



Joint constraints on climate sensitivity in a coupled GCM using palaeoclimate reconstructions of the Mid-Holocene and Last Glacial Maximum

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Palaeoclimate reconstructions can provide important constraints on climate sensitivity estimates from perturbed parameter ensembles because they are independent of the observational data used in climate model development. However, such assessments typically have one or more of the following limitations: a focus on one palaeoclimate era, therefore risking state-dependence of the constraints; simplified model-data comparisons such as large-scale regional averages, therefore under-using or misrepresenting reconstruction information; reduced model complexity or resolution due to the expense of simulating climate states that are very different to the present day, risking substantial biases in the simulations and climate sensitivity estimates.

Here we present an estimate of climate sensitivity that addresses these limitations. Spatial patterns in global syntheses of pollen-based continental climate reconstructions for two of the most well-understood and well-studied palaeoclimate eras, the Mid-Holocene (MH: 6000 cal yrs BP) and Last Glacial Maximum (LGM: 21 000 cal years BP), are used to update the climate sensitivity estimate of the fully coupled general circulation model (GCM) HadCM3. The constraints are applied jointly for the two eras; we also investigate their state-dependence.