

Interactive comment on “Review article “Air-sea exchanges of CO₂ in world’s coastal seas”” by C.-T. A. Chen et al.

C.-T. A. Chen et al.

ctchen@mail.nsysu.edu.tw

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[We appreciated the through and constructive comments which helped strengthening the manuscript.](#)

This is a nice synthesis. A persistent problem with evaluating biogas fluxes is the lack of temporal rather than spatial coverage. Such information is often more useful for model validation than spatial coverage. Previous studies have demonstrated short term changes in pCO_2 at scales of days or less (see references below). Yet, typically our understanding of this variability is limited to a few research cruises. I feel it is worth discussing this source of uncertainty. References:

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*Bozec, Y., Merlivat, L., Baudoux, A.-C., Beaumont, L., Blain, S., Bucciarelli, E., Danguy, T., Grosstefan, E., Guillot, A., Guillou, J., Répécaud, M., Tréguer, P., 2011. Diurnal to inter-annual dynamics of pCO_2 recorded by a CARIOCA sensor in a temperate coastal ecosystem (2003 – 2009). *Marine Chemistry* 126, 13-26.*

*Dai, M., Lu, Z., Zhai, W., Chen, B., Cao, Z., Zhou, K., Cai, W.-J., Chen, C.-T.A., 2009. Diurnal variations of surface seawater pCO_2 in contrasting coastal environments. *Limnology and Oceanography* 54, 735-745.*

*Kitidis, V., Hardman-Mountford, N.J., Litt, E., Brown, I., Cummings, D., Hartman, S., Hydes, D., Fishwick, J.R., Harris, C., Martinez-Vicente, V., Woodward, E.M.S., Smyth, T.J., 2012. Seasonal dynamics of the carbonate system in the Western English Channel. *Continental Shelf Research* 42, 30-40.*

Reply: The comment raised an important issue which deserves discussion although not much information is available. We have added the following in the section on “Air-sea CO₂ Exchanges in Estuaries”:

Numerical data are gathered for 165 estuaries (Table 1), of which 99 are from literature. Unpublished data from 50 estuaries and 16 from data banks are also included, and the Wanninkhof (1992) quadratic equation is used to determine the flux. The method used to calculate the flux, as well as sources of the gas exchange coefficient and wind speed are listed in Table 2. Of note is that using different pCO_2 flux method and gas transfer velocity causes disparity in flux estimations (Borges et al., 2004; Ferron et al., 2007; Jiang et al., 2008a; Zappa et al., 2007). However, there is still not a consensus on the most suitable coefficient to use in estuaries. Factors affecting gas exchange coefficients include wind speed, tidal current and bottom stress, whereas the wind speed is the most con-

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sidered. It is important to point out that this paper deals mostly with published results. It is not possible to re-do the flux calculations, say, based on the same gas exchange coefficient, as the original data were not provided in the papers cited. Further, there is a lack of temporal coverage as previous studies (Bozec et al., 2011; Dai et al., 2009; Kitidis et al., 2012) have demonstrated short term changes in pCO_2 at scales of days or less. Yet, typically data on such a scale are limited to only a few cruises. The lack of seasonality in the numerically averaged fluxes is almost certainly an artefact influenced by averaging all available data.

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