This paper shows that floods in southern France have generally been coming earlier in the wet season (water year in the U.S.) over the last 60 years, and while the associated precipitation extremes have increased, there are no corresponding trends in flood magnitudes. The explanation (which I find reasonably convincing) is reduced antecedent soil moisture, due to the shift of events earlier in the year (and perhaps also a general drying of soils associated with climate warming). The paper constitutes yet another bit of evidence that while precipitation extremes mostly are increasing, there is little evidence of concurrent increases in flooding.

We would like to thank you for the review of our manuscript.

My main misgiving about the paper (which may well not affect the overall results of shifting of floods earlier in the year, without magnitude trends) is their approach to segregating events by flood generating mechanisms. It seems a bit peculiar that the classification of the majority category is based on antecedent soil moisture, but the other two on precipitation intensity only (short and long duration, respectively). I would be inclined to lump all the events together, then examine the role of antecedent soil moisture separately (and as well, whether the flood-associated precipitation is, or is not, sufficient to satisfy the soil moisture deficit by the end of the event.

Actually, this is exactly what we did, in the results section 4.1, we are analyzing the flood event properties, all events together (base flow, maximum and total precipitation, runoff coefficients, antecedent soil moisture…) and similarly in section 4.2 the flood dates without segregating events at first. We notably show that there is regional trend towards a reduction of runoff coefficient, antecedent soil moisture, together with a seasonality shift of floods.

That said, they may have stumbled on something in their finding that the fraction of events in their excess soil moisture category has decreased slightly with time, whereas the short (one-day) events have increased. The question that it would be nice to answer is whether there's been a shift in the distribution of extreme precipitation to shorter events? And if so, could such a shift (doesn't necessarily have to be just one day, could for instance be 1-2 day) becoming sufficient to exceed the initial soil moisture deficit, so that at some point (although clearly not now) this might lead to an increase in extremes. Stated otherwise, while the recent balance between increased extreme precipitation and reduced antecedent soil moisture seems to have shifted so that antecedent dryness is cancelling increased precipitation intensity, is that balance likely to shift in the future?

This is very interesting (and actually inspiring) point. It is true that changes in rainfall properties, including intensity, location, duration and spatial extend may have a strong impact on flood generation. Following your recommendation, we also tested for potential trends in the duration of the rainfall episodes, associated with flood. We plotted the result in the figure below, showing very little changes and a very messy spatial pattern.These changes in the duration of rainfall episodes are only significant in 4 stations (at the 10% significance level), and not at the regional scale. We could possibly draw two conclusions from this analysis =

1- There is likely no trends in multi-day rainfall events associated to floods in this region.
2- About short and intense rainfall events, the daily time step is most likely not appropriate to analyze potential changes.

It is known that climate change impacts the temporal sequence of rainfall events, and these dynamics should be analyzed with instantaneous, or hourly data. As we noted in the conclusion, this can be done for shorter time periods only.

Fowler, H.J., Lenderink, G., Prein, A.F. et al. Anthropogenic intensification of short-duration rainfall extremes. Nat Rev Earth Environ 2, 107–122 (2021). https://doi.org/10.1038/s43017-020-00128-6

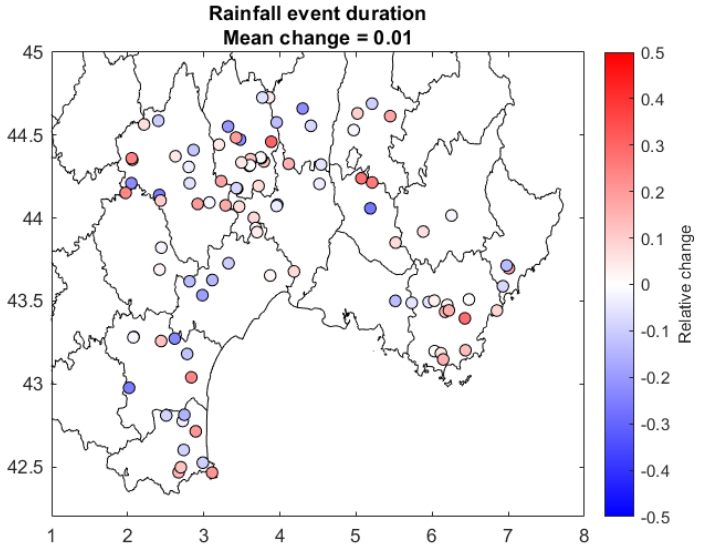

Figure 1: Relative change between 1959-1990 and 1991-2021 in the duration of rainfall events associated with floods.

One final comment: I don't see much value in the weather type discussion. What really matters to floods are a) antecedent soil moisture, b) precipitation intensity and c) precipitation duration (there are in addition factors such as storm extent and movement relative to catchment size and orientation, but these are more difficult to analyze given that the catchments are fixed by prior decisions as to where to locate gauges. So I would stick to the precipitation characteristics that matter to floods, and how they might or might not have changed.

We partly agree, since floods (in this region at least) are induced by rainfall events, and the occurrence of these events is tied to the occurrence of well-defined synoptic conditions, summarized as weather-types. So it makes sense when looking at changes in floods dates to also look at the rainfall triggering mechanisms, and actually there are quite a few studies aiming a relating flood occurrence to weather types (for example, Gilabert and Llasat 2018). We believe that it is a combination of factors, such as changes in the seasonality of soil moisture, precipitation characteristics, but also the inducing synoptic patterns that may explain shifts in flood seasonality.

Gilabert, J. and Llasat, M.C. (2018), Circulation weather types associated with extreme flood events in Northwestern Mediterranean. Int. J. Climatol, 38: 1864-1876. https://doi.org/10.1002/joc.5301