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Simulated Antarctic precipitation and surface mass balance at the end of the 20^{th} and 21^{st} centuries

G. Krinner (1), O. Magand (1), I. Simmonds (2), C. Genthon (1) and J.-L. Dufresne (3)

(1) LGGE/CNRS-UJF Grenoble, France (krinner@ujf-grenoble.fr); (2) School of Earth Sciences, University of Melbourne, Australia; (3) LMD/IPSL, Paris, France

The aim of this work is to assess potential future Antarctic surface mass balance changes, the underlying mechanisms, and the impact of these changes on global sea level. To this aim, this paper presents simulations of the Antarctic climate for the end of the 20^{th} and 21^{st} centuries. The simulations were carried out with a stretched-grid atmospheric general circulation model, allowing for high horizontal resolution (60 km) over Antarctica. The simulated present-day surface mass balance is evaluated. It is found that the simulation is good on continental scales. Errors on regional scales are moderate when observed sea surface conditions are used; more significant regional biases appear when sea surface conditions from a coupled model run are prescribed. The simulated Antarctic surface mass balance increases by 20 mm water equivalent per year in the next century, corresponding to a sea level decrease of 0.78 mm yr^{-1} by the end of the 21^{st} century. This surface mass balance increase is largely due to precipitation changes, while changes in snow melt and turbulent latent surface fluxes are weak. The temperature increase leads to an increased moisture transport towards the interior of the continent because of the higher moisture holding capacity of warmer air, but changes in atmospheric dynamics, in particular off the Antarctic coast, regionally modulate this signal.