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Global and regional models projections of the climate and its variability over the South America-CORDEX domain

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For the South America CORDEX domain, this study investigated the consistency between global climate models (GCMs) and the nested regional model RegCM4 in simulating the climate and its variability. Three GCMs (MPI-ESM-MR, GFDL-ESM2M and HadGEM2-ES) were used to drive RegCM4 simulations in the present (present: 1975-2005) and future (near: 2020-2050 and far: 2070-2098) climates, considering RCP4.5 and RCP8.5 greenhouse gas concentrations pathways. This provided a total of 16 simulations and for each time period we also obtained the ensemble mean. The consistency between each RegCM4 simulation and its respective driven GCM is evaluated through of spatial pattern correlation of simulated fields for the interannual variability and seasonal trends. The interannual variability is evaluated by considering El Niño (EN) and La Niña (LN) years according to the Oceanic Niño Index (ONI) of the Niño 3.4 sea surface temperature. Considering the seasonal precipitation trends, the spatial pattern correlation is greater than 0.66 for all simulations, attaining a maximum of 0.84 for some individual simulations. For the seasonal trends of the ensemble means, correlation values for both near and far future climates are 0.77 and 0.83 respectively in the RCP4.5 and RCP8.5 scenarios. These numbers indicate that greater consistency between GCMs and RegCM4 occurs for the ensemble mean trends and for the warmer scenario (RCP8.5). The consistencies between RegCM4 projections and the driven GCMs are overall smaller when considering the anomalous precipitation associated with EN and LN years. Besides, it is also discussed that some simulations, subdomains and seasons have greater GCMs control than others in defining the RegCM4 simulated spatial pattern.