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Roles of ice-sheet topography, albedo and greenhouse gas forcings in the LGM climate

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The main forcing factors for the LGM climate are the large northern hemisphere ice-sheets, via their topography and their albedo and the lower greenhouse gases atmospheric concentrations. The ice-sheet forcings are expected to modify the radiative balance, most obviously through the surface albedo change related to the ice-sheet presence at mid-latitudes, and atmospheric circulation, e.g. through the direct effect of the large topography difference. The greenhouse gas concentration lowering at the LGM is expected to have an impact at a global scale, with, if symmetrical with the increased CO2 experiments, polar amplification of the temperature response. In this work we investigate the responses of the ocean-atmosphere system to each of these forcings taken separately and compare them to the full LGM response. Two atmosphere-ocean coupled general circulation models, IPSL_CM4 and LOVECLIM are used to establish the robustness of the results, in terms of temperature, circulation and precipitation.