

Interactive comment on “Air-sea CO₂ fluxes in the East China Sea based on multiple-year underway observations” by X. Guo et al.

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Response to Referee #3

The paper by Guo et al., aims at estimating the air-sea CO₂ fluxes in the East China Seas based on 24 cruises carried out between 2006 and 2011. Given the heterogeneity of the area, the authors chose to separate the ECS in 5 domains to compute the air-sea CO₂ fluxes and discuss the main drivers of their variability in each region. I think the paper is generally well written, based on a comprehensive dataset and that the choice of the 5 domains is relevant. I have only minor comments listed below. The page and line numbers below correspond to the printer-friendly version of the manuscript.

[Response] [We thank the positive comments of the reviewer.](#)

P5125, line 16: Give a reference for this statement.

[Response] [Accepted and revised as suggested.](#)

P5126, line 7: Use the past in this sentence: Tseng et al., 2011 investigated: : ;

[Response] [Accepted and revised as suggested.](#)

P5127, lines 5 to 8: Do not end your introduction by the main results of the paper, rather, make a brief introduction of the content of the paper.

[Response] [Accepted and revised as suggested.](#)

P5129, section 3.1: Indicate accuracies of the 2 pCO₂ instruments used.

[Response] Accepted and revised as suggested.

P5132, lines 18 to 20: Rephrase sentence, unclear.

[Response] Accepted and revised. Initially, we intended to present the seasonal average SSS, which was however a repetition and thus was deleted in our revised MS.

P5142, lines 19 to 24: Rephrase to facilitate the comparison of the fluxes with or without the October 2006 cruise.

[Response] Accepted and revised as suggested:

“If this survey was included into the flux estimation, the seasonal average CO₂ source in Domain I in fall would be 1.2 ± 6.4 mmol m⁻² d⁻¹. This CO₂ source was ~ 54% of the average of the other fall cruises in Domain I. However, inclusion of the October 2006 survey into the fall category would result in an annual CO₂ flux of -7.1 ± 3.9 mmol m⁻² d⁻¹, which is not significantly different from the estimate of -6.9 ± 4.0 mmol m⁻² d⁻¹ excluding the October 2006 cruise. This was because we had multiple cruise observations in fall and the fall bloom was only observed in a very small area of the ECS”

Section 5.2: The main goal of this section is to discuss the intra-seasonal variability and how very specific events or cruises can impact the air-sea fluxes budgets annually. This discussion stays very focus on the ECS, it would be relevant to add some general recommendations on how to tackle this issue and take into account these special events in global estimates of air-sea CO₂ fluxes in marginal seas.

[Response] Accepted and revised as suggested. We stated in the revised MS that it remains difficult to fully resolve the intra-seasonal variations in dynamic shelf seas, in particularly in areas such as Domains I and II. High-frequency observations in the seasons and/or locations with largest variability and/or with poor understanding to the mechanisms controlling *p*CO₂ are clearly needed to reduce the error from undersampling so as to further improve the estimates of CO₂ fluxes.

Section 6. Conclusion: The authors come out with a new estimate of $-6.9 (\pm 4.0)$ mmol m⁻² d⁻¹ for the CO₂ sink of the entire ECS compared to the previous estimates of Tseng et

al., 2011 and 2014. Could they also provide some comparison with the export of carbon from the shelf or to the seafloor?

[Response] We appreciate the suggestion from the reviewer. However, we believe that it is premature to do such comparison because of the lack of data in export fluxes and accurate estimates of carbon burials.

Figures: Figures are generally clear and relevant, only Figure 9 needs some reprocessing for clarity: alignment and frame lines.

Accepted and revised as suggested.

Tables:

Tables 3 to 7: Do not use decimals for $p\text{CO}_2$, $\Delta p\text{CO}_2$ and SD, as it is related to the accuracies of your $p\text{CO}_2$ instruments (see above). For clarity of the table, give only 1 decimal for SST and FCO_2 as in table 8.

Accepted and revised as suggested.