

Interactive comment on “Net sea-air CO₂ flux uncertainties in the Bay of Biscay based on the choice of wind speed products and gas transfer parameterizations” by P. Otero et al.

P. Otero et al.

pablo.otero@co.ieo.es

Received and published: 26 October 2012

First at all, we are grateful for your review and we appreciate your reading of the manuscript. You state that this manuscript is not suitable for publication in Biogeosciences, mainly “due to this incompleteness, and numerous publications detailing flux uncertainties based on K parameterization and wind speed products”. Many aspects about the referred “incompleteness” can be easily corrected, because they have been taken into account during the study, although maybe they have not been enough clarified in the text. We agree with the referee that there are several publications related to k-U uncertainties, but at our knowledge, there is not study dealing about this topic in

C5212

the Bay of Biscay region, an important and large area of the Atlantic European coastal and ocean waters. The present analysis could form a good accompaniment to previous studies examining CO₂ fluxes.

You have some disappointments that we will try to reply following the same scheme presented in your review:

1) The uncertainty of the sea surface pCO₂ measurements is not referred in the text, but it will be included in the revision. In Padin et al. (2008) "...The comparison between the in situ and the computed fCO₂sw from pH and AT using the carbonic system constants of Lueker et al. (2000), showed a consistence error of 7.6 μ atm (n = 365, r₂ = 0.91)."

2) All models are interpolated to the location of the vessel in the same way (cubically), and hence, the estimation of the uncertainty due to the choice of the interpolation technique is not relevant for this study.

3) The accuracy of the observations at buoys QuikSCAT is ± 0.3 m/s and ± 2 m/s, respectively. The error associated with models must be evaluated in comparison with observations. This is what is done in Table 1 (we show both the mean and the standard deviation of the difference) and Figure 2 (rms, r and $\bar{\Delta}$).

4) Details of atmospheric pCO₂ sources shown in Padin et al. (2008) are included in the manuscript, namely, "20 xCO₂atm observations were recorded and averaged every 5 minute in order to homogenize the dataset. A selection criterion was applied to eliminate spurious values and to identify xCO₂atm representative data, and fitted to a seasonal curve following Padin et al. (2007)."

5) The separation of both seasons (upwelling and downwelling) has been performed due to the noticeable impact that both scenarios have on the biogeochemical cycles. We agree with the reviewer that the inclusion of FCO₂ during both season should be also included to be consistent.

C5213

Some general points:

- The time period is restricted to the Sep 2002 to Sep 2003 because is the time period of our dataset.
- CCMP has been included. See table attached as supplementary material to this response as an advance to the computations that are being included in the revision and also the new Figure 2.
- As mentioned in the manuscript, atmospheric pCO₂ measurements were obtained as described in de la Paz et al. (2010). Atmospheric xCO₂ values were measured every hour by recording 20 observations within 5'. Subsequently, spurious data were eliminated. These data were fitted to a seasonal curve following Padín et al. (2007).
- Following your suggestion, data will be presented in a Table.
- Interpolation is done "bicubically", which is an extension of cubic interpolation performed over a regular 2D grid (models). The interpolation is accomplished using cubic splines, which results in a "smoother" value than using simple linear interpolation or nearest-neighbor interpolation.

Minor points (all of them are accepted and will be corrected):

- The time period will be mentioned in the abstract.
- Projects financing that work will be clearly mentioned in the manuscript.
- A mention to bubble formation will be done in the text.
- An explanation of ECO cruises will be included.
- The height-adjustment process will be clarified.
- English will be carefully checked to avoid misinterpretations.

References:

C5214

de la Paz, M., Padín, X. A., Ríos, A. F., and Pérez, F. F.: Surface fCO₂ variability in the Loire plume and adjacent shelf waters: High spatio-temporal resolution study using ships of opportunity, *Marine Chemistry*, 118, 108-118, 2010.

Lueker, T. J., Dickson, A. G., and Keeling, C. D.: Ocean pCO₂ calculated from dissolved inorganic carbon, alkalinity, and equations for K₁ and K₂: validation based on laboratory measurements of CO₂ in gas and seawater at equilibrium, *Marine Chemistry*, 70, 105-119, 2000.

Padín, X.A., M. Vázquez-Rodríguez, A.F. Ríos, F.F. Pérez. 2007. Atmospheric CO₂ measurements and error analysis on seasonal air-sea CO₂ fluxes in the Bay of Biscay. *Journal of Marine Systems*, 66, 285-296.

Padín, X. A., Castro, C. G., Ríos, A. F., and Pérez, F. F. 2008. fCO₂sw variability in the Bay of Biscay during ECO cruises, *Cont Shelf Res*, 28, 904-914.

Please also note the supplement to this comment:

<http://www.biogeosciences-discuss.net/9/C5212/2012/bgd-9-C5212-2012-supplement.pdf>

Interactive comment on Biogeosciences Discuss., 9, 9993, 2012.

C5215

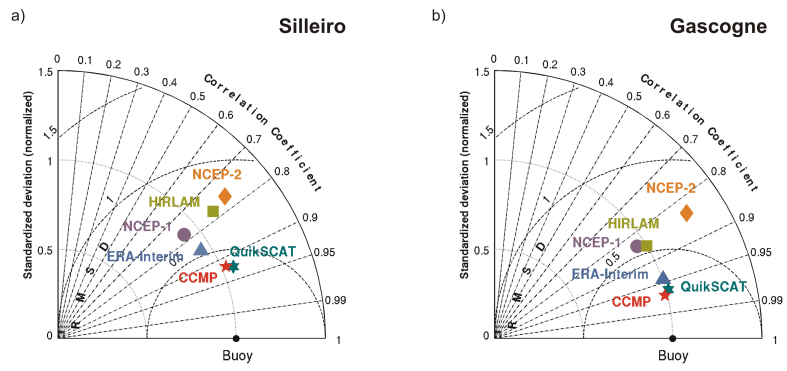


Fig. 1. New Figure 2