Future climate projections of cyclones in RegCM4.7 over South America and South Atlantic Ocean

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Introduction and objective

- Cyclones affect the weather and climate contributing to high precipitation accumulations and intense winds [1, 2, 3, 4].
- Scientists have been interested in climate change, and how it will affect the world in the future
- It is important understand the atmosphere physics in he future to developing adequate strategies for mitigation and adaptation

Objective

- Main focus is to understand how global warming will affect cyclones tracking and variability by using the Regional Climate Model version 4.7 (RegCM4.7).

Data

Period

→ Present (1979-2005) and future (2006-2060)

RegCM4.7 boundary conditions

→ HadGEM2-ES, MPI-ESM-MR and ERAInterim (only historical)

Reanalysis

→ ERA5

Methods

Track scheme

→ Algorithm based on the cyclonic relative vorticity in 925 hPa to identify and track cyclones [5].

Statistics

→ Genesis density, annual and seasonal frequency

→ Analysis separated in three cyclogenetic regions: south/southeast Brazil (~25 ºS), extreme south of Brazil and Uruguay (~32 ºS) and Argentina (~47 ºS) [6]

→ Two period for the future considering RCP85: Near Future (NF, 2006-2030) and Far Future (FF, 2031-2060)

Results

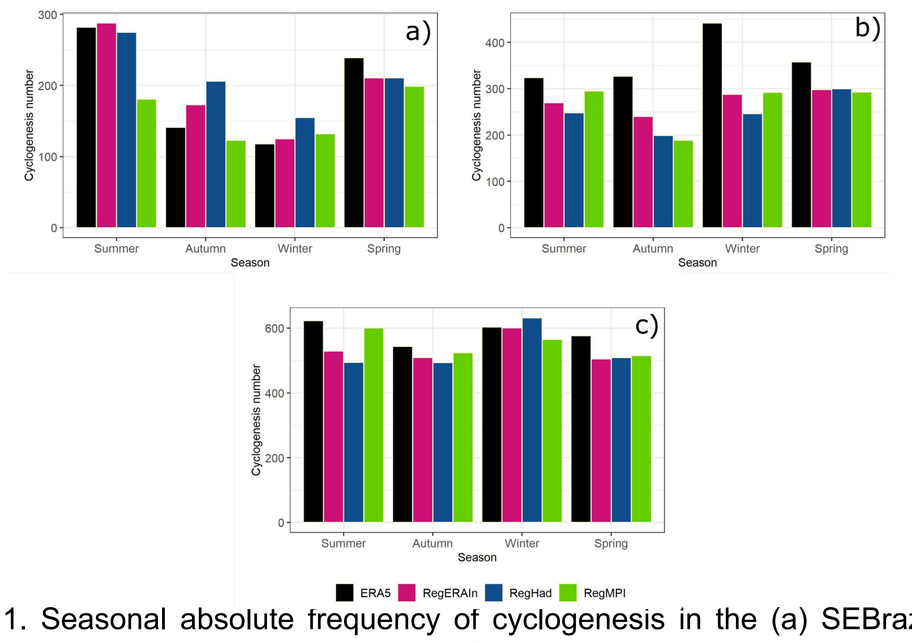

Figure 1. Seasonal absolute frequency of cyclogenesis in the (a) SEBrazil, (b) Uruguay and (c) Argentina for the period 1979–2005.

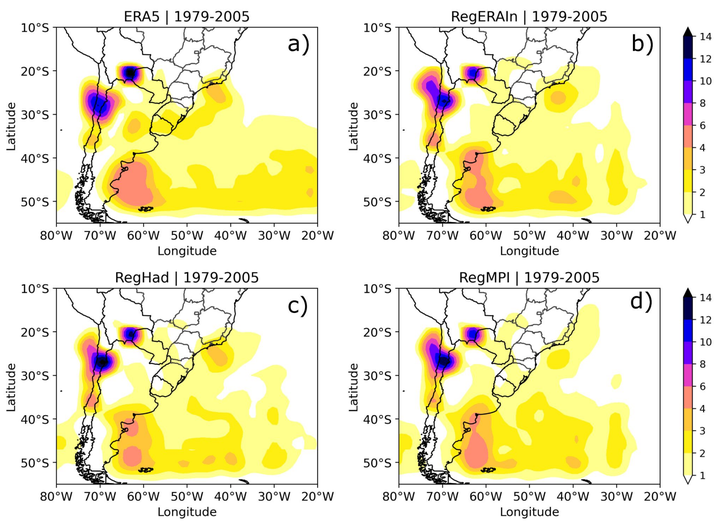

Figure 2. Annual mean of cyclogenesis density for the present climate (1979–2005). a) ERA5, b) RegERAIn, c) RegHad, d) RegMPI. The density unit is cyclone per area (km^2) × 10^5 per year.

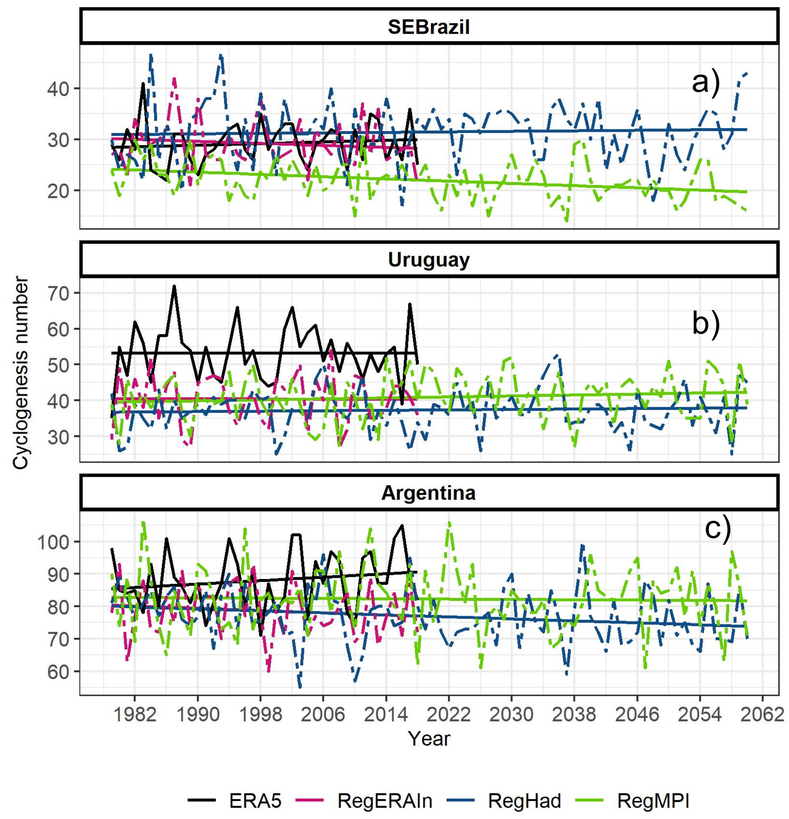

Figure 3. Future changes in the annual frequency of cyclogenesis (1979-2060) for (a) SEBrazil, (b) Uruguay and (c) Argentina.

Results

Evaluation

→ RegCM4.7 simulations reproduce the three cyclogenetic regions in the east coast of South America (Figure 2)

→ The simulations have better ability to simulate cyclones frequency in Argentina and SEBrazil regions than in La Plata/Uruguay (Figures 1 and 2)

→ RegCM4.7 have higher frequency of cyclogenesis (Figure 1) in:

- Winter and spring in Uruguay
- Summer and spring in SEBrazil

→ In Argentina the differences between the seasons are small

Future Changes

→ Decrease in annual frequency until 2060 for RegMPI and RegHad (Figure 3)

→ The two simulations for the both periods (Figure 4) project for:

- Uruguay: increase in autumn and decrease in summer
- SEBrazil: decrease in winter

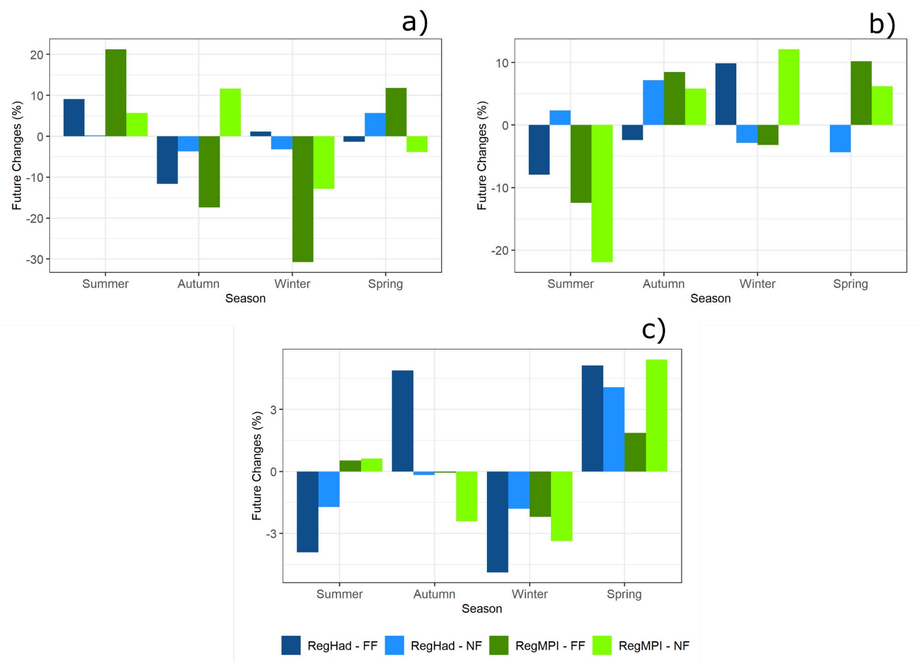

Figure 4. Future changes of seasonal frequency of cyclogenesis in the (a) SEBrazil, (b) Uruguay and (c) Argentina.

References

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