

Interactive comment on “Particulate organic matter composition and organic carbon flux in Arctic valley glaciers: examples from the Bayelva River and adjacent Kongsfjorden” by Z.-Y. Zhu et al.

Anonymous Referee #2

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Major comments In this manuscript, the authors determined total suspended matter (TSM), particulate organic carbon (POC), $\delta^{13}\text{C}$ of POC, particulate nitrate (PN), total hydrolysable particulate amino acids (THPAA) including D-AA, pigments, and dissolved organic carbon (DOC) at the Bayelva River and adjacent Kongsfjorden. The authors determined sources of POC/PN using amino acids (AA) and pigments and concluded that in situ production is an important source for POC/PN at the fjord. Using observational data in addition with previously reported data, the authors estimated POC and DOC flux from Svalbard and pointed out the importance of Svalbard as the source

C6768

of terrigenous POC/DOC to the Arctic Ocean. The topic of the manuscript should be interest to readers of Biogeosciences, and dataset used in this manuscript is new and important for future comparison with this field and other fields in the Arctic region. However, I have a couple of concerns with the present manuscript. (1) DOC, POC and TSM concentrations are possibly related to river discharge, i.e., higher concentrations during greater river discharge period. Did the authors compare DOC, POC and TSM concentrations (Table 1) with daily (or hourly) river discharge data? If these concentrations are function of river discharge, the authors should include the function for their DOC/POC flux estimations. In addition, it was not able to follow how the authors estimate fluxes of POC and DOC, including associated errors. The authors should describe the estimation methods of the fluxes. Especially, the authors should clarify how the authors determined errors associated with estimation of the fluxes. Also, the discussion regarding with representative of the Bayelva River in Svalbard (comparison of TSM, POC, DOC concentrations in the Bayelva River with those in other rivers at Svalbard) is necessary for better understandings of TSM/POC/DOC fluxes from Svalbard to ocean. (2) In section 4.1, the authors determined bacterial contribution to POC/PN (I could not follow how the authors determined the contribution...). In addition, the authors determined bacterial contribution to POC/PN using D-Ala concentrations. Why did the authors determine bacterial contribution to POC/PN by two different ways? I think the latter is reasonable, and thus, recommend using only the latter estimation. (3) The authors discussed zooplankton-derived amino acids to PN in the fjord from the inconsistency of AA contribution to PN derived from calculation (using phytoplankton and bacterial derived AA) and measurements (of THPAA and PN). I think non-living AA also contributed to PN. The authors calculated the degradation index (DI) from AA composition. I think DI will be useful for evaluating contribution of non-living AA to PN. (4) The authors measured many organic matter parameters (listed in Table 1) for Kongsfjorden waters in addition to the Bayelva River. I think a new table which summarize the organic matter parameters for the river and the fjord waters (like as Table 2) will lead readers' better understandings, and thus, I recommend to adding a new table.

C6769

Specific comments Page 15656, line 11: Please use POC or PN rather than POM.

Page 15656, line 12: "particulate nitrogen" should be "particulate nitrogen (PN)"

Page 15656, line 15: "particulate nitrogen (PN)" should be "PN"

Figure 1: The characters in Figure 1 are too small and can not read.

Page 15659, lines 24-25: It seemed that the authors collect water samples from surface to deep layers of the fjord. Please clarify sampling layers/depths.

Page 15660, lines 15-16: " μM " should be " μm "

Page 15660, line 16: "cleaned" should be "filtered"?

Page 15661, lines 1-2: Tryptophan is easily degraded during acid hydrolysis. Thus, the authors should remove tryptophan data for estimation of AA concentrations and compositions.

Page 15662 line 22 - page 15663 line 2: I could not understand how the authors determined DI values. Did the authors use factor score coefficients reported by Dauwe et al. (2009)? Or did the authors conduct PCA? If the latter case, how did the authors collect plankton/bacteria and highly degraded oxic sediments?

Page 15666, lines 14-25: I could not understand this paragraph, especially, how the authors estimate contribution of phytoplankton and bacterial AA to POC/PN. Please rephrase this paragraph.

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C6770