

## ***Interactive comment on “Parameterization of vertical chlorophyll $a$ in the Arctic Ocean: impact of the subsurface chlorophyll maximum on regional, seasonal and annual primary production estimates” by M. Ardyna et al.***

**Anonymous Referee #2**

Received and published: 26 March 2013

### General comments

Ardyna et al. parameterized a number of chl.a profiles covering whole Arctic Ocean and seasons. They also investigated the effect of the SCM on primary production estimates in the Arctic Ocean. Many studies using satellite derived primary production had to use homogeneous profiles of chl.a, though the impact of SCM was anticipated. This study may offer them a nice solution and an advance in understanding of productivity in the Arctic Ocean is expected. Thus, this paper is important and within the scope of Biogeosciences. However, I have several questions and recommendation:

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1. When errors in primary production estimation were investigated, authors used modeled chl.a. The chl.a modeling uses parameters of each category, but large deviation around clear SCM was shown. Is this affect estimation error in post-bloom PP? Could you show the error in modeled chl.a profile and impact on PP estimation?
2. Sensitivity analysis of PP models (3.3) is confusing. I guess that authors should compare modeled PP with in situ PP (as Fig. A1) between homogeneous chl.a profile and presence of SCM. Percent change in Table 6 is probably difference between modeled values with SCM and those without SCM.
3. As shown in Fig. A1, most of the derived PP is within a factor of two. It means that errors in PP estimation is +100% and -50%. Is it possible to reduce this error if SCM is considered in PP model?
4. Pleas discuss about estimation errors in chl.a concentration due to CDOM and NAP
5. If possible, please write results and discussion separately.

### Specific comments:

p.1350 line 17: Did you carry out any quality check or validation on chl.a concentration itself between methods (acidification and non-acidification, HPLC, and so on)?

p.1351 line 3: Is data during the Arctic winter needed for analysis? Because the chl.a in winter is impossible to detect from satellite.

p.1351 line 17: What is the chl.a normalized with? If you put equation (2) just below equation (1), this is easy to understand.

p.1353 line 16: You separated time periods by month and called pre- and post-bloom. Is this meaning that phytoplankton bloom between April and May?

Table 6: "The contribution of the different periods...." Is this "Contribution of SCM" (p. 1364 line 24) ?

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Could you show a flow chart to derive vertical profile of chl.a?

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Interactive comment on Biogeosciences Discuss., 10, 1345, 2013.

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