

Interactive comment on “Monthly measured primary and new productivities in the Ulleung Basin as a biological “hot spot” in the East/Japan Sea” by J. H. Kwak et al.

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Received and published: 4 May 2013

Dear Editor and Reviewer,

Thank you very much for reviewing our manuscript. We have tried to revise the manuscript in line with the suggestions made by the reviewers. Our response to each point suggested by the second reviewer is as follows.

Reviewer #2

General comments

There was a significant increase in Chlorophyll a biomass in your results, which is
C1498

also confirmed from MODIS image (Figure 1). That's the autumn bloom, a typical phenomenon in temperate water. There usually has a coinstantaneous production peak, which is coupled with the growth of phytoplankton, but surprisingly not in your result. Sometimes, the low production rate in this period might be due to the fluctuation (especially the sunlight) or inter-annual variation. You should be careful when you talk about the big picture, which depends on the data you got (only once a month, and no data in October 2010).

→ The general comments are indicated as specific comments below. Accordingly, we have tried to revise carefully all the points suggested by the reviewer.

Specific comment

1. My suggestion is that you should discuss why you got a low production rate but the autumn bloom occurred.

→ It is not easy to understand the mismatch between chlorophyll a concentration and primary productivity. Variation of surface chlorophyll a concentration determined by HPLC technique was similar to average concentration of MODIS chlorophyll (Fig. 1). At the surface, chlorophyll a concentration significantly increased in September compared to that in August. However, the subsurface chlorophyll maximum (SCM) layer was observed between 30 and 40 m depth in the study area normally from May to October in the study area (Rho et al., 2012, Ocean Polar Res. 34:413-430). Due to the existence of the SCM which largely contributed to the total chlorophyll a concentration, depth-integrated values of chlorophyll a concentration did not show any significant difference from August to September (Student-t test, $P = 0.619$) although surface chlorophyll a concentration significantly increased. In addition, maximal primary productivity in summer was also observed at the subsurface layer near nitracline or the SCM depth, showing relatively high abundance of diatoms.

According to the reviewer's suggestion, we have inserted discussion of this matter in the revised ms, and surface chlorophyll a concentration in Fig. 2 (Figure 6 in the revised

ms) as follows:

“The uncoupling event between phytoplankton biomass and primary productivity was observed in September in this present study (Fig. 6, and 8). Surface chlorophyll a concentration was increased from August to September along with enhancement of the nitrate availability reflected by increase of new productivity and f-ratio (Fig. 4, 6, and 8). However, primary productivity integrated from the euphotic depth did not increase between the periods. The mismatch could be explained mainly the existence of subsurface chlorophyll maximum (SCM) layer observed normally from May to October in the study region (Rho et al., 2012). Because the chlorophyll a concentration at the SCM layer largely contributed to the total chlorophyll a concentration (up to 87.5% in August), no significant difference was observed in integrated chlorophyll a concentration between August and September (Student-t test, $P = 0.619$), although surface chlorophyll a concentration significantly increased. In addition, maximal primary productivity in summer was also observed at the subsurface layer near nitracline or the SCM depth and not much changed from August to September (Fig. 4, 5, and 7).”

Interactive comment on Biogeosciences Discuss., 10, 2127, 2013.

C1500

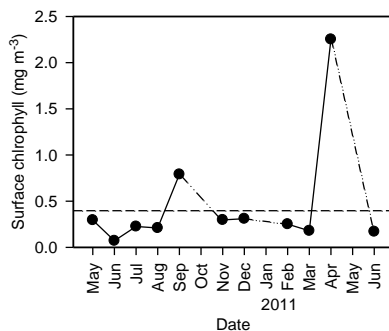


Fig. 1. Average concentration of surface chlorophyll a in the study. (Dashed line represents the mean value of surface chlorophyll a concentration).

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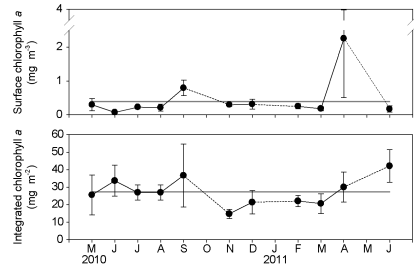


Fig. 2. "Figure 6. Annual variations of surface and integrated chlorophyll a concentration in the Ulleung Basin during our study period. Gray line represents an average of each values."