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Climate of the Last Glacial Maximum: sensitivity studies and model-data comparison with the LOVECLIM coupled model

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Abstract. The Last Glacial Maximum climate is one of the classical benchmarks used both to test the ability of coupled models to simulate climates different from that of the present-day and to better understand the possible range of mechanisms that could be involved in future climate change. It also bears the advantage of being one of the most well documented periods with respect to palaeoclimatic records, allowing a thorough data-model comparison. We present here an ensemble of Last Glacial Maximum climate simulations obtained with the Earth System model LOVECLIM, including coupled dynamic atmosphere, ocean and vegetation components. The climate obtained using standard parameter values is then compared to available proxy data for the surface ocean, vegetation, oceanic circulation and atmospheric conditions. Interestingly, the oceanic circulation obtained resembles that of the present-day, but with increased overturning rates. As this result is in contradiction with the current palaeoceanographic view, we ran a range of sensitivity experiments to explore the response of the model and the possibilities for other oceanic circulation states. After a critical review of our LGM state with respect to available proxy data, we conclude that the oceanic circulation obtained is not inconsistent with ocean circulation proxy data, although the water characteristics (temperature, salinity) are not in full agreement with water mass proxy data. The consistency of the simulated state is further reinforced by the fact that the mean surface climate obtained is shown to be generally in agreement with the most recent reconstructions of vegetation and sea surface temperatures, even at regional scales.

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