**Biogeosciences
Discussions**

Interactive
Comment

Interactive comment on "Simulation of anthropogenic CO$_2$ uptake in the CCSM3.1 ocean circulation-biogeochemical model: comparison with data-based estimates" *by* S. Wang et al.

Anonymous Referee #2

Received and published: 8 December 2011

The manuscript of Wang et al. compares different data-based methods and a coupled carbon cycle – ocean circulation model to reconstruct excess, anthropogenic carbon (Cant) in the global ocean. The manuscript is very well written, structured and clear to even those not necessarily familiar with the topic. It is also timely as several different methods to reconstruct Cant have been published (in particular the one from Khatiwala et al. 2009) and are increasingly applied. It is important to compare the different methods (both numerical and data-based) using the same data and spatial resolution to assess the uncertainties in the reconstruction of Cant in a systematic way.

I highly recommend the publication of this manuscript after the few following minor

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

issues are taken care of.

Page 10897 line 8 and 21: The reference to the work from Pérez et al. 2010 is cited as 2010b but it is the first time in the manuscript this author is cited. Also, the reference Pérez et al. 2010a never appears in the text but is listed in the References section. Please revise the References section and fix the above mistake.

Page 10899 lines10-11: How are ages calculated? Biases can be expected when CFCs are used to infer water mass ages, particularly in young waters (under 25 years approximately) (Hall et al. 2002 ; Matear et al. 2003). Is the KPH method susceptible of this bias too?

Hall, T. M., Haine, T. W. N., and Waugh, D. W.: Inferring the concentration of anthropogenic carbon in the ocean from tracers, Global Biogeochem. Cy., 16(4), 1131, doi:10.1029/2001GB001835, 2002.

Matear, R. J., Wong, C. S., and Xie, L.: Can CFCs be used to determine anthropogenic CO_2, Global Biogeochem. Cy., 17(1), 1013, doi:10.1029/2001GB001415, 2003.

Page 10899 lines 27-30: Although this somewhat discussed later in the manuscript, it would help readers to follow the reasoning for your choices if you described briefly how constant climate, circulation and biological pump affect Cant estimates. This would be even better if you could add a brief sentence pinpointing where or how the different Cant methodologies here considered incorporate those assumptions.

Page 10900 line 13: I don't know why you cite here the work from Álvarez et al. 2009, since you are considering global ocean studies and the work from Álvarez deals only with the Indian Ocean (although they do compare data-based methods and numerical models).

Section 2.3, second paragraph: Nothing is said about the CFC12-ages biases (see previous comment).

Section 2.4: It would make more sense to put this section after 2.1, before the data-

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

based methods are introduced, but this is a somewhat subjective suggestion, so the authors can decide on this.

Page 10905 lines 14-16: At least some of the most important effects of CO2 induced climate change on Cant uptake should be listed, if not briefly described, like variations in surface alkalinity over time, etc.

Page 10908 line 28 (and other occurrences): Although mmol m-3 are international units, papers dealing with Cant often report concentrations in μmol kg-1.

Fig. 4: It is a little confusing having the secondary axis in green when the line that uses it is plotted in blue. I suggest making these two black (or at least have the same colour).

Interactive comment on Biogeosciences Discuss., 8, 10895, 2011.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper