

Interactive comment on “Inorganic carbon fluxes on the Mackenzie Shelf of the Beaufort Sea” by Jacoba Mol et al.

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The authors would like to thank referee #1 for their insightful comments and helpful revisions of this manuscript. The authors agree for the most part with all of the revisions that have been suggested. Each of the referee's comments are individually addressed below, with the comment from referee #1 listed and then responded to.

The wording “excess DIC” is used in excess. Please use it either for DIC/TA limits or for the Burt approach.

Authors agree that the term “excess DIC” should only be used to address DIC/TA limits or for the Burt approach and will go through the manuscript to make this term more robust as a descriptor in these situations.

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P4 L20 ff: Define UHL-ATL (see Fig. 3)

UHL-ATL will be defined in this paragraph, as it is used in the figure mentioned here. “Waters with a mixture of UHL and ATL properties, or without at least 80% of the total fraction of either water mass, are defined as UHL-ATL waters.”

P4 L27: should be ~ 33.1

This is the salinity that is mentioned at P4 L27, and it is the salinity seen at the UHL maximum.

P4 L20 ff: The described layering of PML and UHL is a bit misleading when looking at Fig. 5, where the ratio of UHL water is on the shelf > 90 %

It should be mentioned that the layering described here is more applicable over the deep basin and disappears somewhat over the shelf due to mixing/upwelling.

P6 L3: use “33 km horizontal ..”

Adding horizontal to this statement does increase understanding.

P6 L13: This transformation is hard to understand. What about a self-explaining sketch?

It is possible to add a small direction figure onto the map in Fig 1 to display this transformation.

P7 L9: Which figure is meant?

Changing this line to “These surface plots (Fig. 2) ..” would fix this.

P8 L 24: Give an explanation for the expected pattern.

These lines could be changed to explain the expected pattern with an addition such as “... in the surface or subsurface, due to photosynthesis and the preferential uptake of the lighter carbon isotope, and a decrease to minimum values of -0.5 per mil in the DIC maximum layer in the deep basin and on the shelf bottom due to respiration and the

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release of these lighter carbon isotopes”.

P9 L7: MW fraction is still < 10 % there.

Although the MW fraction is still quite high (>10%), this is the area where it is lowest. The relative fraction may be lower because of this intrusion of sea-ice melt and so it may be better to highlight the fact that there is a greater amount of sea-ice melt rather than saying that river input is more limited.

P9 L18: Show location in Fig. 1

The location where wind data was taken from can be shown on Fig 1.

P9 L25: “easterly”? I see rather north and south winds.

It may be more accurate to state that there were “both northeasterly and southeasterly winds throughout the beginning of the month.”

P9 L25: “wind speeds were comparable low”

It should be added that “wind speeds were comparably low”.

P12 L8: You mean along-shelf here?

There is a mistake in the cross/along wording in this paragraph. From P12 L8 it should read, “Along-shore transports at the stations on the transect are calculated through the water column, to a maximum depth of 200 m, by taking the sum of the products of the along-shore modelled velocity and a cross-shelf distance of 1 km (Fig 9b)”.

P12 L10: Fig. 9b

This is correct, altered in the correction to this sentence above.

P12 L20: Fig. 10

This change to the figure number is correct.

P12 L20: per square meter: which along-shore distance was used?

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An along-shore distance of 10 km was used in this calculation. This information should be added at P12 L19 to enhance understanding. “. . . through the water column with an along-shore distance of 10 km.”

P12 L32: in P8 L3 excess DIC/TA ratio was indicated for values > 1.

It is mentioned at P8 L3 that a “greater ratio of DIC/TA indicates excess DIC”, although this is not exactly equated with a value > 1. The value of 1 is indicating the slope of the line in Fig 3c. The wording at P8 L3 could be modified to further explain what is meant by this linear relationship, but also that the individual water masses have different DIC/TA ratios as shown in Table 1. None of these water masses actually have an average DIC/TA ratio > 1.

P13 L7 please refer here to Fig. 8d

This can be changed to “As expected by the cross-shelf velocity in Figure 8d, the transport in the top 10 m at all three stations is off-shelf. . .”

P13 L9: Add “Table 2”.

Adding the reference to Table 2 at the end of P13 L9 would be helpful to the reader.

P13 L11: It should be mentioned that you use a “railway” approach for the transport of biogeochemical tracers. Please write something like: “Even though no results of a coupled physical – biogeochemical model was available the following arguments could be made . . .”

The beginning of this paragraph can be altered to read: “From August 6th to 16th, strong northeasterly winds were present over the shelf region, but had shifted to an easterly direction by the time sampling took place and through August 22nd. Although no results from a coupled physical-biogeochemical model were available, it seems probable from the wind and physical sampling data that upwelling on the Mackenzie Shelf began around August 6th and continued through to the 22nd of August. . .”

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P13 L14 and L16: give start- and end-day.

Can change to "lasting longer than 10 days in August and September of 2014 (approximately August 10th to 28th and September 14th to 29th), during which. . ."

P13 L13 Did you analyze the wind fields or the hydrodynamic results? Please add: "From the analysis of .., there are two .."

Can alter this sentence to read: "From the analysis of the hydrodynamic model, there are two periods. . ."

P13 L22: Fig. 11d

This reference to Fig. 11d is correct.

P13 L24 Two times "km"

Not sure what this comment is related to. It might be advisable to remove the first set of units in this line and only keep the second after the second gradient.

P13 L31: Fig. 11c

The correction of this figure reference is correct.

P14 L10: Fig. 11e

The correction of this figure reference is correct.

P14 L16: "Table 2 last column"

This line should be changed to "...shown in the last column of Table 2".

P14 L25: Use space "ofCaCO₃"

Should read "of CaCO₃".

P20 Display the Amundsen Gulf and use white color for text within the continent.

A label of the Amundsen Gulf can be added and the text color will be changed to white

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within the continent.

P25: Also indicate 16-20 August and 5-9 September.

Lines of another type can be added to indicated the time periods of 16-20 August and 5-9 September to indicate the times of strongest upwelling and downwelling behavior.

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