure how important this carbon flux is for the ocean end member. The estimates you derive may be comparable but you also show that much of it is bioavailable and would be respired before even leaving the fjord systems. I would down play this argument and maybe consider other effects. Increased labile carbon will increase competition between heterotrophs and autotrophs for mineral nutrients and potentially alter coastal food webs. Frede Thingstad et al had a Nature paper on this in 2010 which might be worth looking into for inspiration.

Figure 2. Legend states that suspended sediments are plotted. You mean the POC data? Why not plot the POC in micromolar so that it is directly comparable with DOC.

Interactive comment on Biogeosciences Discuss., 10, 19311, 2013.