

Review of revised manuscript “wcd-2022-28”

Title: Decadal variability and trends in extratropical Rossby wave packet amplitude, phase, and phase speed

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Summary

As requested, I reviewed the revised manuscript along with the author responses. I found that the manuscript has been improved on several aspects, while the author also clarified raised comments and as to why to refrain from some proposed revisions. At the same time, I also feel that the improvements have been done partially, and that several of my comments need to be reconsidered along with additional changes in the manuscript. After implementing these changes, or clearly motivating why these changes are not desired, I recommend the manuscript to be accepted for publication. Below I outline these open points in a few general and minor comments.

General comments

1. Motivation of the study, and the interpretation and implications of the results

The revised manuscript improved by including a statement on the implications of the work in the abstract. Still, I feel that, after another careful read of the entire revised manuscript, that the main message of the article remains somewhat hidden. Here I do not suggest extending the material of the manuscript in other directions as perhaps unintentionally suggested in my earlier review. After re-reading the manuscript, I still wonder, what is the key message of this work that readers should take away? Perhaps, that decadal variability and trends of RWP characteristics vary substantially across regions and seasons? This may be important information in context of regional circulation changes in a warming climate and weather extremes (as indeed addressed as motivation in the introduction). I would like to suggest including the main message of the work in the abstract, for example, by replacing the phrase “; a manifestation of the pronounced in some areas and season” (lines 19-20) – which I find rather unclear – by such a key message. Also, I think the key message should be articulated in the “Summary and concluding remarks”.

In addition to this general comment, I also think that one of the key points of section 3.1 – the positive (negative) trend in E over the N Pacific in DJF (JJA), and the narrowing distribution and reduced E over the N Atlantic in DJF and JJA, respectively, (based on Fig. 5) deserves to be mentioned in the conclusions. If the author agrees, perhaps a sentence on this subject can be added at line 415, between the sentence ending with “... underestimate E.” and starting with “Focusing on the 1979-2019 ...”.

2. Section 3.3

Okay, thanks for the clarification and mentioned text revisions.

3. Section 3.4

Thank you for the clarification on the analysis using two 20-year periods. About the (compound) extremes in other seasons, it is great these figures are added in the Supplement. However, in my opinion, the results for the other seasons should be briefly described in ±1

paragraph in section 3.4, and should also include a reason on why the author decided to elaborate on DJF, and why the other seasons were less interesting. Currently, as a reader I feel left behind with questions as to why DJF is chosen, and wonder how the analysis looks like for the other seasons. In my opinion, a scientific article shouldn't just add figures in a supplement without describing those in the text and leaving it up to the reader to interpret these figures.

4. Decadal variability or trends? Section titles

After re-reading the manuscript, I still felt sometimes somewhat confused whether the manuscript – as well as specific sections – address decadal variability or trends. In my opinion there is some inconsistency in the manuscript text:

- please, write “aspects of decadal variability and trends” in line 62 as the manuscript clearly addresses both;
- decadal variability and trends of the RWP in line 75 as subsection 3.1 addresses both;

Along the same lines, several section headers/titles do not adequately describe the context of the sections

- section 3.1; please, consider writing “Decadal variability and trends ...” as trends are an important theme of this subsection (line 190);
- section 3.2; perhaps, consider “Spatial distribution of decadal ...” (line 249);
- section 3.3 investigates “trends” and not the “variability” as it seems to me; please, consider writing “trends in joined Rossby wave packets amplitude and phase speed” (line 323)

Minor comments

Lines 4 and 204. To the author's reply on the comments using the phrase “may creep behind”; I understand perfectly what the author means. However, I do believe another phrasing is easily possible, for example, by simply saying “... to unveil past trends and interannual/decadal variability in the probability distribution of Rossby wave packet (RWP) amplitude ... and phase speed (cp).” (Lines 3-4) and “... aim to highlight decadal variability against ‘noise’ from interannual variability” (Lines 204) or something along those lines. I do not mean to impose these specific suggestions but would like to encourage the author to consider rephrasing.

Lines 6-7. Please, consider simplifying the writing, for example, by saying “... where two historical reanalyses systematically underestimate E compared to three modern-era reanalyses.”

Line 30. What would the sentence lose by removing the word “anyway”?

Caption of Fig. 7. Please, clarify in the caption whether the solid and dashed black contours depict positive or negative v.

Lines 286, 300, 304, etc. Please, consider rephrasing “frequency of occurrence of ...” by “occurrence frequencies of ...”, here and elsewhere, which would read better.

Line 415. Please, consider writing "... but less in JJA where the historical reanalyses systematically ...".

Line 418. Please, remove the phrase "The decadal variability of mean", and consider starting the sentence as is with "RWP properties ..." since this paragraph - summarizing section 3.2 - discusses trends and not the variability.

Line 429. In my opinion, it seems more accurate to write "... are associated with varying shifts in the E-cp domain between seasons and regions" and to replace "a lack of" by "the absence of".