Reply to Review of “Intensity and dynamics of extreme cold spells of the 21st century in France from CMIP6 data” (Reviewer #2)

We thank the reviewer for their careful reading of our manuscript and their constructive remarks. Our replies are in red.

General comment

Reviewer’s comment on “Intensity and dynamics of extreme cold spells of the 21st century in France from CMIP6 data” by Cadiou and Yiou (2025)

The authors study historical, present and future extreme cold spells over France in ERA5 and CMIP6 models. They use a stochastic weather generator based on circulation analogues and importance sampling, which is a sort of stochastic rare event sampling algorithm. The paper concludes that the intensity of extreme cold spells decreases in the future as global warming progresses, however impactful cold spells may still occur in the near future and should not be overlooked. Furthermore, the paper evaluates the ability of CMIP6 models to realistically simulate the circulation anomalies leading to extreme cold in France.

The risk of future extreme cold spells is understudied and tends to become underestimated due to the focus on the increasing frequency and intensity of hot extremes as a consequence of global warming. This might exacerbate the general vulnerability of our society to cold extremes. Thus, the topic and the message of this paper is highly relevant. Furthermore, the paper is well written and clearly structured.

Minor comments

I suggest that the authors implement following minor corrections/changes:

1. The authors do not discuss the limitations of the methodology, but point instead to already published work. Since the rare event algorithm is the essential element of this study, I think that the authors should extend the paragraph about limitations in Sec. 5 and discuss, in a concise way, the main assumptions/limitations of the algorithm in this work as well. For example, this stochastic rare event sampling algorithm cannot generate new atmospheric states, but is based on a resampling of already explored atmospheric configurations. This and similar limitations should be mentioned and discussed.

Ok, the caveats of the SWG are more thoroughly discussed in section 5.

2. This shall be an independently published work, thus I ask the authors to shortly summarise what they have done in the first paragraph of Sec. 5, instead of only referring to Cadiou and Yiou (2024).

Ok, the results of the previous paper Cadiou and Yiou (2025) will be summarized.

3. It is confusing that Fig. 6 is discussed before Fig. 4 & 5. I suggest to reorder the figures: what is now Fig 6 should be shown before Fig 4 and Fig 5.

Ok, the Figures will be reordered to match the text.

4. L 136-137: Was the linear trend removed grid-point-wise?

Yes it was. This will be clarified in the text

5. L 174-178: I don't understand how the content of this paragraph leads to the final statement: "In essence, we are evaluating …". Some additional clarifications would be helpful.

We will develop the paragraph to make it clearer.

6. L 247-250: The paragraph on testing causal relations could be clearer. For example instead of writing "here several atmospheric indices", please mention the actual indices.

The paragraph will be clarified by displaying the atmospheric indices used and explaining the "do" action of Hannart et al. (2016).

7. L 6: sentence is not clear, should be rephrased. Past events cannot re-occur, but events similar to past events can occur in the future.

Ok, this sentence will be rephrased.