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Past climate conditions predict the influence of nitrogen enrichment on the temperature sensitivity of soil respiration

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The response of soil carbon release to global warming is largely determined by the temperature sensitivity of soil respiration, yet how this relationship will be affected by increasing atmospheric nitrogen deposition is unclear. Here, we present a global synthesis of 686 observations from 168 field studies to investigate the relationship between nitrogen enrichment and the temperature sensitivity of soil respiration. We find that the temperature sensitivity of total and heterotrophic soil respiration increased with latitude. In addition, for total and autotrophic respiration, the temperature sensitivity responded more strongly to nitrogen enrichment with increasing latitude. Temperature and precipitation during the Last Glacial Maximum were better predictors of how the temperature sensitivity of soil respiration responds to nitrogen enrichment than contemporary climate variables. The tentative legacy effects of paleoclimate variables regulate the response through shaping soil organic carbon and nitrogen content. We suggest that careful consideration of past climate conditions is necessary when projecting soil carbon dynamics under future global change.