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· Pattern and time-scale dependencies of temperature-precipitation correlations in the Northern Hemisphere extra-tropics

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Future precipitation levels under a warming climate remain uncertain because current climate models have largely failed to reproduce observed variations in temperature-precipitation correlations. Our analyses of Holocene proxy-based temperature-precipitation correlations from 1647 Northern Hemisphere extratropical pollen records reveal a significant latitudinal dependence, temporal variations between the early, middle, and late Holocene, and differences between short and long timescales. These proxy-based variations are largely consistent with patterns obtained from transient climate simulations for the Holocene. Temperature-precipitation correlations increase from short to long time-scales. While high latitudes and subtropical monsoon areas show mainly stable positive correlations throughout the Holocene, the mid-latitude pattern is temporally and spatially more variable. In particular, we identified a reversal to negative temperature-precipitation correlations in the eastern North American and European mid-latitudes during the mid-Holocene that mainly related to slowed down westerlies and a switch to moisture-limited convection under a warm climate. We conclude that the effect of climate change on land areas is more complex than the commonly assumed “wetter climate in a warmer world”. Future predictions need to consider that warming related precipitation change is time-scale dependent.