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Performance of RegCM4 in Simulating Subtropical Cyclones over the Southwestern South Atlantic Ocean

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Subtropical cyclones (SCs) climatology is evaluated in three simulations of Regional Climate Modeling version 4 (RegCM4) and in its global climate models (GCMs) drivers (HadGEM2-ES, MPI-ESM-MR and GFDL-ESM2M) over the South America domain. Three algorithms are applied to identify the SCs: the first tracks all cyclones, the second computes the thermal structure of the cyclones based on the Cyclone Phase Space (CPS) methodology, and the third automatically selects only the cyclones with subtropical features. After that, two ensembles were performed (RegCM4 and GCMs) and their climatologies are validated through comparisons with ERA-Interim reanalysis for the period 1979-2005. Over the southwestern South Atlantic Ocean, the annual average and standard deviation of SCs are 8.0 ± 2.5 , 7.6 ± 2.3 and 7.2 ± 3.0 , respectively, in ERA-Interim, RegCM4 and GCMs. Although both ensembles have a good performance in simulating the climatology of SCs, RegCM4 over perform the GCMs showing a better skill in representing both the annual mean and the interannual variability measured by the standard deviation. Moreover, RegCM4 simulates the spatial pattern of the cyclogenesis density closer to ERA-Interim than GCMs, which is another added value of the regional downscaling. SCs represent a small fraction of all cyclones over the region, which is 4.1% in ERA-Interim and GCMs and 3.5% in RegCM4. The relative importance of SCs to the total of cyclones increased to ~40% in the region near the southeast coast of Brazil. In terms of seasonal mean, simulations are able to capture the observed pattern that has the austral summer as the most cyclogenetic season.