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# *Interactive comment on* "Lena Delta hydrology and geochemistry" *by* I. Fedorova et al.

**Anonymous Referee #1**

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Fedorova et al. discuss hydological and geochemical data of the Lena Delta. The data sets include own measurements from the years 2002 to 2012, as well as archived data from the Russian hydrological survey (Roshydromet). The paper makes a valuable contribution to research conducted in the Russian Arctic, in particular by presenting to the international science community the hydrological time-series data. The discussion of the data provides some interesting aspects and testifies to the authors' excellent knowledge of the study area. I feel that the paper would be well worth publishing, but it requires more rigorous organization. I am, however, not qualified to comment on the quality of data and discussion of the hydrological part of the papter. Hence I focus with my detailed comments on the general presentation of the paper and the geochemical aspects.

General comments: A strong focus of the paper is on hydrology of the delta. However, the manuscript is submitted to a biogeochemical journal with a readership that might,



on average, not be experts in hydrology. In order to account for this, the hydrological aspects of the paper should be explained in more detail. Alternatively, the authors might consider publishing these data in a more focused journal.

A great wealth of data is presented, but the authors fall short of discussing them extensively. It might be worthwhile to consider splitting up the data sets and discussing them separately in two publications, one focusing on the hydrology, the other on the geochemistry, and perhaps even a third on sedimentation/erosion processes. As is, the manuscript is already very long and very complex and diverse.

The paper needs to be re-organized. The results and discussion sections are often mixed, with some of the discussion already being presented in the results, and with some results only being discussed without being presented as measured evidence. Care should be taken to define clearly the locations referred to (e.g., "central delta" – which area exactly is meant by this term; "areas of sedimentation" – where exactly is this taking place). The description of the geochemical methods is too vague and lacks details (again, I cannot comment on the hydrological methods, but I suggest to ask a hydrologist to review this aspect in particular). Furthermore, some of the interpretations do not seem to be substantiated by data. This is particularly true for the in itself very interesting discussion of ice-jamming processes, which is presented very prominently at the beginning of the discussion section without the process itself having been described before and the evidence for it not being presented in the data section.

In general, all data discussed need to be made available to the readers. The authors' own data used in the paper are in part archived in the Pangaea data base and publicly accessible; the geochemical data are, however, missing in this compilation. The data from Roshydromet, however, are only presented in figures. It would be desirable to make these data also available for the scientific community by providing them in tables. A clear distinction between own new and (published) old data should be made throughout the paper. The manuscripts includes a large number of tables and figures, which are a bit under-used. More reference should be made to them at the appropri-

ate places, i.e., where the data presented in the tables and figures are presented and discussed.

Furthermore, the manuscrcipt would benefit from some language editing. This could be done by some of the co-authors that are either native English speakers or have very good English skills. Word repetitions (in fact, in many cases sentences seem to be composed rather sloppily leading to statements like “only a minor amount a relatively minor amount of sediments. . .(page 20203)) and some misleading word choices (e.g. “branch length measurements” which I suspect refer to hydrolocial measurements made along the entire length of one of the branches, or “mineralization” which would be better expressed as “mineral content” or “ion content” of the water) should be eliminated.

Specific comments:

In the following I list a number of issues that I noticed when reading the manuscript. The list is not complete, as I cannot do the re-organization and language editing that should be done by the authors.

- The Abstract is not very well organized. It includes vague statements like “many questions regarding processes that occur there” – which processes? This should be described more specifically. The sentence starting in line 4 (“comparing long-term hydrometric. . ..”) is rather long. Line 11: Ice events (plural). How is the role “identified”? Do you mean “quantified”? Line 13: “increase of water and sediment discharge” relative to which time period? On which time scales? Line 14: . . .to a large extent due to an additional influx of water. . . Line 17: . . .major ion an element contents . . .in summer is presented, . . . “The conservative character of some dissolved substances. . .”: reword this sentence. - Page 20181, line 1: “Russian Arctic coast. . .” is this a publication? Please cite accordingly; line 10 and following: Reword this sentence. - Page 20182, line 2: Khabarova polar station – refer to figure 1 for the location; line 23: an increase in temperature in a river basin increases in runoff. . . - Page 20183, line 2:



delete “in a discussion”; line 13: provide a source for this statement; line 13: I am not sure that “sediment runoff” is a proper term - Page 20184, line 1: published in “Resources of surface waters”; line 6: delete “have studied the hydrochemistry of the Lena River estuary”; sentence starting in line 13 is incomplete; lines 23 and 24: this is not clear – which fuctions of H and Q are used to calculate Q and R, respectively? Give details. - Page 20185, line 5: delete “we selected”; line 8 and 9: What are the threshold values for “critical points” and “considerable change”? - Page 20186: line 18: I don’t understand what is meant here; line 21: delete “expedition” - Page 20187: line 1: all measured cross sections. - Page 20189: line 7: delete “on” after “using”; line 8 and following: give units for the error; line 20: introduce acronym (AARI); line 26 and following: Which pore size did the filters have (also on page 20190, line 1). - Page 20190: line 23 and following: Reword to read: The methods of sample preparation and laboratory analyses are described in detail by Wetterich et al., (2009). After this, a brief summary of the methods should be given. - Page 20191: Section starting line 1 needs to be more detailed; avoid expressions like “special apparatus” but instead describe the apparatus; line 22: What is meant by “avaialbe data on suspended sediments”; line 28: please provide the internet source used here - Page 20192: Line 1: provide details on the software; line 3: give example for such a landmark; line 12 and following: What is meant by “picture elements”? - Page 20193: Line 3: I am surprised by the use of W for a volume – why not use V?; line 18: I don’t understand how “the average” can be below the average; line 24: refer to Figure 2 here. - Page 20194, line 3: these data need to be presented in a table; line 6: define time period for which the increase is observed; line 7: define “critical point” (see comment above) - Page 20195, line 19: replace “correspondingly” by “respectively”; line 25: where is “Lenskaya Truba”?; sentence starting in line 27 (“One should also note. . .”) seems contradictory: how can something vary in the center and stay constant in the middle?; line 28 “edge rim” seems redundant, use either edge or rim. - Page 20196, line 1: . . .in the middle of the branch. . .; “edge rim” – see comment above; line 11: delete “and” after “indicating”; line 28: Delete “Sardakh Island is not susceptible to erosion. . .”, this was stated above. - Page 20197: line 2,

delete “formula”; line 7: sentence starting “Perhaps. . .” should be moved to discussion, as this is already data interpretation; line 11 and following: reword sentence; Seciton 3.3.1: “Mineralization” is a poor word choice – replace in entire section (see comment above); please re-define the “mineral classes” as given by Alekin (1970) for the non-russian speaking readers - Page 20198: line 14 and following: re-word this sentence; line 22 and following: Data from laboratory analyses of water sampled during summer field campaigns and field measuremetns are presented in Tables 3 and 4, respectively; sentence starting in line 25 needs to be reworded; line 29: give concentration ranges for trace elements and nutrients. - Page 20199: re-word sentence starting line 3; line 18 and following: no plural-s for nutrients; line 19: seem to be conservative. . .; paragraph starting line 10 and extending to page 20200 line 19 should be moved to discussion; data in section 3.3.2 should also be presented as tables. - Page 20201: Are the percentages given here TOC contents given in % dry weight?; sentence starting line 22 is incomplete; sentence starting line 26: Figure 3 shows discharge, here runoff is discussed, which from my understanding are two different things. - Page 20202: line 2: how is the significance determined?; line 9, insert space beween 21st and century; line 25 dleete “a” after “only”; sentence starting line 23: what are these statements based on? What is the data evidence for Ice blocking? - Page 20203: starting at top: The entire discussion on the ice-influence on river channel morphology comes a bit out of the blue. It would be preferable to first describe the features that need to be explained and then present the ice-jamming as one of the potential processes that could explain the observations. Line 28: reword sentence starting here, delete “only a minor amount” in line 29. - Page 20204: line 19: pariculates that have been eroded. . .; line 21: reword sentence starting “Unfortunately,. . .” - Page 20205: Discussion starting line 18: Here, explanations for the observed decrease in discharge from start to end of a channel alternative to simple branching of the channels are introduced, leading to the impression that the authors deem these likely scenarios. However, in the conclusions, branching of the channels is presented as the likely explanation. This is confusing. - Page 20206: line 2/3: . . .Olenek and Anabar River basins; line 11 and following: here,



cycles are discussed, which are not evident for me from the Figure referred to. How is a “cycle” defined?; line 14: it is not clear to me what is meant by “fluvial processes” that are supposedly evident from Figure 13: Please be more specific. - Page 20207: Section 4.3: Please show a figure illustrating runoff of selected ions paired with water discharge; line 11: sentence after semicolon is not clear to me; line 28. . .insufficient hydrolocial studies. . . - Page 2028: line 2: explain “river orders”; line 9: again, what is meant by “branch order”; line 12: be specific on “biotic constituents”; line 18: please define the “four regions with active sedimentation”, perhaps also by using a figure. - Page 20209, line 12: . . .as well as a decrease of . . .; line 23: “the most valuable of these were branch length measurements”: do you mean “along-branch hydrological measurements”? - Page 20210: line 1: please define “central delta”; conclusion 8: What about aggregation or flocculation as a potential process explaining high TOC? - Page 20211: line 2 . . .parts of the delta that confirm the ranges. . .; line 6: re-word “that is more mineralized” - Table 2: Please indicate whether a change is an increase or a decrease (e.g., by adding +/- signs) - Figure 8: Panel 2) is of very poor quality, hardly anything is visible, and the interpretations made based on this figure cannot be reconciled. - Figure 13: caption: Please refer to “dashed” rather than “dotted” lines; I cannot see what criterion was used to distinguish between the three phases of different annual water volume. To me, the average volume seems to be rather constant with the exception of a the years 1987 and 1988. What was different then?

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Interactive comment on Biogeosciences Discuss., 10, 20179, 2013.