



Dynamical Downscaling over central and southern South America for different periods of the Holocene

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The present study focuses on regional climate simulations carried out with the community model CCLM forced with lateral boundary conditions taken from the AOGCM ECHO-G. Simulations have been carried out as time slice experiments each covering 40 years for the periods 6,000 years before present [BP] with changes in earth' orbital parameters [$\text{CO}_2=270$ ppm], 1750 AD [$\text{CO}_2=270$ ppm], 1990 AD [$\text{CO}_2=360$ ppm] and for the IPCC greenhouse gas [GHG] change experiment B2 for the period 2050–2079 [$\text{CO}_2\sim 510$ ppm] .

Hypotheses addressed with the regional simulations, specifically for climatic changes between 6,000 years BP and pre-industrial times, relate to hydrological changes based on reconstructed lake levels in southeastern Patagonia. In this respect the simulations indicate most notable precipitation changes over the Andes Mountains and towards the subtropical regions of the Pampas. The eastern parts of the Andes Mountains, i.e. the Patagonian steppe, shows however no clear-cut precipitation changes.

More recent changes, i.e. between the climate of the late 20th century and pre-industrial times, show remarkable near-surface temperature and precipitation changes. Again, largest changes occur over the Andes Mountains, but due to the large magnitude of these changes also other regions show statistically significant values. The magnitude of the differences outreaches the mid-Holocene minus pre-industrial changes by a factor of approximately two. Another interesting feature appears when comparing present-day minus pre-industrial changes with the IPCC B2 scenario minus present-day. Here changes are in the same order of magnitude as for the present-day minus pre-industrial period. This result indicates that the increase in GHG concentrations does not linearly project on the increase in temperatures, but under-proportional. It is hypothesized that based on these simulations climatic change has already attained a large order of magnitude compared to the – in terms of GHG concentrations – anthropogenically undisturbed climate over central and southern South America.