

Interactive comment on “Modeling variations of marine reservoir ages during the last 45 000 years” by J. Franke et al.

Anonymous Referee #1

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1 General comments

With this manuscript, Franke et al. approach the question of modeling the variations of the oceanic $\delta^{14}\text{C}$ on long time periods, with a particular focus on the past variations of the oceanic thermohaline circulation.

On the overall, I think this paper is a welcome contribution towards a better understanding of the past variations of $\delta^{14}\text{C}$ and the implications toward dating errors. The paper is clear, well written and illustrated. I have only three comments plus a few typos. I recommend it for publication in Climate of the Past.

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2 Comments

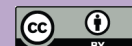
- 1- On the use of present-day wind-fields. The authors mention the use of present-day fields in their past simulations, which is an often use practice in simpler models which do not include all equations needed to accurately represent the mechanisms to simulate past winds. Therefore it is not a problem in principle. However, I have one concern there. On page 8, line 4-6 the authors state that *to assess the influence of this different circulation on the reservoir ages we used the PD wind forcing [...]*. I understand the authors mean that they do not want to include the effect of winds on the uptake of ^{14}C (cf. their equations on page 84 line 25). This is fine in principle, but the energy carried out by winds on the surface ocean might have a quite important effect on the oceanic circulation itself, through the course of the 45,000 years simulated here. In particular, the authors show the overturning computed in the model, which is shown to be coherent with data based estimates (p 88 lines 1-3 and figure 1). Would that still remain under more realistic wind forcing, in the view that winds are generally stronger in GCM simulations (e.g. PMIP-2)? I would appreciate to see some discussion about this fact in the manuscript.
- 2- The authors further show that the obtained ^{14}C distribution is coherent with GLODAP except for some specific zones. One cannot of course expect a model to perfectly reproduce the data. I would nonetheless appreciate to see more discussion on the two main discrepancies seen from the figures of the manuscript : the upwelling zones (mentioned in the text by the authors but not discussed) and the deep north Pacific which appears to be too low with respect to data. A paragraph added to the discussion would improve the data ^{14}C model validation without lengthening an otherwise well-balanced paper.

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- 3- I would recommend the authors to be slightly more cautious in the use of their modeling results towards the data community. In particular the sentence (page 95-96) : *the model results will be a useful tool to estimate reservoir ages for any marine sample* is overselling: this is just one model, and some features are not realistically simulated. I do not want to undermine the quality of the results nor their usefulness, but this could be re-written in a more cautious phrasing.

3 Minor points

Page 84, line 20 : Intercomparison => Intercomparison

Page 86, line 17 : and were run for => and was run

Page 89, line 19 : the influence of circulation change => circulation changes

Page 91, line 16 : an temporally => a temporally

Page 91, line 22: can be treated comparable to => ? ? (meaning ?) can be treated as ?

Page 92, line 9: nearly simultaneous => nearly simultaneously

Page 92, line 15-16: was once at => which was once at

Page 92, line 19: small reservoir age => smaller reservoir age ?

Interactive comment on Clim. Past Discuss., 4, 81, 2008.

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