



EGUsphere, author comment AC2  
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## Reply on RC2

Iason Markantonis et al.

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Author 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-AC2>, 2022

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*This paper focuses on the wet-cold compound events under climate change in Greece using a series of stations observation, reanalysis, and the historical and projection from the EURO-CORDEX. The research topic may be a relevant to the society, however, due to the poor writing and some infidelity in the data used for validation, I feel a major revision is needed, after a great and careful addressing of the following comments:*

### Major comments

*The writing of the whole paper is in a poor state, including some error in words, and vague expression including the title. The title is not good since it only uses a vague naming that covers the scope of the study, but failed with specific details, including the experiments, date time, etc. Such as, the reference seems to be investigating projection of compound events future projection, rather than climate change which may mean present and the future. Some topics like "Investigation of the future extreme wet-cold compound events using EURO-CORDEX regional simulations from 2025-2049."*

Answer: The paper has been changed radically as suggested as well as the title. Now the paper focuses only on fixed threshold wet-cold compound events and the analysis of future changes is conducted using the ensemble mean of the EUROCORDEX projection models.

*The picture used is in low quality. It is hard to see virtually every taylor diagrams (Figs. 19-25) in the manuscript. Other than that, most of the figures are vague to see, poor in quality, which may need reproduction.*

Answer: All figures are corrected to the proper quality in revised version.

*Question the fidelity of using the reanalysis data since Greece is a mountainous region and the authors' conclusions seems to be largely associated with events on the mountains. There is potential of large cooling temperature and excess rainfall bias in the reanalysis data despite of the , the authors may find supplementary data from archives such as the Global summary of the day or month (<https://www.ncei.noaa.gov/access/metadata/landin>*

*g-page/bin/iso?id=gov.noaa.ncdc:C00516) for supplements to that of the reanalysis data for further evaluation, that would gain more fidelity of the study.*

Answer: Unfortunately, the dataset suggested by the reviewer does not contain observational timeseries in Greece. Also, authors could not find another validated dataset with observations for the historical period studied. Authors acknowledge the excess rainfall bias in low values, or days with zero precipitation, in the reanalysis data which however does not affect this study since its scope are extreme values and the upper tail of the precipitation distribution. Also, precipitation uncertainty is reduced during winter period since convective rainfall is rare during cold season over mountains.

*Creativity issue. The current study fails to go one step forward towards higher creativity. It is obvious that the study of the compound events is not uncommon, whatever the means. The authors haven't significantly separated themselves with these studies other than stating the regional uniqueness for this certain compound event examination. However, we need to note that creativity is insufficient just to use similar method and switching to another region. It may be better if the authors can separate themselves with that of the similar studies of other regions to counter this issue. One possibility is stating the uniqueness of the Greece mountainous regions, and how this trait affects the extreme compound event.*

Answer: The uniqueness of the Greece case is a combination of complex orography of the country which mostly affects fixed thresholds compound events since higher probabilities are spotted mainly in higher elevations. These events are mostly caused by the usual west-east movement of synoptic systems in these latitudes. However, Greece located in South Balkans can be affected in winter by Arctic air masses reaching Greece from North.

*What is the take-away message? The author may consider elaborating this part of the work, and how the conclusions drawn from the analysis may be applicable or vary to other mountainous regions around the world, such as that of the Tibetan Plateau, Rocky Mountains, the Andes, and the Alps. This may bring a more valuable message to the broader scientific community.*

Answer: Since the focus of the study now concerns only fixed thresholds, we expect that the rise of temperature will affect drastically the occurrence of wet-cold compound events in other regions of the planet too, although each area has its own unique characteristics .

Minor comments

Line 1, the abstract lacks introduction with the compound events and how it is important to understand. One sentence at least should be used to state the importance.

Answer: A sentence added at the beginning of the abstract.

Line 35, "how the occurrence of these events will be affected by climate change. using projection data from and .", there seems to be a dead sentence just here.

Answer: Error corrected

Line 57, "thence" -> "hence"

Answer: Error corrected