

***Interactive comment on “Reply to Comment on
“Using multiple observationally-based constraints
to estimate climate sensitivity by Annan and
Hargreaves (2006)” by Henriksson et al. (2010)” by
J. D. Annan and J. C. Hargreaves***

Anonymous Referee #2

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In their Reply, Annan and Hargreaves shortly discuss two main issues of criticism raised in a preceding Comment paper by Henriksson et al. (2010). The first issue concerns the assumption of independence of observational data when constraining climate sensitivity by multiple lines of evidence (i.e. the neglect of potential joint uncertainties), the second issue concerns the use of a Chauchy-type prior (Annan and Hargreaves 2006, Annan and Hargreaves 2009).

The authors all agree that a proper Bayesian analysis should take account for estimated covariances in the data used for constraining and that combining different

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sources of observation will allow a more precise estimate of climate sensitivity.

Annan and Hargreaves presented a study in which they make an assumption of independence of three observational data sets used for the Bayesian updating (Annan and Hargreaves 2006). They gave some reasoning for assuming independence and performed several sensitivity checks (Annan and Hargreaves 2006, and see online discussion of the Comment paper by Henriksson et al. (2010)). Further sensitivity analyses also were presented by Henriksson and colleagues. If one accepts the chosen LGM constraint as an independent additional source of information (an assumption having been discussed in some detail in the preceding online discussion following the Comment paper by Henriksson) the performed sensitivity analyses of Annan and Hargreaves as well as of Henriksson and colleagues do not challenge the conclusion by Annan and Hargreaves (2006, 2009) that climate sensitivities above 6°C are hard to reconcile with the data. To me it seems that the simplifying assumptions made by Annan and Hargreaves are a reasonable approximation for a Bayesian strategy of combining multiple lines of evidence.

Annan and Hargreaves motivate the use of their chosen prior in some detail (Annan and Hargreaves 2009) and present some convincing arguments why using a (rather broad) uniform prior should be seen critical. Given the subjective nature of Bayesian analysis, the issue of prior choice cannot be resolved as it always expresses the preference of an individual expert belief.

Interactive comment on Clim. Past Discuss., 7, 431, 2011.