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Biogeosciences Discussions

Interactive comment on "Coupling of surface pCO_2 and dissolved oxygen in the northern South China Sea: impacts of contrasting coastal processes" *by* W. Zhai et al.

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Response to Review #3 (by Joe Salisbury)

In our paper we examined the relationship between CO_2 partial pressure (pCO_2) and dissolved oxygen (DO) based on a cruise conducted in July 2004 to the northern South China Sea, spanning from estuarine plume, coastal upwelling and deep basin areas. Distinct relationships between pCO_2 and DO saturation were identified in different regimes. This study reveals that a combination of high-resolution CO_2 and O_2 measurements may provide valuable information regarding net metabolic status in marine ecosystems under different physical and biogeochemical conditions. We have demon-

strated a simple procedure to evaluate the community metabolic status based on these surface pCO_2 and DO measurements, which may have applicability in other coastal systems with a large gradient of changes in their physical and biogeochemical conditions.

We fully agree with the reviewer that the specific results generated from this study are by no means general. We therefore have stated in the revised MS such limitation of the study. We emphasized that this study has provided an example that a combination of high-resolution CO_2 and O_2 measurements may provide valuable information relating to metabolic status in marine ecosystems.

The reviewer questioned us why not to use DIC instead of CO_2. We believe that it is advantageous to use pCO_2 because pCO_2 observations are far more prevalent than DIC, and therefore we contend that the use of the Revelle Factor to relate pCO_2 to DO, rather than the more direct DIC relationship, stands as a potentially very useful approach.

Based on the conservative mixing line of the carbonate system in the northern SCS, as summarized in Dai et al. (2008), the maximum possible Revelle factor value can be estimated as 11 at salinity $\sim$30, while the general surface-water Revelle factor in the oligotrophic basin area is about 9 (Tseng et al., 2007). Such a range of Revelle factor only leads to a small difference for the photosynthesis-respiration-dominant line of NpCO_2 - excess O_2 (Fig. 5a in the original MS).

The reviewer criticized one of our figures was difficult to follow. We have modified the MS based on the reviewer's suggestion.

The reviewer also questioned us about the methodology of chlorophyll-a. Discretely sampling data of surface chl-a concentrations were from Huang et al. (2008). According to Huang et al. (2008), chl-a was determined by fluorescence analysis of a 300-1000 mL seawater sample, depending on the chl-a concentration, and in vitro measurements were conducted using a Shimadzu (RF-5301PC) fluorospectrometer

with the excitation and emission wavelengths set at 430 and 670 nm, respectively. As for the chlorophyll concentration versus rates of productivity, we accept the reviewer's suggestion and have added the acknowledgement to clarify our assumption about the use chlorophyll data to make implications about biological perturbations of DIC.

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Interactive comment on Biogeosciences Discuss., 6, 6249, 2009.