**Geoscientific
Model Development
Discussions**

Interactive comment on "Water isotope variations in the global ocean model MPI-OM" *by* X. Xu et al.

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I have read the paper with pleasure. The text is concise, well written and easy to follow. Having the isotopes in MPI-OM and hence in the future in the coupled system ECHAM – MPI-OM is and excellent development. The status of the model is assessed with care at the end of a (too rarely seen) long equilibrium simulation.

I think the manuscript is almost ready to be published in GMD, provided that the one main comment below and the few adjustments are taken. I trust the authors will achieve these and will not need to see the manuscript again.

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Interactive Discussion

Discussion Paper

1 Main comment

Page 282, line 3-10 as well as page 285, line 11-25: the state of the ocean model, especially at the ocean surface strongly depends on the atmospheric forcing applied. I strongly miss an in-depth discussion of the atmospheric forcing in terms of isotopes. Indeed, the surface d18O-salinity, along with the d18O in the deep waters formed among others will depend on it. In the present state of the manuscript, there is no description that may allow us to understand the quality of the forcing (excellent for sure, since it is ECHAM-iso, but nevertheless ...) and how it compares to the observations. It does not need to be fully detailed since it was published elsewhere, but the main characteristics in terms of salinity, d18O, etc. needs to be mentioned.
In addition, the results obtained depends as well greatly on the ocean surface assumed as a boundary condition for the atmospheric run. Could you provide a figure that shows the ocean surface as seen by the atmosphere and discuss the resemblance / differences with your own surface obtained (in terms of salinity, isotopes ...). It would be of great help to understand the likely influence of your modelling choices, as well as a first indication on the differences of the fully coupled simulation to come (though probably not so simple ...).

2 Other comments

1. You use *d* for the deuterium excess. A more common notation is *d-excess*. The latter is easier to read.

   P. 283, line 10-12: "As same as δ^{18}O, the measurments ...": what do you mean?

2. Figure 1: it would greatly help to add the observations on the plots of the surface d18O as dots for example.

3. Figure 4: could you comment what are the points off the 1:1 line in panel B of the figure?

4. Figure 6, panel A: similarly, where are the points completly off the 1:1 line for dD?

5. Figure 6, panel B: the range of misfit between your model and the observations are of 3 to 4 per mil in d18O at -2 per mil in d18O in the observations. This needs to be a bit more commented in the main text: where are those points from? Likely reason of discrepancy?

6. Figure 9: similarly as in Figure 1, could you add the (very sparse) data points available?

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