HIGH RESOLUTION SIMULATIONS OF LAST GLACIAL MAXIMUM CLIMATE OVER EUROPE - A SOLUTION TO DISCREPANCIES WITH OBSERVATIONS?

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Reconstructions of Last Glacial Maximum (LGM) climate indicate that the near-surface air temperatures of the coldest month were up to 40oC cooler than present in Western Europe. Standard GCMs are currently incapable of reproducing this large cooling, and typically predict and LGM cooling of only about 20oC in this region. One possible reason for the discrepancy is the relatively low resolution of the GCMs, which mean that the small-scale features and processes may be misrepresented.

Therefore, with 3 different GCMS (LMDz, HadAM3, CSSR), we have carried out both high and low resolution simulations of LGM climate, with a focus on the european region. The high resolution simulation varies between the models; CSSR is a global simulation, HadAM is a regional simulation, and LMDz is a zoomed simulation with variable resolution. The results show that as expected, all the low-resolution models are too warm over Europe at the LGM. The CSSR and LMDz high-resolution simulations show some cooling relative to the low-resolution, but only HadAM3 is capable of simulating the observed extreme cold. The reason for the greater cooling in the HadAM3 high-resolution simulation appear to be related to the heat-fluxes over sea-ice in the North Atlantic, which are greater in the high resolution simulation due to enhanced gustiness, and result in very cold air over sea-ice, which is advected over Western Europe.