Study: Current weakening of seasonal temperature difference in East Asia is unprecedented in past six centuries

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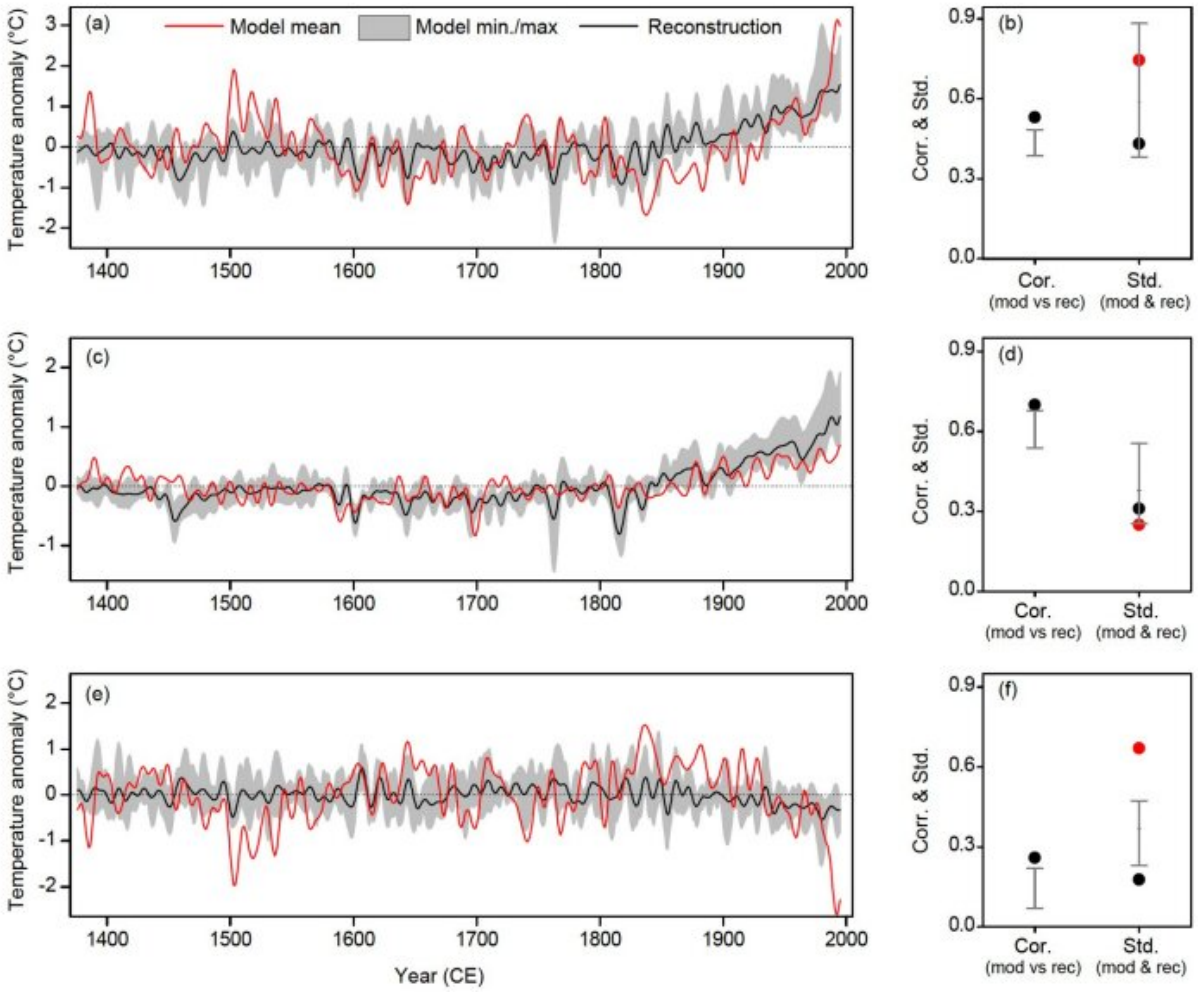

Reconstructed and simulated temperature variability over the past six centuries. (a) 10-year low-pass filtered winter reconstruction and CMIP5 (Appendix Table S2) multi-model ensemble mean (gray shading; minimum and maximum for

individual model) for East Asia relative to the 1376–1995 CE period mean. (b) Correlation between winter reconstruction and model simulations (black dot, for multi-model ensemble mean; gray range lines, the minimum and maximum for individual model), and standard deviation for reconstruction and model simulations (black dot, for multi-model ensemble mean; gray range lines, for the minimum and maximum for individual model; red dot, for reconstruction). (c), (d) same as (a), (b) but for summer temperature. (e), (f) same as (a), (b), but for the annual cycle of temperature. Credit: *Science China Earth Sciences* (2023). DOI: 10.1007/s11430-022-1066-5

A joint research team led by Prof. Wang Jianglin from the Northwest Institute of Eco-Environment and Resources (NIEER) of the Chinese Academy of Sciences (CAS) has reconstructed East Asian temperature changes in winter and summer as well as their differences during the period 1376–1995 CE using tree ring data with separate sensitivity for seasonal temperatures. The study was published in *Science China Earth Sciences* on April 20.

Seasonal temperature difference, also referred to as temperature annual cycle, is a dominant feature of climate systems outside the tropics and has important impacts on social and biological systems. Our understanding of seasonal temperature difference, however, is largely hampered by short observational records.

In this study, the researchers analyzed tree ring records across East Asia and identified those that were separately sensitive to winter or summer temperature changes, but not to both. Using the selected seasonal temperature sensitive tree ring records, they reconstructed the difference of summer and winter temperatures over the past six centuries.

They found that the reconstructed seasonal temperature difference of East Asia showed a sustained weakening trend as early as the 1870s,

which is largely caused by anthropogenic forcing.

The emergence time of the climate signal in the reconstructed seasonal temperature difference was assessed. "The anthropogenic forcing has already driven the current state of seasonal temperature difference beyond the range of the natural variability since the 1370s," said Prof. Wang Jianglin from NIEER.

"Our study implies a further weakening of seasonal temperature difference in the future as a result of ongoing anthropogenic warming," said Prof. Wang. "This may have important social and ecological implications, e.g., plant phenology and the transmission of seasonal diseases."

More information: Jianglin Wang et al, Recent weakening of seasonal temperature difference in East Asia beyond the historical range of variability since the 14th century, *Science China Earth Sciences* (2023). DOI: 10.1007/s11430-022-1066-5

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