Evaluation of RegCM4 over the CORDEX South America Domain: Sensitivity analysis to the Land Surface Scheme for the Amazon Basin

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We compare the performance of the RegCM4 (ICTP Regional Climate Model) coupled to the land surface schemes CLM 3.5 (Community Land Model) and BATS (Biosphere Atmosphere Transfer Scheme) in a 30-year simulation (1979-2009) over CORDEX South America Domain. In general, the coupling of RegCM4 with the CLM substantially improves the simulated climatology over tropical South America relative to the default version of RegCM4 (coupled with BATS). One of the main features is that the RegCLM improves the precipitation climatology and annual cycle, reducing the summer wet bias, over the AMZ basin. With respect to the surface energy balance, RegBATS scheme prescribes lower monthly albedos over the AMZ, resulting in higher solar radiation absorption by the surface. Moreover, RegBATS tends to simulate a higher sensible heat flux and lower latent heat fluxes over the AMZ during the dry season, diverging from observations. The surface water balance also changes considerably between the two simulations. Compared with RegBATS, RegCLM simulates lower precipitation and runoff, as well as less water into the total soil column. RegCLM improves the water balance along the year, reducing the ET (Evapotranspiration) overestimation during the wet season, even though still overestimating it, and simulating closer ET values during the dry season. RegBATS simulates higher sensible heat fluxes and lower ET during the dry season. The Bowen Ratio based on fluxes tower observations, in the AMZ basin, suggests a practically constant value along the year, pattern better simulated by CLM (albeit still poorly represented such a pattern), suggesting a better representation of the net surface energy partitioning. This better representation improves, consequently, the simulated precipitation and air surface temperature, when compared with the observations. Even though the RegCLM improves the precipitation and air temperature.