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Climate sensitivity estimated from LGM ensemble simulations

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The use of paleo-climatic data allows insight into the climatic past but also can help to constrain the model performance in view of simulated future climate change. A key uncertainty in climate predictions stems from uncertainty in climate sensitivity (CS), i.e. the question of how sensitive the climate system reacts to increasing greenhouse gas concentrations. For reducing uncertainty in CS we have performed a large ensemble of simulations of the LGM climate using a fully-coupled model of intermediate complexity (CLIMBER-2). For this purpose we accounted for model uncertainty by having simultaneously perturbed 11 model parameters that strongly affect the model feedback strengths. We have prescribed the main glacial radiative forcings by accounting for changes in greenhouse gas concentrations, existence of large northern hemisphere ice sheets, orbital parameters, and additionally we account for glacial dust content and vegetation cover. By using paleo-data from geographically distinct regions such as the tropical SSTs and Antarctica we can constrain the set of model versions being consistent with paleo-knowledge from the LGM. We thus derive a range for CS almost consistent with the IPCC range (1.5-4.5°C).