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Weak temperature control of Greenland δ^{18}O during the previous interglacial

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We present a model study of the isotopic composition of Greenland precipitation during the previous interglacial, the Eemian. A global climate model with isotopic tracers is run in three time slice experiments (115 kyr, 122 kyr, 126 kyr) during the Eemian. Sea surface temperatures and the orbital parameters are adjusted to Eemian values, while all other boundary conditions are kept at preindustrial values. The modeled summer temperature anomalies during the Eemian climatic optimum, considered here to be 126 kyr, matches well with proxy data in magnitude and spatial distribution for the Northern Hemisphere. The modeled maximum summer anomaly for Greenland is +6^oC. For annual mean δ^{18}O the model results show an anomaly of +0.28 permil compared to the anomaly of +3 permil found in ice cores. The limited response of the modeled δ^{18}O is attributed to a southward shift in the moisture source region and the use of the present day ice sheet configuration. The shift in moisture source is recognized as a change in evaporation patterns and moisture advection. This degrades the coherency between temperature and δ^{18}O for the warmest part of the Eemian. On the grounds of Eemian anomalies in modeled δ^{18}O and ice core δ^{18}O the decrease in elevation of the Greenland ice sheet is estimated for a number of ice core sites ranging from 900 m lower (Dye-3) to 400 m lower (GISP2) compared to present.