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Biogeosciences
Discussions

# *Interactive comment on* "Interannual variability of surface and bottom sediment transport on the Laptev Sea shelf during summer" *by* C. Wegner et al.

**Anonymous Referee #1**

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Interannual variability of surface and bottom sediment transport on the Laptev Sea shelf during summer.

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General comments: For two summer seasons, with contrasting atmospheric conditions over the shallow shelf of the Laptev Sea, this paper compares freshwater distribution and sediment dynamics in the surface and bottom nepheloid layer. The authors demonstrate clear differences in sediment dynamics between the cyclonic pattern that directs the Lena River plume to the east and the anticyclonic pattern where the plume extends



northwards over the shelf. Considering the dramatic changes underway in the Arctic, studies that link atmospheric conditions to shelf processes are particularly important to understanding the direction of change (e.g. to carbon budgets, sensitive ecosystems, and shelf/basin exchanges). This is an important contribution to the understanding of sediment dynamics on Arctic shelves influenced by riverine inputs and applicable to successful modelling of such systems. The manuscript is both interesting and relevant and I recommend acceptance in Biogeosciences. There is however a few suggestions that I would like to make as outlined below:

Suggestions and comments:

It would be very interesting to know the time frame for the cross-shelf section depicted in Figure 4 (a month? a few days?) and how this relates to the time series data in Figure 7.

Given that resuspension of bottom sediments is largely event driven, it would be useful to include stick plots of wind and current in Figure 7. Current direction was measured and is relevant to the sediment transport picture (as described in Wegner et al., 2003). At minimum, a discussion of wind and current velocities at the times of maximum echo intensity could be very informative.

A discussion of wind speeds and depth to which orbital speeds of wave action can resuspend bottom sediments would be a good addition. It is very likely that there is massive resuspension in the shallow foreshore as well as increased shoreline erosion during storm events and that resuspended sediment is transported offshore in a bottom nepheloid layer (e.g. Hequette et al. 2001). Do storm events increase the transport of sediment beyond the shelf edge? I think there should be a discussion on the direction of sediment transport in the bottom nepheloid layer at the mooring sites and the likelihood of changes to shelf basin exchange with increased incidence of shoreward winds.

Minor comments: Abstract Page 13054 Line 5: . . ..Laptev Sea, detailed. . ..Line 22: . . .. . .transport, in both the surface and bottom nepheloid layers, are

Introduction: It should be mentioned that the timing of peak flows of Lena River are in June.

Material and methods: It would be useful to specify the dates over which the sampling was done, especially dates for the x-shelf transect in Figure 4.

Current direction was measured, perhaps it could be added to Figure 7 as stick plots or a general comment added in the results as to the current directions especially during periods of high current speeds.

Page 13059 – lines 18-26: Were any comparisons of the two silicate methodologies done? References for the methods should be included. In line 23, silicates should be changed to silicate (two instances).

Discussion

13066 lines 23-25: remove repetition in the sentence and move comma → Nevertheless the difference in 2007 and 2008 in the SPM concentration, within both the surface and the bottom nepheloid layers, are highest on the Central Laptev Sea shelf (Fig. 4a, e) . . .

Comment on Figures: In the printout version, the labelling is very small and difficult to read.

Figure 1: I suggest changing the symbols so that it is immediately obvious where a site has been sampled in both years. The line marking the x-shelf section should be made darker.

Figure 7: No satisfactory explanation is offered as to why there might be a high peak in echo intensity not accompanied by an increase in current speed (Fig 7b). It would be very interesting to see stick plots of winds and currents on the same scale.

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