

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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The main point of the Referee Comment by Thomas Schneider von Deimling (hereinafter referred to as RC) seems to be that we have not convincingly argued that the shortcomings of AH06 could have had a significant quantitative effect on its result. The RC argues for independence of the evidence from 20th century warming and the last glacial maximum, making a reasonably good argument for it, but discussion regarding

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the third constraint, volcanic cooling, is completely omitted. In AH06 global climate model (GCM) results are used in evaluating correlation between climate changes for the LGM and doubled CO₂ and those results imply a most likely climate sensitivity of 4.5 degrees (Annan et al., 2005), in sharp contrast with the mode value of 2.7 degrees in the distribution used in AH06. Care should be taken that dependence is not introduced in this reasoning step using a GCM. We do find it very possible that the last glacial maximum constraint can be reasonably well approximated as independent, when going through the underlying assumptions, but think the roughly derived pdf for climate sensitivity in AH06 might well have a mode too small (compared e.g. to Annan et al., 2005).

The likelihood function corresponding to volcanic cooling used in AH06 is about as narrow as the one corresponding to the last glacial maximum and therefore much narrower than the pdf corresponding to 20th century warming, it obviously has a strong quantitative effect on the result. As the RC expresses confidence in the result of AH06, we hope referee von Deimling will complete his argument for independence of the different sources for the part of volcanic cooling.

Annan, J. D., Hargreaves, J. C., Ohgaito, R., Abe-Ouchi, A., and Emori, S.: Efficiently constraining climate sensitivity with paleoclimate simulations, SOLA, 1, 181-184, 2005.

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

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