



EGUsphere, referee comment RC1  
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## **Comment on egusphere-2022-48**

Anonymous Referee #1

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Referee comment on "Investigation of the extreme wet-cold compound events changes between 2025–2049 and 1980–2004 using regional simulations in Greece" by Iason Markantonis et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-48-RC1>, 2022

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This manuscript investigated historical and future wet-cold compound events (WCCEs) over Greece with observation data, reanalysis data and EUROCORDEX models. All models agreed that for the historical period, more events by the fixed threshold approach were found over mountainous regions while the percentile approach yielded more WCCEs over the eastern parts of the country and Crete. Furthermore, the projected changes in the number of WCCEs were investigated under RCP 4.5 and RCP 8.5. WCCEs obtained with percentile thresholds, were distributed mostly in Eastern Greece and Crete while their changes differed significantly among models.

This manuscript present too many elementary analysis about historical extremes for observations, reanalysis data and RCMs with different methods (24 figures) without giving a unified conclusion. On the other hand, the subject of this manuscript is compound extremes under climate change, but the discussion about changes in future compound extremes are too simple, with only spatial distribution of extremes. In my opinion, the historical results with obs, reanalysis and RCMS present the historical compound extremes and evaluate performance of RCMs in simulating compound extremes. Then changes in future compound extremes will be discussed in detail. I suggest the authors refine historical compound extremes analysis and reduce or combine some figures, give more discussion about future extremes. Additionally, many grammar errors should be corrected. Thus, major revision is needed.

List of specific (major and minor) comments:

- Abstract: Abstract mainly introduce data and methods used in this study without presenting the main results and conclusions. TX-RR, TN-RR, RCP should be given the fullname.
- P1, L27: Please give full name of IPCC SREX.
- P1, L35: "using projection data from and .": Not a complete sentence. Please confirm.

- Introduction: Recently, there are plenty of studies about compound extremes, and please reorganize Introduction to show the most recent progress about compound extremes, especially for the study area.
- P2, L66: This study adopted EURO-CORDEX under RCP 4.5 and 8.5. Why not considering CORDEX-CMIP6 under SSPs scenarios?
- P2, L71: Is there citation about HNMS observations?
- Figure 1: The quality of the figure is too poor to see the details and the fonts are too small. Please revise the figure and other related figure with higher resolutions and larger fonts.
- L85: Give full name of ECMWF.
- L94: Please give the reason that such five models are adopted.
- Section 3.1, L132-138: It seems that the definitions of TN5p, TX5p, R95p, R20 are same as those in ETCCDI? If so, please cite it.
- Section 4: In my opinion, this section mainly showed the historical results with obs, reanalysis and RCMS and evaluate performance of RCMs in simulating compound extremes in order to investigate future compound extremes with RCMs in Section 5. This section presents too many elementary analysis with too many figures, and some figures are mentioned with few words. Please consider combine similar figures, such as Figs 3-5, 6-8, 9-11 and so on. Additionally, I think compound extremes by observations and reanalysis data are used to evaluate the performance of RCMs in simulating extremes, so Section 5.1 should be mentioned together with observation in Section 4, as well as historical extremes by RCMs. And more deep discussion is also needed.
- L195: "4.3 HNMS" should be "4.1 HNMS...", L209: "4.4..." should be "4.2..."
- The captions of all figure should be given in more detailed description, such as the meaning of black points in Fig. 6, etc.
- L258: Please confirm section number: "4.5.1 Empirical approach" and L280: "4.5.2 Copula".
- Since the manuscript mainly focused on compound extreme under climate change, changes in future compound extremes should be given in more detailed discussion. In current version, only spatial distribution of future compound extremes is discussed. Consider giving more discussion about changes in future compound extremes, such as their statistics, multi-model ensemble mean as well as their possible mechanisms, and so on.