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Impact of the Laurentide Ice Sheet deglaciation on early to mid-Holocene climate evolution

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We simulate the early to mid-Holocene climate evolution enforced by the Laurentide Ice Sheet (LIS) and associated freshwater flux from the melting ice sheet with the coupled global atmosphere-ocean-vegetation model of intermediate complexity, CLIMBER-2, to investigate the impact of the LIS deglaciation on climatic conditions over circumpolar and other regions. The modeling results show that before 7,000 years ago, the air temperature and precipitation over North Atlantic and Northern Europe (50N-70N) were substantially influenced by the presence of the Laurentide ice sheet. In addition, The spatio-temporal pattern of peak warming show that the timing of peak warming in north Canada and part of North Africa is between 8 and 7 kyr BP, which is earlier than that in southern Greenland (7-6 kyr BP). The simulated delayed warming in north Canada and southern Greenland agree with reconstructions for these regions. Elsewhere, peak warming is no delayed in 9-8 kyr BP, showing no significant effect of the LIS, and suggesting that summer temperatures are controlled here by orbital forcing throughout the Holocene. The spatio-temporal pattern of peak summer precipitation is complicated than that in temperature structure. The model results suggest that the coupling of the extra feedbacks and forcings of Laurentide Ice Sheet plays an important role in early to mid-Holocene climate evolution, at least on the circumpolar regions.

Key words:Holocene climate, Laurentide Ice Sheet, climate modeling