Review of NHESS-2024-210

This study claims to investigate trends in European hailstorm damage. The study presents two components. First, insurance data are used to show increasing insured losses owing to hail over recent decades. Yet there is no analysis of exposure or vulnerability which are likely to be significant factors in changes in insured losses. Second, the paper shows an analysis of warming of northern Mediterranean waters, and shows that anthropogenic greenhouse gas emissions are driving these temperature increases. Yet, the link between the water temperature in the northern Mediterranean Sea and hailstorms is barely discussed, with only one line in Section 1 claiming that the "key area" is the Mediterranean Sea. The authors go on to make statements such as "given the coupling between northern Med temperatures and thunderstorm activity" and "a continuation of the warming trend in the Med corresponds to further increases in European hail damage" without sufficient evidence.

While the paper is well written and admirably concise, the article shows incomplete trend analysis and lacks a clear and properly justified link between the Mediterranean Sea temperature and hail damage. Since correlation is not causation, much more analysis is required to show the impact of rising Mediterranean Sea temperatures on hail damage in Europe. Otherwise, the article shows only that greenhouse gas emissions are driving rising Mediterranean Sea temperatures – since there is already an extensive body of work on climate change effects on the Mediterranean Sea (e.g. Ali et al., 2022), is this result novel?

I have made some specific suggestions below, but overall I would suggest that the authors a) consider changes in exposure and vulnerability in concert with changes in damages when performing trend analysis, and b) thoroughly link rising Mediterranean Sea temperatures to hailstorm activity (specifically, as compared to overall thunderstorm activity) in Europe.

Specific comments

1. Lines 15-25: In the introduction the authors should be more specific – what is meant by "recent times"? Were the June 2021 losses caused by hail or by flood as hinted at by the authors mentioning saturated soils? What is "similar magnitude" in the case of the Munich storm? "A couple of decades" should be replaced by the actual time period examined.
2. Lines 75-76: The question with insurance loss data is always the proportion of the trend

owing to change in the number or type of insured objects (ie the exposure and vulnerability part of the risk). See for example Strader et al. (2024) for tornado risk. The authors should comment on this aspect of uncertainty, and whether they think it plays a big role in the trends they present here.

3. Line 89: "Past research points to a warming climate causing more damaging hail in Europe". Yes, but the uncertainty must always be addressed because there remain many unknowns, as the authors have mentioned previously with e.g. references to Raupach et al. (2021). The authors should include the uncertainty in this statement.
4. Line 125: The Butterworth filter and its use requires a reference.
5. Line 187: "rising trend in the European hail climate" – this needs more specificity, since observed trends depend heavily on whether frequency or severity is considered, the geographical region, whether only hail of certain sizes is considered, etc.
6. Line 194: "Rising temperatures of local seas humidify the low-level air, which intensifies thunderstorms leading to more severe hail". The key word here is "local". How much effect would rising Mediterranean temperatures have on hailstorms far inland in Europe? This kind of link needs to be much further explored in this article.
7. Line $\sim$200: While aerosol changes have temperature effects, including on the Mediterranean as discussed here, they also have separate effects on thunderstorm activity that are highly uncertain and may exacerbate or modulate the changes owing to increased Mediterranean Sea temperatures. The authors should comment on this.

Technical corrections and typos, etc

1. Line 42: Remove repeated "more recently".
2. Line 83: Suggest removal of "more accurate" since CAPE and wet-bulb temperatures measure different things.

References

Ali, E., W. Cramer, J. Carnicer, E. Georgopoulou, N. Hilmi, G. L. Cozannet, and P. Lionello, 2022: Mediterranean region. *Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, H. O. Pörtner, D. C. Roberts, M. Tignor, E. S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, and B. Rama, Eds., Cambridge University Press, Cambridge, UK and New York, NY, USA, doi: 10.1017/9781009325844.021.

Raupach, T. H., and Coauthors, 2021: The effects of climate change on hailstorms. *Nat Rev Earth Environ*, **2 (3)**, 213–226, doi:10.1038/s43017-020-00133-9.

Strader, S. M., V. A. Gensini, W. S. Ashley, and A. N. Wagner, 2024: Changes in tornado risk and societal vulnerability leading to greater tornado impact potential. *npj Natural Hazards*, **1 (1)**, 20, doi:10.1038/s44304-024-00019-6, URL https://doi.org/10.1038/s44304-024-00019-6.