

Interactive comment on “South Pacific Subtropical High from the late Holocene to the end of the 21st century: insights from climate proxies and general circulation models” by Valentina Flores-Aqueveque et al.

Anonymous Referee #2

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The study presents an analysis of the South Pacific Subtropical High (SPSH) in two periods of extreme climate in the Last Millennium, i.e. the Little Ice Age (LIA) and the present-day climate, referred to as Current Warm Period (CWP), and a future RCP8.5 scenario. The model analysis and paleoclimate records suggest that, in the CWP compared to the LIA, the SPSH expands poleward and the Southern Westerly Winds (SWW) along the coast off South America intensify and shift southward.

The manuscript presents a good literature review on the topic, the methods are sound, but I found the results are half supported by the analysis. Despite that, I believe the

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manuscript contains important information for the region and I recommend publication after revisions. A few comments below.

Based on previous literature, the authors discuss the link between the ITCZ and the SPSH and hypothesize that the differences in the SPSH strength, position and associated SWW between LIA and CWP is related to changes in the ITCZ and Hadley circulation. However, climate models do not simulate the expected changes in the position of the ITCZ and ERA-Interim differs substantially from models. Therefore, the mechanisms proposed here cannot be verified. Even though changes in the ITCZ cannot be supported, Figure 4 depicts a nice schematic with different position in the ITCZ. At least a cautionary note should be added here to not mislead the readers.

As mentioned in the discussions, extratropical dynamics may also play a role in those changes. For example, could different sea-ice extension between the two periods a possible driver of the SPSH changes? In addition to that, the differential heating between land and ocean (see Fig. S1 for the difference in temperature between the South Pacific and South America) can create a pressure gradient that by geostrophy can accelerate the SWW. Exploring these other mechanisms could help in the interpretation of the paleoclimate records. Or at least it is worth a discussion in the manuscript.

ERA-Interim is used in this study. Note that this reanalysis has been superseded by the newest generation of ECMWF reanalysis, ERA5, and discontinued this year. Not a big deal for this study and the type of analysis presented here, but keep in mind when justifying dataset choice in future studies.

On page 10, p.30, this text needs rewording: “This behaviour can be interpreted as a contraction of the tropics in response to anthropogenic forcing, . . .” It is not intuitive that increase in greenhouse gases would lead to a contraction of the tropics. There is also no mechanism to explain how this can happen. In fact, climate models suggest the opposite, i.e. an expansion of the tropics due to increase in greenhouse gases. Rewording this sentence may be needed.

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On page 15, para 10, there is a citation to Fig. 5 that is not in the manuscript.

Figure 2: The magenta and red lines are hard to distinguish. Figure 3: All axis labels need to be enlarged. Lines are too thin, barely can see the dashed lines.

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