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Sensitivity of simulated South America Climate to the Land Surface Schemes in RegCM4

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This work evaluates the impact of two land surface parameterizations on the simulated climate and its variability over South America (SA). Two numerical experiments using RegCM4 coupled with Biosphere-Atmosphere Transfer Scheme (RegBATS) and Community Land Model version 3.5 (RegCLM) land surface schemes are compared. For the period 1979-2008, RegCM4 simulations used 50 km horizontal grid spacing and the ERA-Interim reanalysis as initial and boundary conditions. For the period studied, both simulations represent the main observed spatial patterns of rainfall, air temperature and low level circulation over SA. However, concerning the precipitation intensity, RegCLM values are closer to the observations than RegBATS (it is in general, wetter) over most of SA. RegCLM also provides smaller biases for air temperature. Over the Amazon basin, the amplitudes of the annual cycles of the soil moisture, evapotranspiration and sensible heat flux are higher in RegBATS than in RegCLM. This indicates that RegBATS provides large amounts of water vapor to the atmosphere and has more available energy to increase the boundary layer and make it reach the level of free convection (higher sensible heat flux values) resulting in higher precipitation rates and a large wet bias. RegCLM is closer to the observations than RegBATS, presenting smaller wet and warm biases over the Amazon basin. On an interannual scale, the magnitudes of the anomalies of the precipitation and air temperature simulated by RegCLM are closer to the observations. In general, RegBATS simulates higher magnitude for the interannual variability signal.