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Biogeosciences Discussions

# *Interactive comment on* "Spring phytoplankton communities of the Labrador Sea (2005–2014): pigment signatures, photophysiology and elemental ratios" *by* Glaucia M. Fragoso et al.

**Anonymous Referee #3**

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The manuscript "Spring phytoplankton communities of the Labrador Sea (2005-2014): pigments signatures, photophysiology and elemental ratios" present a time series of pigments and nutrients data in the Labrador Sea from 2005 to 2014. The authors use the CHEMTAX method to interpret the pigment dataset in term of phytoplankton groups and then to describe the distribution of these phytoplankton groups. Oceanographic provinces of the Labrador Sea are identified using on physical and biogeochemical parameters as well as phytoplankton diversity. Several statistical approaches based on clustering, ordination plot and regression were used to link the distribution in time and space of the phytoplankton with the environmental parameters. Finally, several physiological parameters related to the phytoplankton communities were measured (PI



curves, POC/PON, POC/POC Chla) or extract from the pigments distribution (AP/Chla, photoprotective pigments). The physiological information is used to go further in the explanation of the link between the phytoplankton community's distribution and the environmental conditions.

General comments:

The introduction is not well structured and full of too heavy and unclear sentence. But, the manuscript goes better in the result and discussion section. The results section is clear with a good choice of graph. Sometimes, it was difficult to get the point of the use of methods and the information that sort from some data. Finally, the discussion put together in a clear way all the information in the results section and brings interesting information to parameters that were of unclear utility in the result section. The authors highlight the specificity of the species and explained their success in the different regions and use well the comparison with the literature. I recommend important change in the introduction to make it more fluent, to better extract the key information and topics of each sub-paragraph. The sentences are generally way too long and confusing. Most of them could be cut in two parts. There are several mistakes on the use of superlative in the results section. The discussion is well conducted and uses interestingly the results

Specific comments by section

Introduction

L51: better to use "structure"

L51: change the order to "functional role in the community"

L 54 to 59: there is some redundancy with the lines 51-53

L59 to 64: Unclear about the conservation or not of the stoichiometry. You said the "stoichiometry is consistent phylogenetically" and latter you mentioned, "they may vary (. . .) phenotypically within species". Be more precise on when the ratios are conserved

or not.

L70 “shelves and the basin”

L75-76: I don’t think the interest to study the phytoplankton is to use it as an index of waters masses since simple parameters as temperature and salinity did a good job. It appears to me more important to highlight the possible importance of the biogeography on the biological pump, carbon export or the energy transfer to upper trophic level.

L78-84: The same idea is repeated. Please reduce the size of the sentence, too much utilization of the conjunction “and”.

L82: could simplify “high-latitude Arctic/Atlantic waters” by “polar waters”.

L100: redundancy with the line 88-90

L93: Please precise the concept of “functional cell size”

L94-95: “assemblage dominance”: wrong, it’s the dominance of phytoplankton groups and not assemblages

L95: remove “however”

L99: remove the comma.

L107: “comprehensively understand” is a pleonasm.

L108-L111: you repeat the same information than the line 106-108.

Methods

There is some confusion on the water composition of the Labrador Sea. Moreover the authors depicted as well deep and shallow currents and water masses. The authors should focus on the surface and sub-surface water-masses and circulation since the pigment dataset presented here concerned only the upper 10m.

L115: “transition zone between the Arctic and. . .”



L115: Newfoundland is not really the southern boundary. The North Atlantic is the southern boundary.

L119: The lower limit of the Greenland Shelf (ie 2500m) sounds very deep to characterize a shelf! I think you characterize the extension of the Greenland Current here.

L122: remove “mostly”

L122: The Irminger current is not the main water masses of the Labrador Basin since this current it is confined on the east and west borders of Labrador Basin at a mid-depth (200-600m). The Labrador Sea Water composes the water of the basin and their characteristics are mainly influenced by the winder convection with the deeper water masses (see the work of Yashayaev et al.).

L123: There is no evidence than the cold fresh after originated from Arctic contribute substantially to the deep basin since the front between the basin and the shelf is very strong. Part of the VITALS program using gliders is actually studying the exchange between the basin and the Labrador Shelf (B. De young, J. Palter et al.).

L134: “Data used in this study”

L134: remove “from stations” and “repeat”.

L146: Choose between “surface” or “near-surface” and stick to it all along the manuscript.

L155: Maybe add the underline word “Back in the laboratory, POC/PON samples . . .”

L171: I think the good way to describe the CHEMTAX output is “relative abundance” instead of “ratios of abundance”

L173: not clear if all the pigments ratios are from the literature.

L174: Please indicate how the algal groups present in the study area are identified.

L187: remove “that”

L190: explain here the purpose of the fourth-root transforamation.

L195: “higher” than what? Be careful to compare with something when you use a superlative.

Results

L277: “less well stratified” . . . “at those stations where”

L278: replace “during” by “in”

L279: “more highly stratify”: pleonasm again. . .

L281: “higher”: then superlative to be compared with something.

L288: Not clear if the “pairwise analysis” you mentioned refer to the ANISOM one-way pairwise?

L289: too long sentence, please reduce or cut in two parts. Parentheses are at the wrong place.

L298: “especially” is useless here. In general, there is an over utilisation of adverbs in the text (mostly/especially. . .).

L313: superlative!! No subject of comparison. . .

L315: superlative again. Wrong use.

L321-324: Too long sentence make it confusing. Separate in two sentences?

L340: The table 4 is difficult to understand and could earn a better presentation.

L345: there is a problem, the title is the same than 3.3 !!

L344-352: Please present the POC-PON relationships somewhere.

L354: Please quickly explain the purpose of calculating the relationships between POCphyto and POC:PON.



L359: I would say, “. . . contribute for a high proportion. . .”

L362: superlative lower (use low or compare to something).

Discussion

L392: as noted earlier in the manuscript, the surface phytoplankton didn’t growth in the Irminger water since this water mass is observed only the slope and at great depth.

L396-397: Here the concept of ecological succession should be better presented. Is the variation between a deep and shallow mixed layer associated to the season or the two conditions (shallow/deep mixed layer) can be observed at the same time of the year?

L401-403: A link is missing between this information and the above sentence.

L406: “often” and “as well” mean the same here. Please remove one of the two.

L470: I would prefer to use the mean POCphyto rather than POC>. . . The latter formulation is not really comparable since we don’t know the dispersion of the data.

L475: were also abundant

L512-519: It should be interesting to explain the meaning of the AP/TChla ratio in term of strategy for the adaptation to light regime.

L522-523: Conufsing because you introduce “two parameters” and after you cite three parameters (Nitrate, Silicate and SI).

L540-552: You show interesting difference in the photophysiological characteristics of phytoplankton, especially between the west and east communities. Near Greenland, the communities is composed of species resistant to high light while on the Labrador Shelf, the species are less resistant to photo-inhibition. Is the light conditions are so different between east and west to explain these different adaptations to light? It could be interesting to describe these difference in the light regimes between the two side of

the Labrador Sea. The latter melting of the ice cover on the Labrador Shelf could be an explanation?

L555 to 558: The sentence is confusing. It takes time for me to understand that dinoflagellates bloom in May to avoid higher light levels. Please rephrase or separate in two sentences to improve the clarity.

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