

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

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Following our submission of "An introduction to stable water isotopes in climate models: benefits of forward proxy modelling for paleoclimatology" to CPD, we received 3 anonymous reviewer comments and 1 comment by the associate editor. We are grateful for the detailed analysis of our manuscript, which confirms that our article was adequately drafted to be accessible for a general audience with little experience in climate modelling. The comments will further help us to improve the manuscript to match more closely the expectations of the target audience. All reviewers praised the first part as being a good introduction for the general public. Beyond these comments, the

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discussion between co-authors lend us towards the decision to shorten some parts of the introduction to water isotopes processes (which is assumed as pre-requisite for most readers), and expanding the referencing to previous publications. This way, we aim to preserve the clarity of the introductory part and save some additional space for the additional result analysis. Referee #1 expressed himself critically towards the 'idealised' sensitivity experiments, labelled 'present', 'pre-industrial' and 'mid-Holocene', claiming that the lack of varying SST/sea-ice diminish the relevance of such sensitivity analyses for paleo-climate interpretation. His second concern addresses the regression method for obtaining the $\delta^{18}\text{O}$ -temperature relationship, referred to as 'transfer function'. He argues that spatial regression lines (as depicted in the manuscript) do not necessarily coincide with temporal regression ones (the actual 'transfer function'). The associate editor recommends to take into account these suggested changes. As we indicated in the CPD manuscript, we are well aware that the 'idealised' time-slice experiments should be interpreted as sensitivity experiments and cannot be regarded as true analogues for climate snap-shots in the considered periods. We will therefore run additional simulations, taking into account both insolation and SST modifications, derived from previous PMIP experiments. Hence the new simulations are expected to provide a more reliable reproduction of the climate snapshots. We further plan to extend the experiment period from 5 to 25 years, in order to extract statistically significant regression slopes between $\delta^{18}\text{O}$ and temperature, both in the spatial and temporal sense. We can explicitly discuss the difference between spatial and temporal regression slopes. The analysis of the new simulations is therefore intended to address the two major concerns expressed by referee #1. We also welcome the suggestion of referee #2 to plot the model horizontal resolution over Scandinavia before introducing regional regressions. We furthermore assure the referees that all minor revisions will be duly incorporated in the revised manuscript.

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