

## Revision

To

Dr. Fernanda Cerqueira Vasconcellos  
Universidade Federal do Rio de Janeiro,  
Instituto de Geociências  
Editor of the  
Anuário do Instituto de Geociências

Dear editor,

Please see below (in blue) the answers to the reviewers comments regarding the submitted paper "Soil-vegetation Parameters Variability in the West Region of Santa Catarina State"(AIGEO\_2023-v4). I approached each comment (in blue) and a new manuscript version is now submitted. In this new version, I used the red color on the text to point out the major changes.

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Reviewer A:

1. I think that the authors made important improvements. However, I still believe that results could have been better explored in the discussion section. Nevertheless, I consider that the paper is appropriate for publication.

**R - An improved discussion of the results is now included in the new version of the article.**

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Reviewer B:

General comments:

The problem addressed by the authors is scientifically relevant. However, this relevance is not well explored in the introduction section. I believe that the introduction should focus more on the scientific problem than on the tools, so I suggest a reformulation of this section to better explore the problem presented in its second to last paragraph. About the methodology section, the description of the data and tools is adequate, but it would be interesting to include a

paragraph summarizing the methods used, integrating all these tools.

The results could be further discussed, relating the findings to the influence of modes of climate variability and other aspects that characterize the climate of the studied region. In addition, it would be interesting to compare the results with other studies carried out in the region or in regions with similar climatic regime.

Finally, the authors should be careful with some statements regarding climate change, always taking into account the limitations of the data series and pointing out the statistical significance of the calculated metrics (e.g. linear correlation).

The work is within the scope of the "Anuário do Instituto de Geociências IGEO/UFRJ", but the authors could explore more their tools and data, improving the discussions, considering the great relevance of the theme and its importance to the studied region.

I would recommend the publication with major changes.

**R - Some improvements were included in the introduction to highlight the scientific relevance of the performed analysis including the recent efforts to understand the extreme events (e.g. Herring et al., 2022, 2023).**

**However, the methodology introduction insights is kept because a major contribution of the article is to provide a method that can be applied into other regions of interest.**

**On the results a further discussion includes recent results (e.g. Grimm et al.2020) that explore the influence from combinations of multidecadal climate variability on the South Brazil region drought periods.**

#### **Specific comments:**

- The authors propose to evaluate the temporal and spatial variability of soil-vegetation variables in the West Region of Santa Catarina State.

However, the title was changed to "Soil-vegetation Variables Changes in the West Region of Santa Catarina State". After all, is the objective climate variability or climate change analysis?

**R - Indeed the suggested title is more suitable with the paper focus. Therefore, the new title "Temporal and spatial variability of soil-vegetation variable in the West Region of Santa Catarina State" is now adopted in the new version.**

- It would be better to start the methodology section by presenting the study area.

**R - The methodology starts now with the study area section in the new version.**

- I would replace the NLDAS picture with one made by the authors, based on the original, for copyright reasons.

**R - A new figure was created and the previous one was replaced in the new version.**

- The last paragraph of the methodology section should be outside the GRACE section, as a summary of the methodology.

**R - The last paragraph is now located on a new section named 2.5 Summary and further details.**

- The linear correlation presented in Figure 3 is not spatial, but temporal correlation for each grid point.

**R - The legend of Figure 3 was corrected in the new version to "Temporal correlation for each grid point ..."**

- What can explain the differences in climatological rates of evapotranspiration among the regions of Santa Catarina?

**R - The evapotranspiration climatology can be associated with distribution of precipitation and vegetation cover. For instance, in the state of Santa Catarina higher evapotranspiration over the center west and over the east coast can be associated with distribution of precipitation. The Climatological Atlas shows higher precipitation on these locations as compared to other regions of the state (Pandolfo et al., 2002). At the east coast beyond higher precipitation, there is the presence of the Atlantic Forest that can contribute to transpiration.**

**These comments are included in the new version.**

- Why use the soil moisture in the first Noah layer (10 cm)? It would be better to use the integrated soil moisture in all layers, since the root zone usually exceeds 10 cm.

**R - The deeper layer up to 100 cm is now included in the new figure. The results show that the anomalies are observed on deeper layers, thus it corroborates the importance of soil moisture on the evapotranspiration fluxes. The new figure and discussion are included in the new version.**

- In the discussion of figure 5, the authors point out that the western region of Santa Catarina has suffered from extreme events in the last decade. Wouldn't it be better to use daily precipitation data to evaluate extreme events? I don't know if the monthly accumulations reflect extreme events.

**R - Extreme events such as the record anomalous months can be considered as a climate extreme event. See for instance the annual special issue of the American Meteorological Society bulletin (BAMS) "Explaining Extreme Events from a Climate Perspective" available at:**

**<https://www.ametsoc.org/ams/index.cfm/publications/bulletin-of-the-american-meteorological-society-bams/explaining-extreme-events-from-a-climate-perspective/>**

**An improved discussion on this definition is included on the introduction of the new version.**

- In the discussion of figure 6, the authors point out that the lowest soil moisture value found in the data series has never been observed before. It is important to point out that the value has not been observed in the available data series, which does not guarantee that it has never happened before. It is always important to highlight the limitations of the data series and the methods employed.

**R - The new figure 6 now includes a deeper soil layer and thus allowed a better discussion of the anomalies. Furthermore, improved statistics included on the text compare the recent lowest record in the soil moisture with the previous recorded data.**

Finally, the statement that there is an ongoing climate change in the region has no statistical support, so I would suggest that this statement be presented only as a hypothesis to be investigated.

**R - An improved discussion is now posted on the text suggesting further studies to better understand the impacts of climate change on the region.**

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