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Modelling the Last Deglaciation

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We present results from a small physics ensemble of simulations of the Last Deglaciation from 21kyr BP to present, using a low resolution version of the Hadley Centre Model called FAMOUS. The model is forced using orbital variations, greenhouse gas concentrations, ice sheets and fresh water pulses. We show that the overall change from LGM to Holocene is well simulated with the model. Approximately half the warming from LGM to Holocene is from changes in the greenhouse gases and half from the changes to the ice sheet. Orbital changes do not directly have much impact on the annual mean temperature changes. However, offline ice sheet modelling shows that they play a vital role in the evolution of the ice sheet itself (and hence feedbacks onto annual mean changes of climate). The model is unable to reproduce the rapid changes seen during the deglaciation (e.g. Bolling-Allerod). We show that the only way of reproducing this rapid warming event is to use a fresh water melting scenario which is about 4x the size of our best estimate and which is inconsistent with the observed sea level curve.