Summary of Comments on Blank

Page: 1

Author: None Subject: Highlight Date: 08/02/2021 10:12:37
Title: "the impact" - perhaps nice to have a title that is descriptive in the way it tells what the assumed impact is

Author: None Subject: Cross-Out Date: 08/02/2021 09:34:55

Author: None Subject: Sticky Note Date: 08/02/2021 10:08:59
LIne 17: delete "their"

Author: None Subject: Highlight Date: 08/02/2021 10:44:37
Line 17-19, sampling for oxygen isotopes is not described

Author: None Subject: Cross-Out Date: 08/02/2021 09:35:02

Author: None Subject: Sticky Note Date: 08/02/2021 10:09:40
Line 18: delete "concentration", and add "(CDOM) absorption" - assuming you measured the absorption of CDOM, not fluoresence?

Author: None Subject: Cross-Out Date: 08/02/2021 09:35:07

Author: None Subject: Sticky Note Date: 08/02/2021 10:13:13
Line 18: delete "the" before colored ...

Author: None Subject: Inserted Text Date: 08/02/2021 09:35:42
(CDOM) absorption

Author: None Subject: Highlight Date: 08/02/2021 10:10:20
Line 19: You make the assumption that all the DOM in of terrestrial origin, but there must be some marine production, or release from sediments?, thus the more generic term of DOM should be used, unless you have solid evidence this is all terrigenous material...

Author: None Subject: Highlight Date: 08/02/2021 10:10:54
Line 21: 211 km3 average over the years??

Author: None Subject: Highlight Date: 08/02/2021 10:10:41
Line 22: 245 km3 average over the years?? which period exactly (give months).. for both landfast ice melt and river water..

Author: None Subject: Highlight Date: 08/02/2021 10:11:12
Line 25: the shelf is quite shallow, so what do you mean by "near-surface layer", please be more specific, as usually one assumes that the dense brine-rich water would find their way to the bottom on the shelf, no?

Author: None Subject: Cross-Out Date: 08/02/2021 10:11:42
Line 27-29 (last sentence of abstract) - Feels like hand waiving, and unless there is something more substantial to support this vague statement, delete it. If you can describe what is potentially changed, it would have more substance.

Author: None Subject: Highlight Date: 08/02/2021 10:13:32
Line 32: I would find that work by e.g. Stroeve and coworkers is more appropriate citation here.. e.g.
Stroeve, J., & Notz, D. (2018). Changing state of Arctic sea ice across all seasons. Environmental Research Letters, 13(10), 103001. https://doi.org/10.1088/1748-9326/aade56

Author: None Subject: Highlight Date: 08/02/2021 10:25:10
Line 34: Impressive number in Pg of C, but without context it is useless .. please provide context for this amount of carbon.

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Author: None Subject: Inserted Text Date: 08/02/2021 09:47:34
at

Author: None Subject: Sticky Note Date: 08/02/2021 10:13:54
Line 40: replace "in the high" with "at high"

Author: None Subject: Sticky Note Date: 08/02/2021 10:15:15
Line 48 (and paragraph above): What about the ESS - you describe both LS and ESS in the abstract, but here focus on LS only. Aren't there also riverine fluxes of DOM to the ESS as well? How large are they compared to LS/Lena? And what about diffuse input, not carried by the largest rivers? Which fraction of the water shed (area wise) does the larger rivers cover?

Author: None Subject: Highlight Date: 08/02/2021 10:17:01
Line 54-55: Also Granskog et al. 2012 indicated loss in Fram Strait.

Granskog, M. A., et al. (2012). Characteristics of colored dissolved organic matter (CDOM) in the Arctic outflow in the Fram Strait: Assessing the changes and fate of terrigenous CDOM in the Arctic Ocean. Journal of Geophysical Research, 117, C12021. https://doi.org/10.1029/2012JC008075

Author: None Subject: Sticky Note Date: 08/02/2021 11:02:26
And for Hudson Bay another study on estimating loss of (t)CDOM was also presented in: Granskog, M., et al. (2009). Coastal conduit in southwestern Hudson Bay (Canada) in summer: Rapid transit of freshwater and significant loss of colored dissolved organic matter. Journal of Geophysical Research, 114(C8), C08012. https://doi.org/10.1029/2009JC005270

Author: None Subject: Sticky Note Date: 08/02/2021 11:03:13
Is there differences in the ice season length on Laptev versus Hudson Bay, that could indicate different potential for photochemistry?

Author: None Subject: Cross-Out Date: 08/02/2021 09:50:39

Author: None Subject: Sticky Note Date: 08/02/2021 10:17:31
Line 62: delete "a" before tDOM

Author: None Subject: Highlight Date: 08/02/2021 10:27:46
Line 66: But in fact allt he studies you cite here elude towards a loss of tDOM, isn't that consistent?

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Author: None Subject: Sticky Note Date: 08/02/2021 10:20:42

Lines 65-71: Here also refer to work by Belanger et al (2006) and the CDOM losses have been estimated in the Fram Strait (Granskog et al 2012), and the work of Manizza and co-workers approached this from a modeling perspective, for completeness also discuss these results in the paragraph lines 65-71.

Bélanger, S., et al. (2006). Photomineralization of terrigenous dissolved organic matter in Arctic coastal waters from 1979 to 2003: Interannual variability and implications of climate change. Global Biogeochemical Cycles, 20(4), 1–13. https://doi.org/10.1029/2006GB002708

Granskog, M. A., et al. (2012). Characteristics of colored dissolved organic matter (CDOM) in the Arctic outflow in the Fram Strait: Assessing the changes and fate of terrigenous CDOM in the Arctic Ocean. Journal of Geophysical Research, 117, C12021. https://doi.org/10.1029/2012JC008075

Manizza, M., et al. (2009). Modeling transport and fate of riverine dissolved organic carbon in the Arctic Ocean. Global Biogeochemical Cycles, 23, GB4006. https://doi.org/10.1029/2008GB003396

Author: None Subject: Highlight Date: 08/02/2021 09:55:54

You mean conservative mixing? Why do you not simply say so..this is an awkward way of telling that.

Author: None Subject: Highlight Date: 08/02/2021 09:57:21

depends on the what the sea ice melts into..

Author: None Subject: Highlight Date: 08/02/2021 10:08:27

Line 77: and here it is more appropriate to say "DOM" since offshore there is also marine DOM in the water column..

Author: None Subject: Highlight Date: 08/02/2021 10:08:15

Line 79: what do you mean by thin, and does it melt in place or is it mobile?

Author: None Subject: Highlight Date: 08/02/2021 10:02:49

There are in fact a number of experimental studies that directly look at the fractionation of DOM during sea ice formation.. and the latter point to a minor preferential retention of DOM in ice vs. salt..

Müller, S., et al.(2011). Behaviour of dissolved organic matter during formation of natural and artificially grown Baltic Sea ice. Annals of Glaciology, 52(57), 233–241. https://doi.org/10.3189/172756411795931886

Müller, S., et al. (2013). Selective incorporation of dissolved organic matter (DOM) during sea ice formation. Marine Chemistry, 155, 148–157. https://doi.org/10.1016/j.marchem.2013.06.008

Author: None Subject: Inserted Text Date: 08/02/2021 10:21:55

may also

Author: None Subject: Sticky Note Date: 08/02/2021 10:21:58

Line 82: replace "also explain" with "may explain" - before you have solid proof it is not another process.

Author: None Subject: Inserted Text Date: 08/02/2021 10:03:37

landfast sea-ice

Author: None Subject: Sticky Note Date: 08/02/2021 10:04:06

Or do you mean sea ice in general, or the ice melting in place?

Author: None Subject: Inserted Text Date: 08/02/2021 10:22:40

understood

Author: None Subject: Sticky Note Date: 08/02/2021 10:22:56

Line 87: replace "studied" with "understood"

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Author: None Subject: Highlight Date: 08/02/2021 10:38:26

Lines 102-103: The two sentences could be combined to: "Six ice cores from three different sites (Fig. 1) in March-April 2012 were analysed (Ti12, Table 1).

Author: None Subject: Sticky Note Date: 08/02/2021 10:39:34

Should the campaign be "Ti12_ice" for the ice cores??

Author: None Subject: Highlight Date: 08/02/2021 14:03:29

Figure 1: where all stations visited every year of sampling?, if not, please somehow indicate in the figure which where visited in which year (or expedition).

Bathymetry perhaps draw e.. the 50 m or 100 m isobath for clarity. And what is the source for the bathymetry?

Does the 245 km3 also include the ice in the ESS? (all that is shown on the map)? If not, please show where you draw the border between LS and ESS in your budgets. And is this the average over a period of years, please clarify in the caption.

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Author: None Subject: Inserted Text Date: 08/02/2021 10:43:01
Campaign/expedition

Author: None Subject: Sticky Note Date: 08/02/2021 10:43:06
Table 1: "Campaign/expedition" rather than "Name"

Author: None Subject: Highlight Date: 08/02/2021 10:53:06
Section 2.2, how were oxygen isotope samples collected, and volume large enough to make robust salinity measurement from same sample?

Author: None Subject: Inserted Text Date: 08/02/2021 10:41:54
Line 124: "containers" rather than "boxes"?

Author: None Subject: Highlight Date: 08/02/2021 11:05:19
Line 126-127 -what samples were drawn from the ice cores, DOC, CDOM, O18, salinity?

Author: None Subject: Sticky Note Date: 08/02/2021 11:05:40
Which unit of salinity is used for the data in this paper?

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Author: None Subject: Highlight Date: 08/02/2021 13:33:12

Line 150: what is the effect of microbial degradation on this slope? and also Granskog (2012) indicated that slopes of shorter wavelengths sensitive to removal..

Author: None Subject: Inserted Text Date: 08/02/2021 10:53:33

were

Author: None Subject: Highlight Date: 08/02/2021 10:56:53

Line 160: Since the choice of end-member is probably quite important in such a system, what are the uncertainties in the fraction calculated using this mass-balance equation?

Author: None Subject: Highlight Date: 08/02/2021 10:51:51

Line 168: Please elaborate on the choice of end-members, since the resulting fractions are sensitive to the choice of end-member, especially in such a region with clearly several different end members.

Do you have a measured sea ice end-member value for the landfast sea ice?

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Author: None Subject: Inserted Text Date: 08/02/2021 11:09:12
Lena River

Author: None Subject: Cross-Out Date: 08/02/2021 11:09:18

Author: None Subject: Highlight Date: 08/02/2021 11:10:19
Line 173: month/date? Do you have the hydrograph of the Lena River, to indicate when you sampled relative to the freshet in 2014?

Author: None Subject: Highlight Date: 08/02/2021 11:11:53
50 ug/L at salinity of 20? Seems quite low at such low salinity. Sea-ice melt?

Author: None Subject: Highlight Date: 08/02/2021 11:18:56
How well does the methods applied by Fichot and Benner - and - Goncalves-Araujo et al apply:

Fichot, C. G., & Benner, R. (2011). A novel method to estimate DOC concentrations from CDOM absorption coefficients in coastal waters. Geophysical Research Letters, 38, L03610. https://doi.org/10.1029/2010GL046152

Gonçalves-Araujo, R., et al. (2020). A decade of annual Arctic DOC export with Polar Surface Water in the East Greenland Current. Geophysical Research Letters, 47, e2020GL089686. https://doi.org/10.1029/2020GL089686

Author: None Subject: Highlight Date: 08/02/2021 11:19:48
Line 181, impressive R2, but what about RMSE, especially at lower DOC concentrations..

Author: None Subject: Sticky Note Date: 08/02/2021 11:22:39
Lines 181-186: What was the DOC and CDOM in the water that the ice grew into, i.e. what was the "fractionation" at freezing .. the same as for salinity? Are salinity normalized values the same for ice and water?

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Author: None Subject: Highlight Date: 08/02/2021 11:16:20

Figure 2: The fit is made for the DOC range that is "huge" when marine environments are considered, and despite the high R, are the deviations from this at low DOC significant? What is the RMSE, as it is an absolute measure of the goodness of fit, rather than R?

Add a "zoom in" for the range 0-200 ug/L DOC, or peharps 0-400 to include the ice samples.

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Author: None Subject: Highlight Date: 08/02/2021 11:26:02
Figure 3. Add a panel for S275-295, does this change with season/freshet..

Author: None Subject: Sticky Note Date: 08/02/2021 11:35:19
Also, a second y-axis with accumulated flux could be added to each panel (except S275-295)..

Author: None Subject: Highlight Date: 08/02/2021 11:33:42
Line 199: 211 km3: But this must vary from year to year, and this data is available from Arctic GRO for the years with observations, consider at least reporting these values..

Author: None Subject: Sticky Note Date: 08/02/2021 11:34:12
And what are the corresponding accumulated DOC/CDOM fluxes

Author: None Subject: Highlight Date: 08/02/2021 11:26:36
Line 202: where is the value of 14 m-1 taken from?

Author: None Subject: Highlight Date: 08/02/2021 11:33:04
Line 203: how far does the "full freshet" extend, and by how much (%) would the water and CDOM/DOC fluxes increase?

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Author: None Subject: Highlight Date: 08/02/2021 11:54:08
Line 206-7: Using an a350 end-member of 14 m-1 seems low, when you show in Figure 3 values of 26 m-1 for the period of observations in Lena River, no?

Author: None Subject: Highlight Date: 08/02/2021 13:11:37
Figure 4: In this system you also have another mixing line, with sea-ice melt as end-member, right? This should also be indicated with at least with apparent location, low S (2-5?) and 5-fold lower CDOM than the parent water (at most 14/5?).

That said, you have a system where salinity alone cannot be used to deduce the exact behavior or cause of the deviations. I would expect to add a panel to this figure where "salinity" is replaced with "fraction of river water (meteoric)".

Are the samples with S<5 also included in the fit? And the "drop" of values from S<5 to S>5, how is that explained?

Author: None Subject: Sticky Note Date: 08/02/2021 13:12:07
Figure 4 Legend: Instead of "Theoretical mixing line" - this is the River:Marine mixing line. Since there are more than 2 end-members here (+processes we cannot account for in such a salinity-property plot).

Author: None Subject: Sticky Note Date: 08/02/2021 13:12:49
Figure 4: Especially the end-member at 0 salinity might vary a lot from campaign to campaign (which you only show in Fig 8!)... thus I think one should indicate this uncertainty in the mixing line(s) and also here show the zero salinity values now only shown in Fig 8.

Author: None Subject: Sticky Note Date: 08/02/2021 12:08:49
Fig 4. And I believe the Fsim fraction could be shown better with a different colormap.

E.g. in matplotlib a colormap type Diverging (coolwarm), see
https://matplotlib.org/3.1.0/tutorials/colors/colormaps.html#diverging
Would perhaps be better, than the "rainbow" type used now.

Author: None Subject: Inserted Text Date: 08/02/2021 11:41:25
to the data in the Laptev Sea

Author: None Subject: Sticky Note Date: 08/02/2021 11:41:54
Line 2014: insert. .. fit "to the data in the Laptev Sea" (solid line). ?

Author: None Subject: Highlight Date: 08/02/2021 11:42:33
Line 2016 - give salinity and A350 values for the end-members..

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Author: None Subject: Inserted Text Date: 08/02/2021 12:09:19
examined

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Author: None Subject: Highlight Date: 08/02/2021 12:45:34

Figure 5: Again, make certain what the mixing line is for (See comment on fig 4). Also here, indicate the plausible marine to sea-ice melt mixing line.

Consider that you show the station in ESS in Fig 1. with their own color, and then use same color in this plot for ESS data points.

What are the different sizes of the back dots representing? Or are they clusters of samples?

Author: None Subject: Highlight Date: 08/02/2021 12:44:01

Generic comment. Results Section. I would have expected a salinity-DOC plot, just out of curiosity to see also how DOC relates to salinity. Same also for Fr-DOC if there is enough data available. And colored with e.g. Fsim

Author: None Subject: Sticky Note Date: 08/02/2021 12:44:37

Figure 4, 5, 6, should be merged into one figure with multiple panels, also including plots Fr-property. And add S/Fr-DOC plots as well.

Author: None Subject: Highlight Date: 08/02/2021 13:01:13

Line 235-236. Here you have the data to also indicate the potential sea-ice end member in Figs 4 and 5. And mixing line from marine to sea-ice melt. What was the DOC concentration in the sea ice?

Also, the comparison to a350 at same salinity is valid in terms of the effect as end-members. But the ice was likely grown into water with a salinity of >20?

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Author: None Subject: Highlight Date: 08/02/2021 12:15:12

Your sea ice data in Fig 6 shows what you could use as a mixing line for sea-ice melt int he Figures 4&5, thus I would introduce the sea ice a350 data already in Figure 4, and use this to add the mixing line. This in turn explains (potentially) the data from the ESS. At least I would show them in same figure, but different panels, this would make it much easier to compare and review.

Author: None Subject: Inserted Text Date: 08/02/2021 12:16:44

Line 244-45: this was also shown to indicate CDOM loss (Granskog, 2012).

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Author: None Subject: Highlight Date: 08/02/2021 13:08:00

But with salinity alone, you cannot really say this, because you have evident contributions from sea-ice melt (or brine) which could also alter the situation, and thus change your salinity-property mixing line. Thus as suggested above also including the Fr-property plots would allow to make full use of the isotope data collected (cf. Granskog, 2012, analysis in Hudson Bay).

Why is the situation in the Hudson Bay so different? (Granskog, 2012), with evident loss of CDOM?

Author: None Subject: Inserted Text Date: 08/02/2021 13:13:40

This apparent conservative mixing is indicated in the

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Author: None Subject: Highlight Date: 08/02/2021 12:34:12
Figure 7- Since you have at least CDOM data, add a panel with S275-295 into this figure.

What are the black bars at two of the station on the top of figure?

Author: None Subject: Highlight Date: 08/02/2021 13:15:09
Line 280-282, could this also be explained rapid loss at very early stages of the more labile material during freshet?

Author: None Subject: Highlight Date: 08/02/2021 13:16:11
Line 289 - do you mean microbial degradation is a plausible loss term?

Author: None Subject: Highlight Date: 08/02/2021 13:16:57
Line 290-291: How does this relate to what was observed by Belanger et al.?

Author: None Subject: Highlight Date: 08/02/2021 13:20:34
Line 288-296: What does the S275-290 data tell you? You show it above, but do not fully explore what the data tells in terms of signs of photodegradation. I would have expected some discussion ion the Slope data since it is shown in the Results part.

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Author: None Subject: Highlight Date: 08/02/2021 13:34:09
Section 4.2. Please split this one up in a few paragraphs.

Author: None Subject: Inserted Text Date: 08/02/2021 13:18:08
during sea ice formation

Author: None Subject: Cross-Out Date: 08/02/2021 13:34:29

Author: None Subject: Inserted Text Date: 08/02/2021 13:35:20
landfast

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Author: None Subject: Highlight Date: 08/02/2021 13:37:55

Figure 8 - again, since this is a multiple source system, I think adding the sea-ice melt mixing line is also valuable to show. You also have some data to indicate that end-member.

And as before indicate the uncertainty in the mixing lines with e.g. shading.

I would drop the Linear fit, since itis a fit to the data, that might include factors affecting the CDOM, and as such is not "the" mixing line but a "results" of processes acting on the CDOM on the shelf.

Author: None Subject: Highlight Date: 08/02/2021 13:38:53

Line 333-334: I thought the landfast ice start growing early, so it is fairly thick after the winter? You mention 2.0 m thick landfast ice, so I am bit confused here. Please clarify.

Author: None Subject: Highlight Date: 08/02/2021 13:22:13

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Author: None Subject: Highlight Date: 08/02/2021 13:40:20

Lines 334-337: Given the complexity of the system the simple property-property plots (figs 4-5,8) are hardly able to explain the situation.

Here the approach should rather be on individual profiles, where the "parent" water mass (i.e. end-members) for each one can be more reliably determined, and such the relative contribution of e.g. ice melt can be deduced. E.g. the approach by Granskog et al. (2009) in Hudson Bay was based on "individual" end-members since these vary much in space in such coastal systems with sea ice.

Author: None Subject: Sticky Note Date: 08/02/2021 13:28:59

Are there data for the isotopic values of the landfast sea ice?

Author: None Subject: Highlight Date: 08/02/2021 13:31:09

Lines 342-344: Again, it would have been helpful if there was data on Fr and the deviation from the river water mixing line could be deduced, salinity alone makes it rather difficult to discern what actually causes this deviation.

Author: None Subject: Highlight Date: 08/02/2021 13:58:35

Line 261 - What about sea ice conditions during this expedition? (pack ice gone long before cruise?).

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Author: None Subject: Cross-Out Date: 08/02/2021 13:53:46

Author: None Subject: Highlight Date: 08/02/2021 13:54:29
Line 376 - is it all landfast ice, or could it also be drift (Pack) ice that is melting in the region?

Author: None Subject: Highlight Date: 08/02/2021 13:57:05
383 - must if be landfast ice, or in cases further offshore also pack ice? The pack ice could have even lower CDOM than the landfast ice? E.g. see Kowalczuk et al.

Kowalczuk, P., et al. (2017). Bio-optical properties of Arctic drift ice and surface waters north of Svalbard from winter to spring. Journal of Geophysical Research: Oceans, 122(6), 4634–4660. https://doi.org/10.1002/2016JC012589

Author: None Subject: Highlight Date: 08/02/2021 13:43:11
Lines 384-386. Do not quite follow how you derive the amount of DOC "removed" from sea ice, or rather moved with the brine. Please elaborate.

Author: None Subject: Highlight Date: 08/02/2021 13:41:54
LIne 388-389, what do the actual studies of Giannelli and Müller tell about the change in DOM composition at ice growth?

Author: None Subject: Highlight Date: 08/02/2021 13:45:00
Lines 390-395 - at what salinity are these brine-rich waters on the shelf?From an oceanographic point of view, these do not then contribute to the formation of Arctic halocline in the Nansen or Amundsen basin?

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Author: None Subject: Highlight Date: 08/02/2021 13:51:21
Lines 407-8, at what depth? Do they feed to the halocline observed all the way in Fram Strait? And could CDOM be used to indicate where the brine-rich waters originate from?

Author: None Subject: Inserted Text Date: 08/02/2021 14:01:38
outer shelf?

Author: None Subject: Highlight Date: 08/02/2021 14:01:24
Lines 418-420: Does this mean the winter brine formation never reaches the bottom on the shelf?

Author: None Subject: Highlight Date: 08/02/2021 12:24:39
Line 428: and these multiple sources are?

Author: None Subject: Highlight Date: 08/02/2021 12:27:16

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Author: None Subject: Highlight Date: 08/02/2021 12:28:19

Line 431-433: are all these changes relative to 1940s? Please be specific which period the rates of change are given for in each case.

Author: None Subject: Highlight Date: 08/02/2021 13:50:09

But arguably you also first need a source of brine, thus sea ice formation in the future must also play an integral role? IF there is stratification sea ice can more easily form - but will it ever penetrate the stratification?