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# Mid-Holocene simulation with a fully coupled ocean-troposphere-stratosphere GCM (EGMAM)

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The EGMAM (ECHO-G with middle atmosphere) fully coupled ocean-atmosphere model is used for simulation of the Mid-Holocene climate. Two long control simulations are performed where boundary conditions are chosen in accordance with the Paleoclimate Modelling Intercomparison Project Phase-II (PMIP2, http://pmip2.lsce.ipsl.fr/) for 6000 BP and for a pre-industrial state (1750 AD) respectively. As solar activity is assumed to be the same for both simulations (fixed solar constant of 1365 W/m2) the main focus is on the role of changes in orbital parameters for the simulated climate.

The simulated climate for Mid-Holocene is compared to the pre-industrial simulation. Here the Mid-Holocene simulation shows higher temperatures for summer season (JJA) in mid- and high latitudes in the Northern Hemisphere especially over the continental areas. For boreal winter season (DJF) the model simulates lower temperatures for the Mid-Holocene in low latitudes, over northern Africa, southern Asia and in the western North Atlantic area between the southern tip of Greenland and Newfoundland. Higher temperatures are simulated above mid-latitudinal ocean areas and especially in the Arctic. Over the North-Atlantic the simulated MSLP change pattern reveals an NAO type pattern with a tendency towards a more positive NAO for Mid-Holocene when compared to the pre-industrial simulation. Results will be compared with other studies based on reconstructions and model simulations.

The changed configuration in orbital parameters in Mid-Holocene also leads to statistically significant changes in zonal mean temperature throughout the atmosphere when compared to the pre-industrial state (1750 AD). For example boreal summer season is characterized by higher temperature in large parts of the stratosphere and lower mesosphere. In contrast to that boreal winter season is characterized by colder temperature in the stratosphere and lower mesosphere at all latitudes with the exception of the NH polar stratosphere, where slightly warmer temperatures are simulated. Possible implications for the circulation in the troposphere and the near surface climate will be discussed.