

Review Strigunova et al. WCD by Paolo De Luca

The study by Strigunova et al. addresses the linkages between Eurasian heatwaves and Rossby waves. They used a small sample of CMIP5 models belonging to historical, AMIP and RCP4.5 experiments, along with ERA5 reanalysis. They show agreement between the models and ERA5 in reproducing surface temperature over Eurasia, EHWs and anomalies of Z500 during EHWs. However, there is little agreement between models and ERA5 when it comes to day-to-day variability of Rossby waves.

I personally find the paper very interesting and also timely, however there are several methodological, structural and written aspects of it that require the foremost attention of the authors, before the paper can be considered acceptable for publication. Please see below my comments.

Major comments

I think the abstract lacks a concluding sentence. Or, what are the implications of your study? Whether they are purely scientific or impact related.

L44 (and elsewhere) you refer to different metrics used for computing heat extremes. I think you should at least mention some of them to inform the reader about some of their differences. You can look here <https://climpact-sci.org/indices/> for a general overview. Also, in our paper we used some of them: <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2022GL102493>

L62-77 this should go in the Methods section and adjust accordingly L78-81.

L83-86 should be removed and the details of the reanalysis used incorporated into Section 2.1 which can be renamed: “Reanalysis and CMIP5 datasets”.

Section 2.1 specify the horizontal resolutions of the reanalysis and models, and if they have been regridded. Also make clear which variables did you use for the analysis.

The paper lacks a clear Methods and Data section. For instance in Section 2.2 from L111 there is a description of the method along with a presentation of some of the results, same in Section 3.1. Could you please confirm that this is a suitable format for WCD?

In the estimation of the EHW metrics you used two different periods: 1980-2005 and 2070-2100. Then in Table 1 you compare the number of HW days and HW events between these periods. I don't think this makes sense, because a longer period will likely contain more heatwave days and events. I think you should compare two periods of the same length, e.g. 1970-2000 and 2070-2100, so that you also compare the end of the two centuries.

Following my previous comment, in Figures 2-3 the climatologies of the models are computed for 1980-2005, whereas the ones of ERA5 for 1980-2019. That's a 14-year difference. Also climatology by definition isn't it minimum 30 years? I wonder if results change when considering two periods of the same length.

The statistical significance of the composites in Figures 3 and 4d-f is not assessed. This should be addressed with for example a parametric (or non-parametric) test between Z500 during EHWs and Z500 during non-EHWs.

Section 3.3. Although you refer to Setal2022 is not clear from the text to what type of energy you are referring to. Please make it clear in the section, although this should be described in the Methods section.

In Section 4 (Summary and conclusions) the study is not put into the broader perspective of the current literature, except for one link to "(e.g. Schaller et al., 2018; Brunner et al., 2018; Jeong et al., 2022)". The authors should discuss more the implications of their results and research gap addressed with their study by linking it to other studies.

Minor comments

L8 EHWs

L11 please add two key references supporting the statement

L12 you can add <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2022GL102493>

L18-19 word “bias” repeated three times in less than a row. Suggest to amend to “due to regional inaccuracies” and “atmospheric misrepresentation of teleconnections”

L26 CMIP5’s

L27 “anomalies” repeated twice

L33 NH? Please define acronym if you use it later on, otherwise just write “northern hemisphere”

L37 “in relation to comparably” not clear, please rephrase

L38 double repetition of “trends”

L42-43 “that climate models”

L51-52 I think you can remove the sentence. Looks like a repetition of L39-40.

L55 “It coincides” what? The reduction of the RW variance? Please clarify

In general, when you refer to the models you used throughout the text, mention them as “CMIP5” and not as “CMIP”.

L83 “for identifying”

L107 remove first sentence. Also, did not you use also the method from Ma and Franzke (2021)?
Please clarify

L110 “we extend the set in by” ?

Section 2.1 add citations CMIP5, AMIP and RCP4.5

L139 “do not directly”

L141 “AMIP”

L142 “the boxplots”. Also refer to figure 1.

L158 “the latter are” ?

L160 “Setal2000” ?

L168 change “heat waves” to “HWs”

Figure 4, make colorbar larger as the other ones.

L200 “Setal2022” or “Setal2022” ?

L207 “for all days HIST and AMIP” not clear.

Figure 6 caption: “for ERA5”

L218 EHWs are not defined only by T2m, but by other criteria too (e.g. persistence?). You can say
“are defined by using near-surface.....”

L219 if you mention the future period in the sentence you should also mention the present-day period.

L221 “reanalysis”

L225 “4”

L225-226 “it should be highlighted”

L232 “blocking pattern”

L238 “lead to the following”

L241 “Rossby”

L242 “reanalysis”