Projected changes in precipitation, temperature and their extremes over tropical South America through the RegCM4 ^{1*}Da Silva M.L., ²De OLiveira C.P., ²Santos e Silva C.M., ¹Alves L.M. ¹National Institute for Space Research, São José dos Campos-SP, Brazil ²Postgraduate Program in Climate Science, Federal University of Rio Grande do Norte, Natal-RN, Brazil *<u>leidinicesilva@gmail.com</u>

0 150 300 450 km

The problem

- The frequency and intensity of extreme events induced by global warming have increased significantly, causing impacts on the development of society and ecosystems [1];
- In this sense, the RegCM4.7, was run to produce simulations and projections based on low (RCP2.6) and high (RCP8.5) GHG emission scenarios;
- Besides evaluating the AV of RegCM4.7 in reproduce spatio-temporal features, this study attempts to answer the following question:

According to RegCM4.7, how will the climate crisis affect extreme events in TSA?

Experiment design

Figure 6. Spatial pattern of MBE and AV of the precipitation and temperature indices in TSA. The left panels are MBE of RegCM4.7, the middle panels are MBE of HadGEM2-ES, and the right panels are AV. Dots represent the statistical significance of Student's t-test at a 95% level.



- Tropical South America (TSA) domain (Figure 1);
- ICTP RegCM4.7 regional climate model [2];
- HadGEM2-ES (CMIP5);
- 1986-2005 (Historical) and 2079-2099 (Projection);
- 25 km horizontal grid spacing;
- Model setup [3];
- Extreme climate indices (ETCCDI) [4];
- Model evaluation: climatology mean, added value and variability.

Results

Figure 2. MBE and AV maps of precipitation and temperature over TSA. Dots represent the statistical significance of Student's t-test at a 95% level









Figure 7. Spatial changes of precipitation and temperature indices in TSA for the period 2080-2099 with respect to the period 1986-2005. Dots represent the statistical significance of Student's t-test at a 95% level.

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Figure 8. Relationships of precipitation and temperature indices between the far future (2080-2099) and the

Figura 3. Hovmöller diagram for the annual cycle of the precipitation and temperature over the 80°W-15°W.



Figura 4. Annual cycle and Taylor diagram of precipitation and temperature for the TSA subregions: SAMZ, ENEB and MATOPIBA.









10°S



Conclusions

- RegCM4.7 is capable of AV in the mean climate over NEB and part of the Andes. However, it does not adequately represent precipitation over the AMZ;
- The underestimation of precipitation in AMZ is a persistent feature of the regional climate models [3];
- Systematic errors of HadGEM2-ES were persisted by RegCM4.7;
- RegCM4.7 improves the projected changing patterns and modifies the precipitation signal in some cases. Both models project a higher temperature rise for RCP8.5.

Figure 5. Spatial patterns of projected changes for precipitation (%) and Temperature (°C) in TSA. Dots represent the statistical significance of Student's t-test at a 95% level.





- However, RegCM4.7 presents a more refined and realistic spatial distribution;
- Over the TSA, the magnitude and severity of climate change will increase by the end of the 21st century the frequency and intensity of extreme events.

References

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