

Interactive comment on “Glacial–interglacial shifts in global and regional precipitation $\delta^{18}\text{O}$ ” by S. Jasechko et al.

Anonymous Referee #1

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General comments:

Jasechko et al. present a compilation of 88 sets of d^{18}O isotope data. By bringing a large range of dated groundwater measurements together with speleotherm and ice core data, they provide a global picture of the difference in d^{18}O between the ice age (19,500 to 50,000 years ago) and the late Holocene (0 to 5000 years ago). This new compilation should prove a valuable resource for both isotopic modellers and observationalists.

The paper is generally well structured and well written. It presents a convincing global and regional picture of the isotopic change. However the extended descriptions of the isotopic data can read more like an figure caption than a scientific investigation. Generally, there is a lack of physical explanations provided, more particularly , there is

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no meaningful use of the model results in helping the authors interpret/understand the compiled d18O measurements.

To help alleviate this problem, Figures S1, S2, and S3 should be moved into the main text – and equivalent model plots to Figure S1b should also be provided. This would enable the authors to provide more by way of model-data interpretation.

Finally, since the data compilation is the main point of the work, the data could usefully also be put into a more accessible form. Alongside Table S3, S4, and S5, a text or excel file, with these table info and also uncertainties (wherever possible) would be useful.

Specific comments:

Terminology: The ‘ice age’ tends to be a rather loosely defined term. The authors could usefully switch to using the ‘latter half of the last glacial period’. And define this as an average from 19,500 to 50,000 years ago. ‘Ice age’ is currently used throughout the text and figures.

The current title could be more precise, given that it does not really deal with glacial-interglacial shifts (plural). Perhaps could be replaced with something like: “Global and regional d18O in precipitation during the latter half of the last glacial period”.

P839 L29, ‘In general, these models were the versions submitted to the CMIP5 archive and participating in PMIP3’. If three of the five model simulations are not from CMIP5-PMIP3 this sentence should be revised/removed, since ‘in general’ is not accurate.

P840 L8, and all other similar instances: ‘reconstructed’. It would seem more accurate to use the term ‘measured’. Reconstructed is usually used when inferring a quantity from a measurement e.g. reconstructed temperature (from d18O). In this case these d18O values seem to be measured quantities.

subsection 3.1 It would be useful to include a brief analysis/discussion of inter-archive differences here, i.e. do speleotherm measurements show the same pattern as ground-water measurements?

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P842, L842 It is unlikely that the d18O simulation differences are primarily due to differences in ocean d18O. Most of the differences are instead likely to be due to differences in the simulated climates: e.g. humidity, temperature, precipitation etc. This should be described and discussed in 3.2.

It seems odd to show the glacial-to-modern changes in land temperature S1 from reconstructed temperatures, without any similar discussion/plots of the model results. See also 'general comments' above.

P843 "Simulated precipitation d18O values either show little change (0.1 ‰ or show increases of up to 1.5 ‰ when modern spatial heterogeneous of surface ocean d18O values are included (LeGrande and Schmidt, 2006)." This is confusing – should it not be one or the other?

P846 L10-11 "mechanisms driving this extra-tropical/tropical difference remain elusive and can be examined through future inter-model or model-reconstruction comparative studies." Not a very useful statement – suggest removing it.

P849, L19 'during the Pleistocene' – rather non-specific!

P850, L2, 'subglacial recharge' – clarify please.

P852, L12 "Differences in simulated precipitation isotope composition changes amongst the models might be linked to different parameterizations of seawater d18O, glacial topography and convective rainfall, however, this hypothesis requires further testing." These would seem to be three hypotheses.

The abstract should also be tightened up.

Figure comments:

Figure 1 There are a lot of odd straight lines in my printed version of F1 – could these be removed?

Figure 2 It would be helpful if different colours were used for the groundwater versus

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the cave (speleotherm?) measurements.

Figure 3 This figure is much too small to be able to see anything. Perhaps it could be spread over two or three pages.

S1, S2, and S3 would seem better off in the main text, accompanied by a new figure showing modelled temperature (and precipitation?) anomalies too.

Technical corrections:

P845 L17-18 i.e. or e.g. – consistency.

Supporting Information; Supplement; Supplementary Information – not used consistent throughout text.

Interactive comment on Clim. Past Discuss., 11, 831, 2015.

CPD

11, C283–C286, 2015

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