



Impact of increased horizontal resolution in coupled and atmosphere-only models of the HadGEM1.1 family upon the climate patterns of South America

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This study analyzes the impact of increased horizontal resolution in coupled and atmosphere-only climate models on the simulation of climate patterns in South America. To this end, we analyze models of the HadGEM1.1 family with three different horizontal resolutions in the atmosphere - 135, 90 and 60 km - and in the ocean - 1-1/3o and 1/3o. In general, the coupled simulation with the highest resolution (60 km) has smaller systematic errors than the atmosphere-only models for seasonal fields over SA (precipitation, temperature and circulation). The simulations, both coupled and atmosphere-only, represent observed spatial patterns related to the seasonal march of the Intertropical Convergence Zone (ITCZ), formation and positioning of the South Atlantic Convergence Zone, and the subtropical Atlantic and Pacific highs; nevertheless they overestimate the rainfall rate, especially for the ITCZ and over the western border of the higher-elevation areas such as southern Chile. For the Atlantic ITCZ and the continental branch of the SACZ in particular, the coupling combined with higher resolution results in a more realistic spatial pattern of rain. All simulations correctly represent the phase and amplitude of the annual cycle of precipitation and air temperature over the most subdomains in South America. The results show that despite some problems, increasing the resolution of the HadGEM1.1 family of models results in a more realistic representation of climate patterns over South America and the adjacent oceans.