

## ***Interactive comment on “Relative importance of increased atmospheric CO<sub>2</sub> concentration and local moisture deficit to hot extremes” by Ajiao Chen et al.***

### **Anonymous Referee #2**

Received and published: 17 January 2021

This research presents evidence on which driver, either the enhancement of CO<sub>2</sub> molar fraction or the soil moisture deficit, dominates the temporal occurrence of hot extremes at the global scale. The methodology is based on applying a wavelet analysis (GRACE) to a long climatologically data set that ranges from 1985 until 2015. The findings identify which regions characterized by different ecosystems are influenced by soil moisture deficit and which ones by the atmospheric CO<sub>2</sub> molar fractions. Although the findings are per se might be worth to be published, I found that the analysis and the writing of the paper is done in a hasty manner and therefore requires major revisions.

Below my recommendations:

C1

1.- I think the representativeness of the statistical analysis should be placed in a better perspective and with clearer justifications. I am particular concern on how they attribute the correlations to the specific dominance of a driver. This requires a much in-depth elaboration throughout all the paper.

2.- I believe it is interesting to provide a global perspective, but I think the authors are in a position to provide more evidence at the regional scale. For instance, in Figure 3, they could select representative regions characterized by differentiated ecosystems and explain in more detailed the differences. At figure 3b, it is clear that the Amazonian basin has a contrast behavior in two areas that is also observed in Figure 7. Why? Could they please elaborate and provide more detail explanation supported by figures?

3.- Closely connected to this, I miss more in-depth explanations on the causality of their effects. There are some attempts to explain a connection of feedbacks (lines 131-133), but in the majority of the results the reader is left out. In my opinion, at section 3.3 (I will call it discussion) the authors have an unique opportunity to provide some diagrams that show the feedback relations and the effects of the enhancement of CO<sub>2</sub> or soil deficit in the hottest month.

4.- In my opinion, there is a driver that is missing in the discussion: the water vapour pressure deficit. What is the role played by this variable in enhancing the warming of the hot extremes? Could they calculate it also using their wavelet analysis and then relate it to their findings?

5- The wording throughout the article is casual and not very exact. Would it be possible to identify the important ecosystems like the tropical rain forest, temperate or boreal forests instead of mentioning the continents (Africa, South America,...)?

6- Figure 8 at section 3.3 appears out of the blue. In my opinion, it needs to be removed or much better embedded. As an alternative, un my opinion preferable, the extra space should be addressed to a more in-depth explanation of the cause-effects dominance of either enhanced CO<sub>2</sub> or soil moisture deficit on the hot extremes.

C2

