



## **Extratropical Cyclones over Southwestern Atlantic Ocean: Present and Future Climates projected by RegCM4**

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This study shows some of the climatological features of the extratropical cyclones in present and future climate over Southwestern Atlantic Ocean (SAO). The projections were carried out with Regional Climate Model (RegCM4) nested in HadGEM2-ES global model outputs and using representative concentration pathway 8.5 (RCP8.5) from the CMIP5. The simulations considered the South America domain suggested by CORDEX, horizontal grid spacing of 50 km, 18 sigma-pressure levels in the vertical. An objective tracking scheme based on cyclonic relative vorticity calculated using the wind at 925 hPa was used to identify the cyclones. All cyclones with relative vorticity lower than the  $-1.5 \times 10^{-5} \text{ s}^{-1}$  and with lifetime higher or equal 24 hours were included in the climatology. Considering the period from 1979 to 2098, RegCM4 and HadGEM2-ES project a negative trend in the frequency of the extratropical cyclones over SAO, with the biggest negative trend occurring in the latitudinal band between  $40^{\circ}\text{S}$  and  $57.5^{\circ}\text{S}$ . This result can be associated with the southward displacement of the baroclinic zone which contributes to the cyclones move to south leaving the region analyzed. The three subregions with largest cyclogenetic activity discussed in the literature (southeast coast of Brazil – RG1, coast of Uruguay and southern Brazil – RG2; east coast of Argentina - RG3) were better reproduced in RegCM4 than in HadGEM2-ES. Therefore, RegCM4 downscaling ads value in the HadGEM2-ES projections. The frequency of cyclones in present (1979-2005) and future climate (2070-2098) is higher in winter and lower in summer. Regarding the mean characteristics of the cyclones (life time, travel distance, velocity, initial relative vorticity and total average vorticity), both models successfully reproduced those obtained in the reanalysis (NCEP1, NCEP2, CFSR, ERA40 and ERA-Interim) and there are no significant differences in the future climate compared with the present.