

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

Anonymous Referee #2

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This study relates POC and DOC transport to seasonal ice melt and subsequent discharge from the Greenland Ice Sheet. It demonstrates the variable nature of this process and how it affects the export of carbon from this system to the coastal ocean. Certainly an interesting story to read with implications for biogeochemical fluxes from the ice sheet and the coastal ocean. I have the following questions/suggestions before the manuscript should be published. 1. Methods. The study uses a number of analytical methods that are inadequately described in the current version of the manuscript, there should be enough information in the main body of the manuscript to reproduce how the analysis were carried out. I suggest describing the methods for carbohydrates and amino acids more thoroughly. From reading the CHO method section it seems like the authors carried out a hydrolysis step, was that done for POM and DOM? If so, the neutral sugars don't necessarily represent LMW DOM but rather are the hydroly-

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sis product of polysaccharides. If no hydrolysis was done on DOM samples, then the carbohydrate concentrations are likely underestimated. It is not clear from the current version. These methods need to be described for both, DOM and POM fractions.

A similar lack of detail is found with the description of the fluorescence analysis, why did the authors choose an offset of 18nm for the synchronous scans?

The incubation studies also need to be described in more detail. With a volume of 100ml the bottle effect might potentially be significant. Why was there no control treatment in the experiments? Why not show the actual DOC concentrations but % DOC losses during the experiment? Can you calculate decay rates of DOC to put a timeline on the degradation process? How would the decay rate compare to the time it takes the glacial DOC to reach the coastal waters, or would most labile DOC be respired before it hits the ocean? The high sensitivity catalyst for the Shimadzu TOC analyzer does not work well with salt water, how reliable are your DOC data? These are just a few questions that need to be addressed with a more detailed description of what was actually done, I highly recommend revising the method section.

A key point of the manuscript is the estimate of labile carbon export to the marine environment, for this to be a meaningful number, the authors should include a calculation of potential DOC losses before discharge into the coastal area. A substantial fraction of the labile DOM might be removed prior to reaching the coast. Looking at the map, the coast is about 200 km away from the sampling site?

Specific comments: Page 19316, line 1: results for SS should be included in results section. The headings in the method section don't make sense. Page 19319, line 6 and 7 and Table 1: POC export is given in $\times 10^6$ mg/l? Milligram per liter? Page 19325, line 13: timing Page 19329, line23: POC and DOC flux to these ocean masses (to the ocean) from the GrIS. . . References: for river carbon flux comparisons the authors might want to use more recent references for Arctic rivers (Raymond et al. 2007, Holmes et al. 2012, Amon et al. 2012).

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