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Interactive comment on "Pigment signatures of phytoplankton communities in the Beaufort Sea" *by* P. Coupel et al.

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We would like to thank referee 2 for his relevant comments. Referee 2 asks us to provide a threshold value for changes in initial pigments ratios. If the ratios and criteria are well defined on the basis of regional phytoplankton knowledge, reasonable variations of the ratios will not strongly affect the output of CHEMTAX in terms of phytoplankton abundance. We tested the sensitivity of CHEMTAX by multiplying each number of the ratio matrix by a random factor. It appears that by independently and randomly varying the ratios until 35% of their initial values, the final abundance varies by only 2% on average. We suggest that a threshold value of 50% ensures confidence in the CHEMTAX output. By testing the sensitivity of CHEMTAX to the different ratio matrix found in the literature (see figure 3), we understand that the difference in CHEMTAX interpretation

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is mainly due to the choice of pigments attributed to each group. For example, Suzuki et al. (2002) by characterizing the cryptophytes group with only “alloxanthin” obtained a greater contribution of this group compared to other studies in which cryptophytes were characterized by both “alloxanthin” and “chlorophyll c1c2”. In fact, in the second case, the group must satisfy two conditions to be identified. A second important source of discrepancy is to which group the highest ratio of a given pigment is associated. This group will more likely be dominant if the concerned pigment is highly concentrated in the sample. For example, in Not et al. (2005), a higher “fucoxanthin” ratio was attributed to haptophytes (0.676) than to diatoms (0.421) while other studies attributed the higher “fucoxanthin” ratio to diatoms. This choice results in a low contribution of diatoms and a high contribution of haptophytes in Not’s study. Referee 2 asks us to convince him about the usefulness of CHEMTAX. First of all, we will modify the sentence to which the referee associated his remark. Referee 2 also pointed out that too much emphasis was attributed to CHEMTAX as the most accurate method for monitoring phytoplankton populations. Our intention was not to discard other methods; we agree that the use of various measurement techniques increases the accuracy of phytoplankton studies. We modified the introduction and conclusion to highlight the importance of using complementary approaches. Nevertheless, we introduce the pigments and CHEMTAX as a suitable method to provide an overview of phytoplankton populations when accuracy at a species level is not needed. The critical benefits of CHEMTAX for monitoring studies rely in the ability of pigments to characterize small and large phytoplankton equally, while microscopy is effective primarily for large cells. HPLC analysis shows good reproducibility in comparison to microscopy (Hooker et al., 2005) facilitating the detection of year-to-year changes in the communities. Note that CHEMTAX must be seen as a tool to convert pigments into phytoplankton groups. Pigments alone are of limited utility when working on population ecology, diversity and repartition. Finally, referee 2 mentioned that the conditions of clusters 1 and 2 do not seem to be different in table 4 and suggested statistical testing. Because clusters 1 and 2 are clearly different for most of the parameters, I presume that the comment refers to cluster 1 (surf) and cluster 2.

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We performed a Student's test (t-test) to examine if the average conditions are significantly different between the clusters. The t-test highlighted that clusters 1, 2, 3, 4 are significantly different from each other by a minimum of 3 environmental parameters. But, as highlighted by referee 2, cluster 1 (surf) and cluster 2 didn't exhibit significant differences in their environmental conditions (p-value of the t-test was higher than 0.1 for all parameters). Therefore, according to k-means testing these two clusters have significantly different pigment compositions. We suppose that the different community (high diatoms) observed in cluster 1 surface stations could be a remnant of a past event whose specific conditions are no longer visible, possibly an upwelling as previously observed (Comeau et al., 2011; Forest et al., 2014). The manuscript will be modified based on the above discussions. The other specific comments that were raised have been corrected according to the referee's suggestions. As soon as a corrected version of the manuscript is available we will be able to provide a full report of the corrections with their line numbers.

Comeau, A. M., Li, W. K., Tremblay, J. E., Carmack, E. C., and Lovejoy, C.: Arctic Ocean microbial community structure before and after the 2007 record sea ice minimum, PLoS ONE, 6, e27492, 2011.

Forest, A., Coupel, P., Else, B., Nahavandian, S., Lansard, B., Raimbault, P., Papakyriakou, T., Gratton, Y., Fortier, L., and Tremblay, J.-É.: Synoptic evaluation of carbon cycling in the Beaufort Sea during summer: contrasting river inputs, ecosystem metabolism and air–sea CO 2 fluxes, Biogeosciences, 11, 2827-2856, 2014.

Hooker, S. B., Van Heukelem, L., Thomas, C. S., Claustre, H., Ras, J., Barlow, R., Sessions, H., Schlüter, L., Perl, J., and Trees, C.: Second SeaWiFS HPLC Analysis Round-robin Experiment (SeaHARRE-2), National Aeronautics and Space Administration, Goddard Space Flight Center, 2005.

Not, F., Ramon, M., Latasa, M., Marie, D., Colson, C., Eikrem, W., Pedrós-Alió, C., Vaulot, D., and Simon, N.: Late Summer Community Composition and Abundance

of Photosynthetic Picoeukaryotes in Norwegian and Barents Seas, Limnology and Oceanography, 50, 1677-1686, 2005.

Suzuki, K., Minami, C., Liu, H., and Saino, T.: Temporal and spatial patterns of chemotaxonomic algal pigments in the subarctic Pacific and the Bering Sea during the early summer of 1999, Deep Sea Research Part II: Topical Studies in Oceanography, 49, 5685-5704, 2002.

Interactive comment on Biogeosciences Discuss., 11, 14489, 2014.