

Interactive comment on “An introduction to stable water isotopes in climate models: benefits of forward proxy modelling for paleoclimatology” by C. Sturm et al.

Anonymous Referee #1

Received and published: 15 July 2009

Review result for Sturm et al.

This is a review result for Sturm, Zhang, and Noone’s paper entitled “An introduction to stable water isotopes in climate models: benefits of forward proxy modeling for paleoclimatology”. The paper really introduces a version of global climate models in which stable water isotopes are incorporated. The language, particularly by using no mathematical equation, is probably easy enough for those who not familiar with GCMs. Moreover, the (possible) benefit and caveat of the models were elaborately described, and they seem reasonable to me. The paper then really utilizes one of the models and shows some results from the experimental simulations. These experiments, however,

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made the paper's focus ambiguous and even misleading. Therefore, I strongly recommend the editor not to accept this paper without having a significant modification or even withdrawal of the experimental part. Concrete reasoning of the decision follows below.

Major issues (mainly about the experiment):

1. The temperature-d18O relationships they showed in P1717 are misleading. These numbers (e.g. 1.84 degree C per permil) is only the geographical gradient over Scandinavia. They are never applicable to the regionally-averaged temperature changes in different climates, but they read so from the context.

2. The experiments' names of "present", "pre-industrial", and "mid-holocene" are misleading, too, because the largest forcing (SST and sea ice) is lacked. Please change them.

3. Overall relevancy of the experiments for the purpose is little. They are never the past climate reproductions nor a set of climatic realizations in the same climate since the insolation and greenhouse gases forcings are different. According to the purpose, I expected that the paper was going to show some beneficial implication for the past climates. As a set of sensitivity experiments, the authors mention about the weak relationship between temperature and d18O. But, such relationship may be strong in distinctive temperature differences such as between "real" Holocene and present climates.

Minor issues:

1. Abstract "transfer function...": If "transfer function" means T-d18O relationship that is transferable to different climate, the current paper does not provide any (only geographical T-d18O relationships are presented).

2. Abstract "The multi-proxy data can then...": This is future application and should not be put here.

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3. Abstract “the impact of changing climate...”: As stated above, the experiments do not represent the changing climate.
4. P1698L22 “two fundamental aspects”: These two aspects are not on the same level to discuss.
5. P1699L24: SWI is not included in speleothems and celluloses.
6. P1700L9: This paper does not present appropriate climate simulations for the 3 time-slices.
7. P1701L12: Whose relationship is this?
8. P1705L20: What is Arakawa grid?
9. P1705L23: The time step depends on resolution and the way of descritization.
10. P1706L21: Not in reference list
11. P1707L5,L7,L8: What is justification for these numbers?
12. P1707L18: Mention the bucket process is only for isotopes.
13. P1709L24: Give some literature for statistical downscaling methods for isotopes.
14. P1710L11: The way of applying nudging is different by models, and may have significant impact.
15. P1710L15-L19: Why is the ensemble approach useful for the period when observation is lacking?
16. P1710L23 “model output can be compared with the measured proxy”: I don't understand this. Just before it says the model cannot be compared with measurement unless nudged.
17. P1711L8: What do you mean by “This will give way to the assimilation of proxy records by forward proxy modeling”? Explain more.

18. P1712L1: How many years for a single experiment?
19. P1713L24: What exactly is “atmospheric circulation pattern”?
20. P1713L25: What is “strict physical control of local T on local d18O in P”?
21. P1718L19: “give way to the assimilation...”: again, I don’t understand.
22. Table1: MIROC3.2 is not on Kurita et al. (2005).
23. Table1: What is BAS?

Interactive comment on Clim. Past Discuss., 5, 1697, 2009.

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