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Interactive comment on “Coupling of surface $p\text{CO}_2$ and dissolved oxygen in the northern South China Sea: impacts of contrasting coastal processes” by W. Zhai et al.

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The paper presents some interesting information from a single cruise studying the dynamics of the CO_2 cycle from an important area of the world from which more data is required if global budgets are to become more reliable. It presents a snap shot of a complex environment and more attempt should made to put it into the context of the annual cycle of change in the region.

Points

Abstract

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The abstract is not sufficiently quantitative. It should include the latitudes and longitudes of the area studied. The range of concentrations and fluxes encountered should be summarised.

Introduction

This should set the area into its global context in terms of scale. The conditions during the limited period of sampling should be considered compared to the expected annual cycle.

Materials and Methods Study area.

This should be separated from the description and of the transects. It should follow on from the introduction and introduce the areas studied more clearly. What is expected to happen in each area and how does it change through the year, should be clearly annunciated - which areas are dominated by changing rates of advection, which by the annual cycle in productivity, which by the annual cycle in temperature.

Note: The use of the single word metabolism is confusing - mostly when it is used, it is either referring to primary production or respiration, which are two opposed processes. The appropriate one should be used. The other use of "metabolism" would be to identify the trophic balance in the system i.e. is the system net hetro or auto trophic. The ideas in this paper move towards this concept but don't clearly express it. (see e.g. Smith, S. V., and J. T. Hollibaugh (1993), Coastal Metabolism and the Oceanic Organic Carbon Balance, Rev. Geophys., 31(1), 75–89.)

Survey transects

On what basis were the survey transects chosen?

A better map of the region should be provided. Why is the 70m contour used in the review of the data when it not marked on the map? The map should show the extent of the Pearl river plume, the region of up welling and the likely direction of currents though the area.

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The use of an oxygen excess of 2.5 % should be thought about again. It is likely to be variable quantity. It was set at 2.5% in the Baltic because Stigebrandt (1991) believed the Baltic to be in trophic balance. 2.5% was the level of bubble saturation required to achieve a balance in the data in the Baltic, but not necessarily elsewhere.

Data overview

More use of mapping should be used to display the data. It is difficult to see the relationship between the different transects presented as isolated profiles in figure 2. I would suggest that each of the continuously measured underway data sets is mapped in the same way as the chlorophyll data in figure 1. Contour lines should then be added to indicate the likely 2 D links or absence of them across the transects. This would give the reader a better appreciation of the physical context and variation in the data.

Data analysis

Results

I would like to see this done in a more structured way. The results should be considered for each area in turn. The different processes should be effectively be tabulated for each area.

Discussion

Once the processes have been quantified and tabulated in each area the scales can then be compared. This needs to be set in the context of the time scales of the different processes. It is acknowledged that oxygen and CO₂ transfer across the air sea interface occurs at different rates but in the present discussion it's not clear that this being adequately taken into account.

Finally for each area the authors should try and say what fraction of the annual cycle their data represents.

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