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Reconciling East Asia's mid-Holocene temperature discrepancy through vegetation-climate feedback

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The Holocene temperature conundrum, marked by inconsistencies between proxy-based reconstructions and transient model simulations, challenges our understanding of Holocene temperature evolution. Reconstructions suggest a cooling trend after the Holocene Thermal Maximum, while model simulations indicate a consistent warming trend due to ice-sheet retreat and rising greenhouse gas concentrations. Various factors, such as seasonal biases and overlooked feedback processes, have been proposed as potential causes for this discrepancy. In this study, we found the impact of vegetation-climate feedback on temperature anomaly patterns in East Asia during the mid-Holocene (6000 BP). By utilizing the fully coupled Earth system model EC-Earth and performing simulations with and without coupled dynamic vegetation, we aim to isolate the influence of vegetation changes on regional temperature patterns. Our findings reveal that vegetation-climate feedback contributed to warming across most of East Asia, resulting in spatially diverse temperature changes during the mid-Holocene and significantly enhanced the model-data agreement. These results highlight the crucial role of vegetation-climate feedback in addressing the Holocene temperature conundrum and emphasize its importance for simulating accurate climate scenarios.