



A best-of-both-worlds, multi-era estimate of climate sensitivity

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The multi-model ensemble (MME) represents the global state-of-the-art in climate simulators, while palaeoclimate reconstructions provide the only tests of these simulators that are independent of their development. We present a "best-of-both-worlds" approach that combines MME (CMIP, PMIP) simulations and proxy-based (pollen, multi-ocean-proxy) reconstructions of the mid-Holocene (6ka BP) and Last Glacial Maximum (21ka BP) to estimate climate sensitivity to atmospheric carbon dioxide. Rather than attempting to assess the skill of the individual MME members, or estimate their parameters, we use a conceptually simple but standard data assimilation approach to update the MME estimates of the palaeoclimate states with the reconstructions. This provides an estimate of the relationship between the MME and the real world, the "ensemble discrepancy", which we apply to the MME estimate of climate sensitivity. Our method has the advantage of requiring very few judgements about climate simulator uncertainty compared with other studies.