First of all, thank you for your comments and suggestions that allowed us to greatly improve the quality of the manuscript. We agree with all your comments, and we corrected point by point the manuscript accordingly. Your comments are in bold text and our responses in plain italics. As you proposed, we separated our article in two manuscripts (M1 and M2), which greatly increased the clarity of the scientific message. The separation into two papers facing each other, one on the impact of freshening on primary production and the other focused on the distribution of phytoplankton determined by optical microscopy and HPLC, has conducted to shorter manuscripts where the structure was improve, the objectives tightened, and the number of figures reduced. The problematic of the manuscript 1 has been better defined, by focusing on the impact of one physical parameter related to the melting of ice: the surface freshening (SFL). The manuscript 2 gives more places to the description and interpretation of data from cell counting and pigments. The results of both methods (microscopy and HPLC) are presented in parallel and used as a basis to make a comparative study with previous campaigns in the Arctic. Particular care has been taken to make the figures more clear and legible by increasing their size and by being more consistent in the captions and color codes. Abbreviations, too many in the first draft, were reduced in number and reported in a table (Table 1 in M1) for easy reading. The two manuscripts have been corrected from language mistakes by a native English speaker.

I also did not expect a paper where methods (HPLC and only few counts of filters) are compared so explicitly. The discussion is overloaded with a methodological discussion on CHEMTAX, way too little information is given on species counts.

The comparisons between CHEMTAX and microscopy have been strongly reduced from the manuscript. Instead, we present results of microscopy and pigments and discuss them in the second article (M2). Because of previous publication on the species counts during the same cruise (Joo et al., 2011), more importance was given to the pigments data. However, the pigments (HPLC) and microscopy (taxonomy) are presented in parallel in section 2.2.2. and 2.2.3 of the manuscript 2 in order to increase the accuracy of the description of the phytoplankton communities. Complementarity and differences of both approaches are discussed (section 3.1, M2). In one hand, the microscopy gives a precise count at the species level of the large phytoplankton (diatoms, dinoflagellates) and some nanoplancton. However, the lack of discernible morphologic features in the smaller phytoplankton (pico- nano-size phytoplankton) precludes the identification by light microscopy. In the other hand, the pigments analysis through HPLC is a rapid and suitable tool to analyze hundreds of samples.

Moreover, analysis of photosynthetic pigments can identify taxonomic groups when it is difficult or impractical to identify and count individual cells.

The authors differentiate certain areas with specific ecological features like ice free, covered with ice and so on. However, instead to follow their own classifications of the different regions in the results and discussion parts, one by one, they are jumping back and forth causing confusion to the reader.

To fully understand the spatial variability of the phytoplankton, two classifications must be used: one based on the topography (shelf/basin and east/west over the basins), the second based on the ice conditions (ice-free/MIZ/heavy ice. Efforts have been made to clarify these two classifications and make them less confusing (section 1.1. in M1).

The manuscript presents a considerable amount of data worth being published. However, the manuscript is not so easy to read and not easy to understand, because the authors sometimes use strange English words being not common expressions - I assume. As I am not an English native speaker I cannot help with the corrections.

Sincere apologies for the poor English, we have corrected the grammatical mistakes and have asked an English native speaker to edit entirely both manuscript.

Another point leading to confusion is all the abbreviations the authors are using as well as the introduction of non-common new abbreviations in the manuscript. Some are okay – but not so many, please! I always had to go back in the text to find them. In the discussion it is especially exhausting. Exhausting, in such a way, is the whole manuscript.

The number of abbreviations has been greatly decreased and reported in a table (Table 1 in M1) for easy reading. Some abbreviations have been replaced by more commonly used ones. In both manuscript, AMZ (Active Melting Zone) has been replaced by the MIZ (Marginal Ice Zone) as defined by Carmack and Wassmann (2006).

In this regard, also a third point has to be mentioned: the figures. There are too many of them. In addition, different data sets shown have similar color codes. Although, most of them are nicely drawn with ocean data view, but in total, this is again very confusing to my point of view. Furthermore scales are not always the same. All figures should have captions directly above the graph. I am also afraid the figures are too small to clearly see

details discussed in the text. Too many oceanographic data are shown in great detail.

By splitting our manuscript, the number of figures by article has been reduced. Most of the figures have been modified and reorganized to increase the clarity and to fit with the new focus of both manuscript.

The Manuscript 1 (M1) includes 11 figures and 2 tables:

Figure 2 has been simplified by removing the map 2d. Figures 3b and 3d were replaced by Figure 4. Figure 6 was replaced by Figure 7 in which primary production data have been added. Figure 9 has been removed. Figures 11 and 12 have been simplified and replaced by Figures 10 and 11. Data presented in figures 7 and 8 were strongly modified and displaced in the manuscript 2 (M2).

The Manuscript 2 (M2) also includes 11 figures and 2 tables:

Two figures present the pigments data (Figures 3, 4) and 2 figures allocate to the taxonomy data (Figures 5, 6). One figure is about the comparison between pigments and taxonomy data (Figure 7) and the figures 9, 10 and 11 compare our data with historical data.

The discussion is more a sort of interpretation of the results; too many repetitions and thus boring. The cell counts are mentioned here for the first time, better to write a detailed chapter in results.

The importance given to the cell counts has been greatly increased thanks to the splitting of the manuscript. The second manuscript will give full space to the presentation and discussion of the cell counts and pigments. The discussion has been reformulated to avoid repetitions with the results section. For example, the discussion of M1 is now much more focused on the role of freshening on the phytoplankton production.

More work of other authors, more recent literature should be cited, compares your data with others in the central Arctic Ocean (in one or two tables).

More recent literature has been cited in M1: i) the work of Dr Tremblay's group about the impact of nutrients and light on phytoplankton (Tremblay and Gagnon, 2009) ii) the work of Dr Shimada's group about the circulation of the Pacific Waters into the deep basins (Shimada et al., 2006), and iii) more recent literature about the decrease of ice in the Arctic (Perovich

et al., 2010, Stroeve et al., 2011). Comparison with historical cruise in the Arctic Ocean from two programs: the Arctic Ocean Section (AOS in 1994, Booth and Horner, 1997) and the Shelf-Basin Interaction programs (SBI, 2002-2004, Hill et al., 2005) is provided in the M2 (section 3.2.)

All in all, an interesting data set, but the manuscript should be only published after major revision. The ms could considerably be improved by shorten the text, by focusing on less figures as well as by a stiff structure. Perhaps it makes sense to write two papers out of it.

Considering the splitting in two manuscripts, we decided to follow Referee # 2 as well as Referee # 1's advice. By this way, the structure has been improved and the text has been shortened. Moreover, in splitting, we allow a stronger focus on each manuscript.

Because I recommend a major revision, I do not go into all the tiny little details of the text but few:

-I do not like the expression Western Arctic Ocean, call it central and call the regions by their proper names.

Western Arctic Ocean has been replaced in both manuscripts by "Pacific sector of Arctic Ocean", "Pacific Arctic Ocean" as proposed by Referee #2 and Referee #1. We intend here to mark the distinction between the Western Arctic Ocean connected with the Pacific Ocean through the Bering Strait and the Eastern Arctic Ocean connected to the Atlantic Ocean through the Fram Strait.

-Chlorophyll (a?) values are given in mg m-3; I would prefer µg or ng per liter.

Chlorophyll-a concentrations are given in mg m^{-3} for consistency with the historical publication used for comparison (section 3.1.2. in M1 and section 3.2. in M2).

-Depict more details on figures themselves

Most of the figures have been modified and reorganized to increase their clarity and comprehension.

-Conclusions are too detailed too long, half or 3/4 page is enough

We made efforts to shorten the conclusion and go straight to the main points.

-More information on cell counts is desirable

As mentioned above, the importance given to the cell counts has been greatly increased thanks to the splitting of the manuscript. The second manuscript will give full space to the presentation and discussion of the cell counts and pigments.

We would like to sincerely thank you for your advices and constructive comments.

Sincerely,

Pierre Coupel on behalf of all the authors

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