Clim. Past Discuss., 5, C1060–C1061, 2010
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Climate of the Past Discussions

Interactive comment on "Comment on "Using multiple observationally-based constraints to estimate climate sensitivity" by J. D. Annan and J. C. Hargreaves, Geophys. Res. Lett., 33, L06704, doi:10.1029/2005GL025259, 2006" *by* S. V. Henriksson et al.

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Received and published: 12 January 2010

I would like to shortly comment on the 2 issues raised in the reply :

1. Estimating the likelihood for the LGM constraint

The study of Annan et al. (2005) has not considered two important forcings which have affected the magnitude of LGM cooling: the impact of glacial dust content and

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of vegetation changes. By omitting these negative forcings a systematic bias towards larger sensitivity values is resulting. When accounting for these forcings (as AH06 did), a mode of 2.7°C in the distribution is a reasonable choice for describing the LGM evidence and in line with other studies which account for all relevant LGM forcings (see e.g. Schneider von Deimling et al. (2006)).

2. Discussion of the Volcanic Cooling constraint

In my comment I have focused on the LGM constraint as AH06 discuss the issue of possible dependence between 20th century warming and volcanic cooling in their manuscript. I agree with Henriksson and colleagues that independence of 20th century warming and volcanic cooling is more difficult to justify compared to 20th century warming and LGM cooling. To avoid a possible double-accounting of information (1. last century warming and 2.volcanic cooling) AH06 discuss the use of a uniform-prior for the first and show that this does not have a strong impact on their results. Estimating a posterior distribution of climate sensitivity based only on the information of 20th century warming and LGM cooling is likely to provide us with estimates which are least affected by a possible doubling accounting of observations.

Annan, J. D., Hargreaves, J. C., Ohgaito, R., Abe-Ouchi, A., and Emori, S.: Efficiently constraining climate sensitivity with paleoclimate simulations, SOLAS, 1, 181-184, 2005. Interactive comment on Clim. Past Discuss., 5, 2343, 2009.

SCHNEIDER VON DEIMLING, T., HELD, H., GANOPOLSKI, A. & RAHMSTORF, S. 2006. Climate sensitivity estimated from ensemble simulations of glacial climate. Climate Dynamics, 27, 149-163.

Interactive comment on Clim. Past Discuss., 5, 2343, 2009.