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Comment

Interactive comment on “Seasonal and mesoscale variability of oceanic transport of anthropogenic CO₂” by Z. Lachkar et al.

Anonymous Referee #2

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This manuscript describes model results designed to study the temporal variability of oceanic transport of heat and anthropogenic CO₂.

In general, it is difficult to understand the importance of this study. The overall objective is not clearly defined. Why one would like to know the variability of transport of oceanic anthropogenic CO₂? Today we know there are large uncertainties in the quantification of the penetration of anthropogenic carbon in the ocean and we also know there are even larger uncertainties in the quantification of water-mass transport. There is still a significant potential for progress in ocean modelling.

There are a few details I could not understand in the strategy used to perform this study. For instance why a series of finer GCM runs were not already performed to confirm (or provide some uncertainties on) the results of the intermediate-resolution

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model? In order to model the penetration of anthropogenic carbon across the air-sea interface it is necessary to introduce initial conditions such as the total CO₂ and the total alkalinity fields; what are they and what are the uncertainties associated with these fields? What are the uncertainties associated with the computation of the air-sea fluxes? How results from a time-varying (non-steady state) model can be compared with GLODAP data ?

Anthropogenic CO₂ concentrations cannot be measured. There are always determined from a model. Many recent comparative studies have demonstrated that the anthropogenic CO₂ estimates included in the GLODAP data base are probably not the best. Therefore, for comparison, it would be best to use anthropogenic CO₂ results from other models too.

The sections results-discussion-conclusion are too long, some of the figures are of poor quality and/or inaccurate (it is misleading to label “data” results from a model). There are too many figures. If the aim of this study is the “seasonal and mesoscale variability” as indicated in the title, why describe and show figures of annual means, of global-, basin-, and zonally- integrated transports? It would be expected to see true seasonal cycles (not like in Fig.3 where the “seasonal cycle” is just a difference of July minus January).

In summary, although the authors could raise some interesting points, the present manuscript is relatively difficult to read because it is too long and the objective is not clearly defined. I would suggest the authors to be much more concise and to show clearly their results in very few figures and Tables. It is also essential to provide uncertainties associated to each quantity. This would give an indication on how meaningful the results are. The conclusion should point out the most significant and new scientific progress that stem from this study.

Interactive comment on Biogeosciences Discuss., 6, 4233, 2009.

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