

## ***Interactive comment on “Glacial–interglacial changes of H<sub>2</sub><sup>18</sup>O, HDO and deuterium excess – results from the fully coupled Earth System Model ECHAM5/MPI-OM” by M. Werner et al.***

### **Anonymous Referee #3**

Received and published: 25 November 2015

Summary: The authors present results from a pre-industrial and Last Glacial Maximum simulation of climate using the isotope enabled version of the coupled ocean-atmosphere model ECHAM5/MPI-OM. This is a sound manuscript. I would suggest it requires only rather minor revisions before publication.

Major comments: I have only one more major comment which is on section 4.2.4 “Glacial changes of the deuterium excess”. It is really interesting that the authors find that glacial sea surface temperature which are cooler than the GLAMAP reconstruction, lead to an improved simulation of dex changes over Antarctica. Would it be possible to also comment on whether coupled model ECHAM5 simulation of sea ice around

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Antarctica is also in agreement with the available sea ice data e.g. from Gersonde et al.?

Whilst plotting simulated changes of dex in vapour against the modelled relative humidity change between LGM and PI over the ocean surface reveals no correlation between these humidity changes and the simulated dex variations in the vapour layer, these are over rather large changes in climate, with many changes in climate variables. Some work, such as that by Schmidt and LeGrande using the gissE model, indicates that near surface wind changes may also be important in dex changes. Examining the correlation and relationship between dex and relative humidity, and dex and SST does not eliminate the possibility that the dex-SST relationship could be dependent on other aspects of the climate shift – such as wind speed changes. It would therefore be useful if the authors could support their dex-SST relationship assertion by providing a much wider examination of dex-climatic variable relationships.

Minor comments: P8837 L15 “the combination of water isotopic ratios permits to have a tracer of the low latitudes in polar ice cores” provide a reference, and perhaps make the reference to d-excess more explicit?

P8838 L2 “that they allow reconstructing the three-dimensional structure” rephrase, for example “the reconstruction of” would be better.

Section 4.1 Might be better to also include a present day simulation. This would enable the authors to also test the simulation against isotopes in vapour satellite data. P8864 L1 “constraint”

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Interactive comment on Geosci. Model Dev. Discuss., 8, 8835, 2015.

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