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Biogeosciences Discussions

Interactive comment on "Seasonality of CO_2 in coastal oceans altered by increasing anthropogenic nutrient delivery from large rivers: evidence from the Changjiang-East China Sea system" *by* W.-C. Chou et al.

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The comment by Zhai used two other datasets published by Zhang et al. (1997) and Zhang et al. (1999) to purport that the dataset presented by Tsunogai et al. (1999) may not be representative for the seasonality of pCO2 on the ECS shelf in the 1990s. We regret that his comment is a misunderstanding of the essence of our work for the following reasons:

(1)Zhai questioned the representativeness of Tsunogai's work for the early 1990s con-

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ditions by bringing out two other publications (Zhang et al., 1997 and Zhang et al., 1999), which have only limited access by the scientific community due to the language barrier. We reiterate that Tsunogai et al.'s (1999) work has been extensively recognized as the earliest and the most comprehensive pCO2 surveys in the ECS in the early 1990s (total citation number is 172 according to Web of Science). Therefore, we strongly believe that it is more justified to use Tsunogai et al.'s dataset to do the comparison in this area.

(2)Zhai argued that "in temperate oceans, seasonal cycles of phytoplankton production are characterized by spring and autumn blooms (Lalli and Parsons, 1997). Generally the autumn blooms are weaker than the spring blooms. Therefore, both high pCO2 and low pCO2 can be observed in most autumns in the inner shelf area of the temperate ECS". This argument contradicts the well-studied seasonal variation of primary production in the ECS (Gong et al., 2003), which shows that phytoplankton bloom occurred only in summer in the ECS due to the favorable conditions (i.e. high availability of light and nutrients and warm temperature).

(3)While we have identified the major reason for the observed difference between the 1990s and 2000s, we do not intend to exclude other factors. In fact, in our BGD paper (Page 19007 Line 6-11), we clearly pointed out that "Although increased eutrophication/respiration could well explain the observed decadal change in the seasonal variation of pCO2sw, other processes such as alteration of circulation or the Changjiang discharge may also change the seasonal variation of pCO2sw. Therefore, more long-term studies are needed to unveil the fundamental relationship between changes in oceanic CO2 uptake and increased eutrophication and hypoxia in the ECS, and in other eutrophication-impacted coastal seas as well". Additionally, as mentioned by Anonymous Referee #2 "The data appear sound and the interpretation robust. Their interpretation for the historical data does not seem far-fetched either. I believe this paper will contribute to advancement of our understanding of carbon cycling in coastal-shelf systems." and by Anonymous Referee #3 "their inclusion justified, and the conclusions

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drawn from the results of the study are appropriate.", we believe, thus, that this work will contribute to our understanding on global carbon cycle, and will stimulate more research efforts on the study of the anthropogenic impacts on the carbon cycling in coastal-shelf systems. On the other hand, comments made by Zhai are beneficial for the community to further discuss the relevant issues and have a better understanding of what controls the carbon cycling and CO2 flux in the ECS region as well as the implications for other regions.

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