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# State-dependency of temperature variability in transient simulations of the last Deglaciation from models of varying complexity

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Much about the response of temperature variability to a change in the climate's mean state, as the one projected for the current century, remains uncertain. These uncertainties include spatiotemporal patterns, the magnitude, and, in some cases, even the sign. For the last Deglaciation, - the last change in global mean temperature of a similar degree to that expected in projections - variability analyses of climate model simulations and temperature proxies produce conflicting results.

Here, we build a hierarchy of transient simulations covering the period since the Last Glacial Maximum about 26k years ago. We include a range of climate models, from conceptual to complex Earth System Models. The simulations cover a variety of temporal and spatial resolutions, parameterizations, and modeled processes. For annual to multi-millennial temporal as well as regional to global spatial scales, we compare variability patterns and power spectra and analyze how they relate to model properties and the background state of Earth's climate. This allows for the examination of regional temperature differences between low, middle, and high latitudes and at locations of available paleoclimate proxy records. For sets of sensitivity experiments, we investigate effects of changes to ice sheets, sea ice, and in volcanic, solar, greenhouse, and orbital forcing on modeled climate variability.

Thus, our analysis provides insights into when and how models disagree with each other and with proxies, and what differences arise due to specific models, simulation setups, and boundary conditions. Based on these results, we can then gauge the degree of complexity which is required to reproduce past temperature variability and predict its changes in the future.