



## State Dependence of Past Climate Sensitivity

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Recent work with simple idealist models and based on ice core data (von der Heydt et al. 2014) has suggested that the fast (Charney) climate sensitivity can vary considerably during the last glacial-interglacial cycle with substantial differences between glacial and interglacial states. We investigate this further using a suite of 62 simulations of the last glacial interglacial cycle, using a fully coupled atmosphere-ocean model (HadCM3). The original simulations use orbital, greenhouse gases and ice sheet boundary conditions appropriate for various time periods throughout the last 120 kyr BP (sampling at 1 kyr BP simulations from 21 kyr BP, reducing to 4 kyr BP sampling at the last interglacial). We have repeated these simulations, quadrupling CO<sub>2</sub> for each period. We quantify the implied climate sensitivity using Gregory plots. The results show that fast climate sensitivity can vary by more than 40% depending on the background climate state. However, within the model it is not just a simple function of glacial versus interglacial climates, but is strongly influenced by regional forcings from the ice sheets. The mechanisms of changes will be discussed as well as the implications for palaeo estimates of climate sensitivity.

A. S. von der Heydt, P. Köhler, R. S. W. van de Wal, and H. A. Dijkstra, On the state dependency of fast feedback processes in (palaeo) climate sensitivity, *Geophysical Research Lett.* 41, 6484–6492 (2014).