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The influence of the Laurentide ice-sheet topography on the atmospheric meridional heat transport: implications for the surface temperature

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Modeling experiments of the Last Glacial Maximum (LGM), ∼21,000 years ago, have revealed a dominant influence of the Laurentide Ice Sheet (LIS) on the zonally asymmetric atmospheric circulation. However, the effect of LIS on the zonal-mean atmospheric circulation has received less attention. Here we investigate the influence of the LIS topography on the atmospheric meridional heat transport in experiments with a global atmospheric circulation model. We find that the LIS topography yields an increase of the zonally integrated meridional heat transport by stationary eddies. As a result, the surface temperature of the Arctic region increases and the total meridional transient eddy heat transport is reduced to maintain the meridional energy balance. These results contribute to our understanding of glacial environments, and may be informative for understanding difference in the ice-sheet distribution between, e.g., the penultimate glacial maximum (∼140,000 years ago) and the LGM.