

Interactive comment on “Quantitative reconstruction of sea-surface conditions over the last ~150 yr in the Beaufort Sea based on dinoflagellate cyst assemblages: the role of large-scale atmospheric circulation patterns” by L. Durantou et al.

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Thanks to considering our manuscript, please find below specific responses to the comments.

1

"Chronology: It is not available so it cannot be assessed. The authors are refereeing

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to a paper being submitted (Ledu et al.). That is not enough, I would suggest including an age-depth model."

That is true. The chronology will be appear, be commented and discussed in the reviewed manuscript.

210Pb and 137Cs revealed high sedimentation rates (0.22 to 0.32 cm.yr⁻¹) directly linked to high sediment discharge from the Mackenzie River. Even if neighboring studies using 210Pb and 137Cs datation in the Mackenzie Trough gave away lower sedimentation rates (Bringué et al., 2012 ; Richerol et al., 2008a), the MA680BC core datation results are similar than other cores situated in the middle point of the slope between the Mackenzie Trough and the Amundsen Gulf (Scott et al 2009). Furthermore, sedimentation rates in the Mackenzie Trough are heterogeneous, following the dominant eastward transport of sediment in the suspended sediment plume (Hill et al., 1991) that reflects the possibility of finding of such high sedimentation rates along the MA680BC core.

2

"Correlation between SSS and SST, and the PDO/AO indexes. According to figure 4, the only correlation that I find significant is between 1979 and 1990s. The others as discussed in the text are not convincing at all. In fact, for some periods, there is an anti-correlation. To convince the reader, a spectral coherence could have been performed, as the authors seem to have confidence in their age model. I was not convinced about the impact of the oscillations on the sea-surface conditions in the Beaufort Sea based on these data."

That is also true. In consequence, we moderate our interpretation in the discussion.

Indeed, results from transfers functions are not systematically associated with PDO variations along the studied period. The comparison of atmospheric and paleoceanographic reconstructions is thus difficult to interpret and we cannot demonstrate with

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certainly that the PDO fully controls up-welling conditions and sea-surface parameters in the Mackenzie Shelf area. However, some of the reconstructed sea-surface parameters are synchronous with certain positive phases of the PDO, suggesting the probable effect of wind on sea-surface parameters and productivity at a decadal scale.

3

"A number of mis-spelling and mistakes are found in the text"

Line 20: correct "sea surface" with "sea-surface". CORRECTED Line 26: correct "sea surface" with "sea-surface" CORRECTED Line 29: correct "sea surface" with "sea-surface" CORRECTED Lines 51-25: Do not understand "the impacts climatic oscillations". Something is missing here CORRECTED Line 61: replace "essentially" with "mainly" CORRECTED Line 92: correct "Sea- ice" with "Sea ice" CORRECTED Lines 117-118: If Fig 1 is printed in BW, then the river plume is not visible CORRECTED Lines 131-132: Show the Mackenzie River on your map CORRECTED Line: 171: Correct "40x" with "x 400" CORRECTED Line 173: correct "foraminifera" with "foraminiferal" CORRECTED Line 174: correct "counted systematically" with "systematically counted" CORRECTED Line 175: replace "useful" with "meaningful" CORRECTED Line 185: correct "sea surface" with "sea-surface" CORRECTED Line 190: R is a software that contains statistical packages amongst other. Which package was used CORRECTED for the transfer function? Be more specific. CORRECTED Line 192: Guiot and de Vernal, 2011 is missing from the references IT WAS BADLY PLACED Line 194: what is the reference for the dinocyst reference database of 1429 sites? CORRECTED Line 198: replace "Data of" with "data for" CORRECTED Line 243: Correct "Dinocysts" with "Dinocyst" CORRECTED Line 248: Chose between fluxes or influxes. Not both. CORRECTED. Also, give some references about the relationship between cyst fluxes and productivity as it may not be as simple as that. Productivity is reflected on the dinocyst assemblage composition rather than fluxes.

Dinoflagellate productivity in estuarine zones are not necessarily reflected in assem-

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blages and heterotrophic/autotrophic ratio (Radi et al., 2007), and inter-annual productivity is expressed on phytoplankton communities in the study area (Tremblay et al., 2011). In the present study we are presenting dinocyst results as flux to better convey changes in dinoflagellate primary productivity throughout the time period covered by our core. Therefore, in order to study the evolution of surface productivity during the period covered by the sedimentary record, data flow dinocysts are interpreted as tracers of planktonic productivity (eg de Vernal et al., 1997), whose relationship is known particularly sensitive to upwelling regions (eg Susek et al., 2005)

Line 259: There are no fig 2F, 2G or 2H. Confusion with figure 4 may be? Line 286: Why refers to fig 3 here? CORRECTED Line 287: correct "were" with "are" CORRECTED Through the text, it is "cysts of Pentaparsodinium dalei" see line 288. CORRECTED Lines 316- 319: Should refer to figure 4 here? CORRECTED Line 332: You never mentioned salinity units before, so why here? Furthermore, salinity has no unit as it is a ratio CORRECTED Line 378: correct "sea surface" with "sea-surface" CORRECTED Line 411: replace "coverage" with "cover" (not the same meaning in English), see also line 465 CORRECTED Lines 417-420: not always. See comments above on the correlation between reconstructions and indexes. CORRECTED Line 420: correct "sea ice" with "sea-ice" CORRECTED Line 421: Correct "positives" with "positive". This statement overstretches the findings. CORRECTED Line 427: replace "normal" with "present-day" CORRECTED Line 429: correct "dinocysts" with "dinocyst" CORRECTED Line 429-431: This statement is not convincingly supported by the data CORRECTED Line 432: correct "sea ice" with "sea-ice" twice in the sentence CORRECTED Line 439: Most authors: be more specific. CORRECTED Line 447: This section is wrong. The reconstructions show an increase of sea-ice cover with decrease of SST at around 1991. Line 452: correct "sea ice" with "sea-ice" (please also check the rest of the text) CORRECTED Lines 453- 456: this statement does not match the record. I find it very confusing. CORRECTED

The short ~1915-1925 period, which is characterized by a negative PDO index, is

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not marked by higher reconstructed SIC, but by a slight decrease in reconstructed values of SSS and SST. With respect to modern values, reconstructed SIC indicate lower values during positive PDO phases ~1900-1910 ; ~1925-1940 and ~1980-1990, but any higher values are observable during the negative period ~1915-1925. Likewise, lower duration of SIC during periods not characterized by up-welling conditions is not systematically observable. During the older period (~1860-1900) the link between reconstructed parameters with the large scale PDO is difficult to establish. Against atmospheric reconstructions (NOAA, ERSST v3, http://www.ncdc.noaa.gov/ersst/ersst_version.php), this period may be synchronous to a slightly negative PDO phase but reconstructed parameters display typical values of positive PDO phases in the SIC, SSS and SST reconstructed conditions and low sea-surface productivity. Therefore, results from transfers functions are not systematically associated with PDO variations along the studied period. The comparison of atmospheric and paleoceanographic reconstructions is thus difficult to interpret and we cannot demonstrate with certainty that the PDO fully controls up-welling conditions and sea-surface parameters in the Mackenzie Shelf area. However, some of the reconstructed sea-surface parameters are synchronous with certain positive phases of the PDO, suggesting the probable effect of wind on sea-surface parameters and productivity at a decadal scale.

Line 457: Positive against what? CORRECTED Line 458: replace “sea ice” with “sea-ice cover” CORRECTED Line 462: correct “sea level” with “sea-level” CORRECTED Line 474: What does “not appears”? CORRECTED 476: Correct “river” with “River” CORRECTED

Figure1: Place your map in a bigger context to show the Pacific Ocean. Show the Mackenzie River. CORRECTED Show the bathymetric scale. CORRECTED Plate 1: what is the scale bar? ADDED

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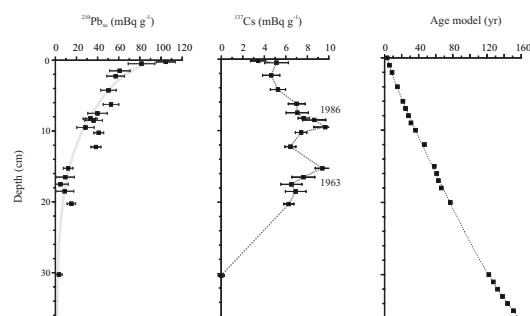


Fig. 1.

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