**Open Review**

(x) I would not like to sign my review report  
( ) I would like to sign my review report

English language and style

( ) Extensive editing of English language and style required  
( ) Moderate English changes required  
(x) English language and style are fine/minor spell check required  
( ) I don't feel qualified to judge about the English language and style

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|  | Yes | Can be improved | Must be improved | Not applicable |
| Does the introduction provide sufficient background and include all relevant references? | (x) | ( ) | ( ) | ( ) |
| Are all the cited references relevant to the research? | (x) | ( ) | ( ) | ( ) |
| Is the research design appropriate? | ( ) | (x) | ( ) | ( ) |
| Are the methods adequately described? | ( ) | (x) | ( ) | ( ) |
| Are the results clearly presented? | ( ) | (x) | ( ) | ( ) |
| Are the conclusions supported by the results? | (x) | ( ) | ( ) | ( ) |

Comments and Suggestions for Authors

This works presents the main large-scale atmospheric processes connected to the precipitation anomalies observed in the Tropical South America. To pursue their goals, the authors used an observational-based gridded dataset (the GPCC Full Data Monthly Product) and the ERA-20C reanalysis dataset, as well as several teleconnections indices (related to SST anomalies). A well-known Principal Component Analysis (PCA) has been carried out to extract the leading modes of precipitation variability in the study area.

The overall judgement about this study is positive. In my opinion, the results from this study can be of interest for the atmospheric scientists dealing with Tropical Meteorology and Climatology. However, I think that this paper can be considered for publication on Atmosphere after the authors have fixed the following questions.

Main comments

*1) In Data and Methods Section, the authors stated that they limited their study to 1931-2016 period, because before 1931 there were too few stations in the study region (mainly over Amazon). In my opinion, more details about this point are necessary. It is very important to assess the impact of the number of stations on the reliability over the time of the considered gridded-data set. Can you produce a simple plot showing the evolution over the time of the number of rain-gauges available for the study region?*

R: We thank the reviewer for this comment that adds useful information in the present study, when we decided to limit our study period to the 1931-2016 range, we based our decision in the maps of the number of stations for each pixel in the dataset. We have added a figure in supplementary material (Figure S1), as the figure shows, the plot for 1931 is the first one to show stations over the Andes and the central Amazon rainforest. We believe that data prior this time (as seen on the 1921 figure and the ones before) are not sufficient for the analysis we perform.

*2) About the methods. Can you motivate the use of PCA? Why did you not use the cluster analysis?*

R: PCA is very useful tools for studying of climate. We chose this technique as it is very adequate to distinguish among different modes of variability that are independent from each other (as each PC is calculated after the effect of the previous ones is removed), which was the objective of our analysis. Another reason for us to choose PCA was that we needed to reduce the dimensions of our dataset, thus this method was the most suitable to fulfill of these requisites.

*3) Section 3.1 (lines 149-152). Those sentences must be motivated and supported by a quantitative investigation (for example by a correlation analysis). See the next comment.*

R: We thank the reviewer for this suggestion. Please refer to our reply for the next comment.

*4) A point of weaknesses of this work is related to the absence of a coherent quantitative investigation about the relationship between the main PCs and the large-scale atmospheric features. For example, I think that is necessary to perform at least a correlation analysis to support the association between the first PCO (considered in terms of amplitude) and the SACZ intensity, as the authors have done to support their findings about the linkages between the second PC and the ENSO.*

R: We are thankful to the reviewer for this observation that improves and strengthen the analyses of our manuscript. In order to calculate the SACZ intensity we calculated an index based on Outgoing Longwave Radiation (OLR) data over central-eastern Brazil delimited by 65–30◦ W, 40◦ S–0◦ N. The SACZ index is the first PC of the DJF OLR anomalies over this area. This methodology is described in [1]. We had to calculate the correlation between PC1 and the SACZ index for the 1979-2016 period, as OLR data is only available since 1979.

When we correlated the SACZ index with our PC1 we found a correlation coefficient equal to 0.69. Thus, we confirm that our first PC and the associated precipitation anomalies are related to the SACZ intensity.

*5) Section 3.2: what happens in the negative phase of the second PC?*

We have added the effects in precipitation anomalies of La Niña (or the negative phase of the second PC) to Section 3.2.

*6) Moreover, I do not see any detailed analysis or discussion about the variability over time of the precipitation anomalies, with specific reference to the last 50 years (1970-2020), in which most of the global warming phenomenon occurred. I suggest to add a section about this point and to investigate about (potential) changes in the relationship between large-scale features and tropical south America precipitation anomalies in the global warming era.*

R: As observed in Figure 5, the 4 leading PCs of precipitation anomalies in Tropical South America do not have any observable trends over time. Thus, these time series do not show a sign of the climate change in the past 50 years. However, we do comment on the implications of our results in the context of climate change in the Conclusions section. We refer to how the SAMS has changed, and also about how the relation between our PCs and their corresponding precipitation anomalies could be useful to infer precipitation changes should these modes of variability change in the future. However, there is an apparent, change in the frequency and amplitude of the extremes after 1970, we have made a comment about this in the conclusions.

 Minor comments

*1) I suggest to standardize the citation style within the text. According to MDPI Journal style, the reference citation numbers should be placed in square brackets, i.e. [ ], and placed inside the punctuation. For example, at Page 2 (line 50) I see a different citation style.*

R: We thank the reviewer for this comment, we have fixed these errors of standardization in the citation style format.

*2) At the end of the introduction section, the authors should devote a couple of sentences to the structure of their manuscript.*

R: We thank the reviewer for this comment. We have written a short paragraph in the end of the Introduction section. We think this is a good addition to our manuscript.

*3) Figure 2: I suggest to reverse the colorbar. Usually, the red colors indicate positive values, whereas blue colors are related to negative values. Please modify the colorbar and make it consisent with the other figures. The same consideration can be applied to the Figure 8.*

R: We thank the reviewer for this comment. This is something that we considered carefully and discussed when deciding on the color bars, not only for this figure but also for the others (4 and 6). We decided on the color bars as they are to relate blue colors to more rainfall, moisture, and thus water; and red colors to less rainfall and thus drought. This is also stated in the figure captions. We believe this makes for a more intuitive reading of the papers and figures. Therefore, we would like to keep our figures in their current format.

*4) Conclusions (Pag. 11, lines 343-344): the investigated period is 1931-2016, not 1931-2010.*

R: We thank the reviewer for their careful revision of our paper, we have corrected this typo.

*Finally, I suggest to carefully check the paper in order to address some minor typos.*

R: We have checked our paper to correct the mentioned typos.

**References**

Sulca, J.C.; Rocha, R.P. Influence of the Coupling South Atlantic Convergence Zone-El Niño-Southern Oscillation (SACZ-ENSO) on the Projected Precipitation Changes over the Central Andes. *Climate* **2021**, *9*.