Biogeosciences Discuss., 8, C2249–C2251, 2011
www.biogeosciences-discuss.net/8/C2249/2011/

Biogeosciences Discussions

Interactive comment on "Climate dependent diatom production is preserved in biogenic Si isotope signatures" *by* X. Sun et al.

Anonymous Referee #2

Received and published: 30 July 2011

This paper examines an application of a method based on Si isotope analyses of diatoms derived from a Gulf of Bothnia sediment core to reconstruct diatom production during the last two hundred years. The focus is a relation between the Si isotope and air temperature variations. Furthermore, the Si isotope values seem to be influenced by anthropogenic activities such as the damming of rivers. This is an interesting paper that is in general clearly written and well-laid out. I recommend the paper for publication in Biogeosciences after some revisions.

Overall comments for the revisions are as follows.

1. It would be better to describe advantages of this method (Si isotope analyses) over the previous studies. For example, in the previous studies, lacustrine BSi flux was also used to reconstruct air temperature. Is the estimate of air temperature from the Si

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

isotope more accurate than that from BSi flux?

2. I think that the Bothnia Bay would be a suitable place to examine this method and ideas. It would be useful to discuss the application of this method to other oceans. In Abstract, you mentioned that this method can be applied to other diatom dominated aquatic systems. But, I couldn't find such a discussion in the text.

3. You assumed that the increase of air temperature (between May - September) melted the sea ice, resulting in the enhanced light availability in the water column. Therefore, the diatom production could increase. But I think winter cooling (or air temperature during winter) and annual wind patterns, as well as air temperature during summer, could contribute to summer sea ice distributions. Probably, we need evidence to agree with your assumption. In addition, you also mentioned that the cold temperatures likely limited diatom production by preventing the formation of stratified water column. Please show a threshold value of the stratification or air temperature that limited the diatom production. Which is the determinant factor for the diatom production, light availability or water column stratification?

4. The value of δ30Si increased after 1950 (Fig. 4b), which was explained by the increased diatom production caused by anthropogenic nutrient enrichment and the increase of δ30Si river input. Please add a quantitative discussion of their contributions to the increase of δ30Si.

Other specific comments are as follows.

Page 3773, Line11: What are the ongoing environmental changes?

Page 3773, Line 17: Please define DSi here.

Page 3777, Line 18: Not 4M Cl, but 4M HCl.

Page 3778, Line 26: I can't understand the reason why changes in detritus sedimentation rate were minor in comparison to diatom flux. Can you show the data that the diatom flux was larger than the detritus sedimentation rate?

BGD

8, C2249–C2251, 2011

Page 3779, Line 11: Do you mean low nutrient at the bottom? That is, low remineralization at the bottom?

Page 3780, Lines 1, 4, 9: Not Eq. 2, but Eq. 3.

Page 3782, Lines 5, 10, 12, 13: Not Eq. 3, but Eq. 4.

Page 3782, Line 9: Eq. (4) was derived from the data between 1896 and 1955. However, you compared the f values calculated from Eq. (4) with that obtained from the field observations between 1980 and 2000. Can Eq. (4) be extended to the years after 1955?

Interactive comment on Biogeosciences Discuss., 8, 3771, 2011.