

***Interactive comment on “A model study on the sensitivity of surface ocean CO<sub>2</sub> pressure with respect to the CO<sub>2</sub> gas exchange rate” by P. Landschützer et al.***

**Anonymous Referee #3**

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Review of: “A model study on the sensitivity of surface ocean CO<sub>2</sub> pressure with respect to the CO<sub>2</sub> gas exchange rate” by Landschützer et al. 2011

The authors investigate the effect of an increased CO<sub>2</sub> gas exchange rate on the overall air-sea CO<sub>2</sub> fluxes as well as on the distribution of surface ocean pCO<sub>2</sub> in 3 sensitivity experiments designed to cover the North Atlantic, the Southern Ocean and the equatorial regions respectively. The study shows that global CO<sub>2</sub> uptake is not affected by the increase of the piston velocity while effects can be observed on regional scales.

Overall evaluation: I find this an interesting study with implications for a broad scope of readers. The experiments are well designed and the manuscript is well written. I

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recommend it for publication after some minor revisions.

General comments: I do not understand why the Takahashi pCO<sub>2</sub>-climatology is compared to one single year (year 2000) in order to elucidate potential improvements in the predictions by using an increased piston velocity. Wouldn't it make more sense to average around year 2000 to remove interannual variability? If only one year is taken the results are not robust at all.

Specific comments:

page 10801 / line 5 ... Is there a reason for prescribing pCO<sub>2</sub>(atm.) instead of emissions?

page 10803 / line 12 “where flux differences exceeding  $\pm 2 \text{ molCm}^{-2} \text{ yr}^{-1}$  can be identified.” How can it be identified when the colorbar of Fig. 1 is only in the range of  $\pm 2 \text{ molC/m}^2/\text{yr}$ ?

page 1087 / line 22 “potentially” ?

page 10808 / line 7 ... For the North Atlantic, a similar conclusion was drawn by Friedrich et al. [2006, GRL] who showed that interannual changes in piston velocity explain only  $\sim 25\%$  of the interannual CO<sub>2</sub>-flux variance whereas wind-stress is responsible for about twice as much.

page 10808 / line 11 “substantially” ?

page 10808 / line 20 Another study worth citing is Groeger and Mikolajewicz [2011, Ocean Modelling] on the CO<sub>2</sub> air- sea gas exchange rate at high ocean temperatures

Table 1 May I suggest to find more self-explanatory experiment names?

Figure 1+2, caption: “difference between the model standard run and the G02 scenario (top),...” Vice versa?

Figure 6 I find the panels very complicated to understand. Maybe there is a simpler

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way to visualize the findings.

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Interactive comment on Biogeosciences Discuss., 8, 10797, 2011.

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