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Climate variability decreases globally from the Last Glacial Maximum to the Holocene

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Changes in climate variability are more important for society than changes in the mean state alone. While we will be facing a large-scale shift of the mean climate in the future, its implications for climate variability are not well constrained. Here we quantify changes in temperature variability as climate shifted from the Last Glacial cold to the Holocene warm period. Greenland ice core oxygen isotope records provide evidence of this climatic shift, and are used as reference datasets in many palaeoclimate studies worldwide.
A striking feature in these records is a distinct reduction in centennial to millennial-scale variability in the Holocene.
We present quantitative estimates of the change in variability on 500-1750-year timescales based on a compilation of high-resolution proxy records for temperature which span both the Glacial and the Holocene. The estimates are derived based on power spectral analysis, and corrected using estimates of the proxy signal-to-noise ratios.
We show that, on a global scale, variability decreased by a factor of $\sim$4 (2.5–6.6, 90% confidence interval). The spatial pattern of the variability change is latitude-dependent. While the tropical areas show no changes in variability, mid-latitude changes are larger. A slight reduction in variability is found in Antarctica, whereas the variability decrease in the Greenland ice core oxygen isotope records is the largest worldwide.
The pattern of variability decline can be explained by changes in the meridional temperature gradient, which suggests further decreases of long-term climate variability in a warmer future. Our results contradict the view of a globally quiescent Holocene following the instable Glacial, and imply that the two states may have been more similar than previously thought.