Clim. Past Discuss., 7, C919–C921, 2011
www.clim-past-discuss.net/7/C919/2011/

Climate of the Past Discussions

Interactive comment on "Sensitivity of interglacial Greenland temperature and delta;¹⁸O to orbital and CO₂ forcing: climate simulations and ice core data" *by* V. Masson-Delmotte et al.

Anonymous Referee #1

Received and published: 27 June 2011

This paper uses climate models and climate models with embedded water isotopes for a better understanding of measured δ^{18}O in Greenland ice cores during interglacials.

I find the study well mature and an important improvement in understanding ice core water isotopes. For me it leaves only very few open questions. Thus, I think the paper is nearly ready for publication and I have only one major comment and various some technical issues:

The major comment:

It is said in sect 2, concerning the depostion effect, that "*atmospheric models have shown a large deposition effect for glacial climate, due to strongly reduced winter precipitation (Krinner et al., 1997; Werner et al., 2000). In this manuscript, we assess the "precipitation weighting effect" by comparing the average temperature change to the monthly precipitation weighted temperature change"*. Although the paper is on Greenland ice cores it makes this as a very general conclusion. However, a recent paper by *Laepple et al.* (2011) makes the case that Antarctic precipitation is stronger, not weaker in southern hemispheric winter. Laepple et al. base this finding on present day data sets. This has consquences for the seasonal information contained in the water isotope thermometer of the ice cores. The Masson-Delmotte et al. paper here calculates this precipitation weightening of the water isotope — and thus the deposition effect — based on modelling only. My comment on that is twofold: First, some clarification or more dicussion seemed to be needed here concerning the increase / decrease of the precipiation in winter time. This might be simple a difference between Greenland and Antarctica. Second, it would be very desirable if the Greenland deposition effect for present day could also be supported by data and not based on modelling alone. Thus, seasonality resolving precipitation data should be used to validate the precipitation ratio of 60% in the summer half year in the control run.

Minor comments:

1. At least twice throughout the draft it reads "twice as small as" (abstract and page 1596, line 19), which is better termed as "half as large as".

2. Text and labels of Figs are sometimes very small, especially in Fig 3. It is necessary to ensure that this Fig will be published as big as possible and then it need to be verified, that all label can then be read easily, which is not the case at the moment.

3. The titel is slightly misleading: "Sensitivity of interglacial Greenland temperature and δ^{18}O to orbital and CO_2 forcing: climate simulations and ice core data". For me it was not clear, that the CO_2 forcing refered to future simulation with 2 $\times CO_2$. Because ice

cores were explicitly mentioned in the title I thought I would find a pure paleo study here. Thus, clarification of the title should ensure that potential reader are aware of the past2future aspect. For example:

"Sensitivity of interglacial Greenland temperature and δ^{18}O: ice core data and orbital versus 2 $\times$ CO_2 forced climate simulations".

References

Laepple, T., M. Werner, and G. Lohmann (2011), Synchronicity of Antarctic temperatures and local solar insolation on orbital time scales, *Nature*, *471*, 91–94., doi:10.1038/nature09,825–94, doi:10.1038/nature09825-94.

Interactive comment on Clim. Past Discuss., 7, 1585, 2011.