



Correcting for the background state dependency of palaeo climate sensitivity

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The equilibrium (Charney) climate sensitivity, here indicated by S^a , is the equilibrium change in Earth's global mean surface temperature due to a radiative forcing associated with a doubling of $p\text{CO}_2$, the atmospheric CO_2 concentration. Palaeo data have been frequently used to determine S^a , and — if slow feedback processes are adequately taken into account — indicate a similar range as those based on climate model results used in IPCC AR4. In most of these palaeostudies it is implicitly assumed that the (fast) feedback processes are independent of the background climate state, e.g., are equally strong during glacial and interglacial periods. Here we assess the dependency of the fast feedback processes on the background climate state using data of the last 800 kyr and a conceptual climate model. S^a is found to be higher in cold periods than during warm times. By correcting for this state dependency, we determine a new value of the Charney sensitivity $S^a = 0.71 \pm 0.40 \text{ K (W m}^{-2}\text{)}^{-1}$ (corresponding to a warming of $2.6 \pm 1.5 \text{ K}$ for $2 \times p\text{CO}_2$), which is lower than present estimates in which state dependency is neglected.