Biogeosciences Discuss., 7, C3375–C3377, 2010
www.biogeosciences-discuss.net/7/C3375/2010/

Biogeosciences Discussions

Interactive comment on "Influence of seasonal monsoons on net primary production and CO_2 in subtropical Hong Kong coastal waters" *by* X. C. Yuan et al.

X. C. Yuan et al.

xcyuan@scsio.ac.cn

Received and published: 20 October 2010

RC: This manuscript covers a very small area of Hong Kong, discusses upwelling phenomenon which is well known, and relies on suspect data. There are a lot of good data in waters near Hong Kong. The authors should combine and discuss their data together with the much larger data sets in the context of the larger geographic domain. Related papers in the neighborhood should also be mentioned, if not discussed.

Response: We added more discussion with the much larger data sets in the context of the larger geographic domain (See discussion section). Although our study focuses on a relatively small area, it contains several contrasting environments in terms of hy-

drodynamics which help us to understand the mechanism of the relationship between trophic state and CO2 source or sink. While our study focuses on a relative small area around H.K., we emphasize that our purpose is to discuss how monsoon induced physical processes (upwelling and downwelling) affect biological production/respiration and these would affect O2 and CO2 dynamics. It is NOT our intention to report regional air-sea CO2 flux or Pearl River estuarine processes. Our paper is unique in reporting the relationship between biological properties and CO2 properties and is very different from other papers reporting mainly CO2 dynamics (i.e., those from M Dai and coworkers).

RC: Having said the above, however, I do not think the manuscript publishable mainly because I have serious doubts about the quality of the data. For one thing, the seawater pCO2 was calculated based on pH and DIC. Yet, it is not even certain which pH scale the authors chose to use. The precision of pH measurements is also very poor. Further, the authors did not measure the CO2 concentration in the air and chose a value of 370uatm for the calculation of CO2 ïňĆuxes. This value is almost certainly too low as values near 440uatm have been measured in cruises near Hong Kong. Most of the stations sampled are in the harbour with heavy trafïňĄc in a city with six million people, thus the CO2 concentration in the atmosphere must be high and variable. Without such data the CO2 ïňĆux can not be calculated.

Response: Our pH measurements were based on the NBS scale and have a precision about 0.01 units. We added this information to the method. Insufficient of information regarding pH measurements should not be a reason to conclude that "The precision of pH measurements is also very poor." In addition, whether a set of measurements is sufficient depends on the purposes of the issue to be addressed. The precision of pH measurements is enough for our purpose. The 0.01 pH error will result in the uncertainties of $\pm$3% pCO2 (ca. 15 $\pm$ 6 μatm CO2) and $\pm$10% CO2 fluxes (ca. 3 $\pm$ 2 mmol C m-2 d-1), which does not considerably affect our conclusion due to high pCO2 in Hong Kong waters. Incorporating the reviewer's concern, we now added a

discussion on the uncertainty of unknown atmospheric pCO2 value: The atmospheric pCO2 has been reported to be in the range of 349 to 372 μatm in inner shelf/coastal areas adjacent to the Pearl River plume (Zhai et al., 2005), and $\sim$358 μatm in offshore waters (Zhai et al., 2009). Since our sampling sites are very close to a mega city (Hong Kong), the land mass influence may result in higher atmospheric pCO2, especially in the dry season when northeast winds were dominant. A large range of the atmospheric pCO2 (349 to 460 μatm, and averaged 400 μatm) was reported in Randers Fjord, Scheldt, and Thames (Borges et al. 2004), where sampling sites were also close to anthropogenic influences. The average atmospheric pCO2 (400 μatm) is used for the calculation of the air-sea flux of CO2 in our studies. The variations in atmospheric pCO2 (349 to 460 μatm) would quantitatively result in the estimates of average CO2 effluxes (-20 mmol C m-2 d-1) varying from -12 to -25 mmol C m-2 d-1 in Hong Kong waters.

Interactive comment on Biogeosciences Discuss., 7, 5621, 2010.