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Polar amplification in the mid-Holocene derived from dynamical vegetation change

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An atmosphere-ocean-vegetation coupled model is used to quantify a vegetation-induced feedback in the mid-Holocene climate. Compared th the reconstructed typical warming over land in northern hemisphere (+2$\pm$0.5K), our result indicates +1.25K annual warming over land in the northern hemisphere in the mid Holocene. The inclusion dynamic vegetation and vegetation-climate feedback explain +0.87K out of this +1.25K warming. Due to the summer warming, boreal forest extends northward in mid-Holocene compared to the control experiment. The result indicates that the vegetation-induced feedback amplifies annual warming from +0.13K to +0.36K globally and from +0.38K to +1.32K in boreal terrestrial region ($>$40N) compared to atmosphere-ocean experiment without vegetation feedback in mid-Holocene. We note that these vegetation-induced feedbacks are dependent to accuracy of climate and vegetation predicted in the control experiment.