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Interactive comment on **"Sub meso scale phytoplankton distribution in the north east Atlantic surface waters determined with an automated flow cytometer"** *by* **M. Thyssen et al.**

Anonymous Referee #1

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The authors present a complete dataset of autotrophic pico-, nano- and small microplankton sampled at a high frequency, across different provinces of the NE Atlantic Ocean. Their analysis aimed at explaining both meso and sub-mesoscale spatial and temporal variability of cytometrically-defined phytoplankton clusters, by using a novel cytometer (CytoSub) that considers from small to large cells. Their results give insights into cell cycle dynamics and spatial heterogeneity.

My general comments are that the MS is well written and the approach is novel. The impressive amount of information is treated and analysed by employing appropriate statistical tools that allow the authors to separate from general trends to small scale

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and short-term variability (on an hourly basis). Their conclusions underline the need of carrying out high frequency sampling for understanding spatial heterogeneity and short-term variability, in order to feed phytoplankton distribution models.

Some specific comments concern mainly two issues.

First of all, the authors should be more precise when underlining both temporal and spatial sub-mesoscale features, as sometimes their analysis seem rather confusing. If mesoscale spatial features are revealed by the 24h average values and by the description of a smoothed general trend of variation through the different water masses encountered (Fig. 8), in most of the MS the authors explain changes in cell abundance, FLR and FSW by the short-term variability mainly due to cell cycle. However, even though the MS is focused on the sub-mesoscale spatial distribution of autotrophic cells, only a few spatial heterogeneity at sub-mesoscale is pointed out or discussed so far.

I think the authors should make a clearer distinction between what they consider to be temporal from spatial at sub-mesoscale, in spite of the assumption that both spatial and temporal variability are connected, as it is stated in the discussion and conclusion sections. Moreover, figures describing the variability of hydrological, chemical and cytometric data should be shown either on a spatial or on a temporal axis (i.e. figs. 3 to 7 and fig. 8). The description of one or another feature should be clearly separated as well (i.e. p. 2477, line 17). If the sub-mesoscale spatial variability should be considered to be less important than the temporal variability, then spatial aggregation or dispersion processes might have been underestimated to some extent and should be better addressed in the discussion section.

My second concern would be the definition of cytometric clusters: to what extent may changes in the cytometric signals as FLR and FSW be responsible for the definition of new clusters instead of reflecting physiological changes within a same phytoplankton community? A discussion on this issue would be useful for the interpretation of the

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authors' results. As some changes are inferred by the authors to reflect "phenotypic changes"...are the authors also considering "composition changes"?

I would also like to point out the fact that nor hydrological neither chemical data seemed to be included in the sub-mesoscale variability analysis. These analysis would probably allowed to give insights into the causes of clusters' spatial and temporal variability, at sub-mesoscale.

Some detailed issues are reported below:

-at least 10 citations are not reported in the "References" section

-p. 2474, line 23: could you precise the nature of the pump employed and the "non toxic seawater supply"?

-p. 2475, line 4: Wasn't the Cytosub designed to analyze cells within the range from sub-micrometric particles ($<1\mu$m) to microplankton (up to 1000 μm)?

-p. 2478, lines 10, 12, 16: "μm"; should be replaced by "μM";

-p. 2479, lines 13-15: reference should be made to figures 6 & 7 when describing FWS & FLR variability. The decrease in FLR for cluster C2 is not as obvious when looking at fig. 6.

-p. 2480, lines 26-27: the stability of FLR average values is not clear when compared to the variability of FWS (that is supposed to increase along the transect, Figs. 6 & 7).

-p. 2482, line 7: "μm"; should be replaced by "μM";

-p. 2485, lines 3-6: is there any correlation between nutrients and C1 abundance supporting this hypothesis?

-p. 2485, line 29 & p. 2486, line 30: when talking about water masses, the authors compare spatial and temporal features: shouldn't it be all referred to spatial or temporal features instead?

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-p. 2487, line 29 & p. 2488, line 1: the assumption on the identity of C6 is made only on their abundance? Or on their cytometric signature as well?

Interactive comment on Biogeosciences Discuss., 5, 2471, 2008.

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