Authors' response to Reviewer 2

[hess-2021-628-RC2]

We thank the reviewer Ruben Imhoff for his evaluation of our manuscript and his many helpful comments (hess-2021-628). Below we address the reviewer's comments (full text) indented by arrows and coloured in blue. We appreciate the efforts by the reviewer, which will help to improve our manuscript.

General comments

Dataset length

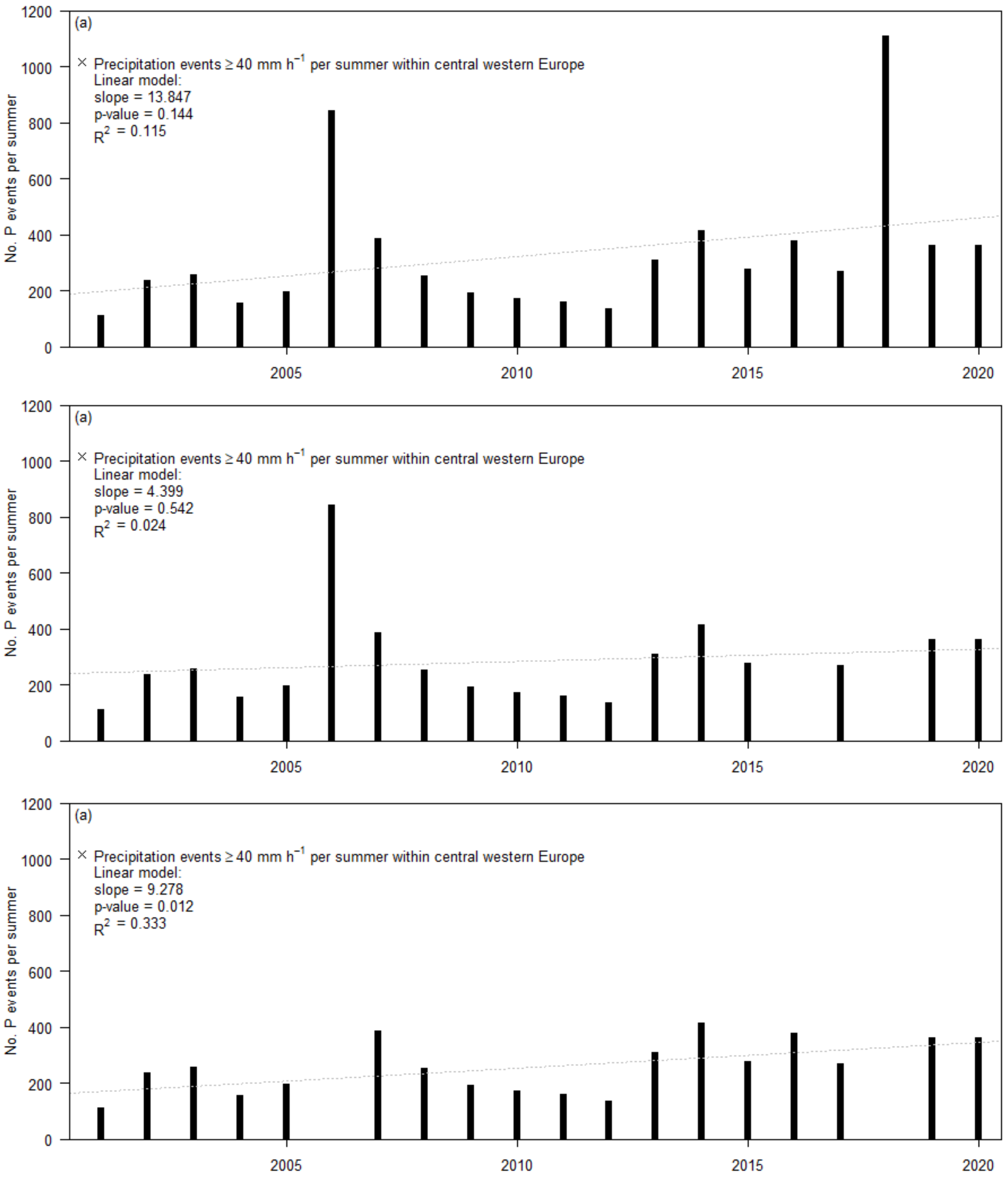
The authors used RADOLAN data from 2001 – 2020 and ERA5 reanalysis data from 1981 – 2020. I am concerned whether that is a long enough record to make climate-related conclusions? Especially the radar dataset, which only covers 20 years, seems too short to make climate trend-related conclusions. I do see the advantage of the high space-time resolution of radar for such an analysis, and it makes me happy to see it used, but the database length seems not sufficient yet. Although I find it hard to say what the minimum number of years should be in the dataset, I think the work needs at least a more extensive written support for the use of the dataset and the uncertainty that gives in the results.

→ *This is a valid point. Prior to these analyses we analysed 98 precipitation stations with data for the time period 1954-2018. For this long time period, only daily precipitation amounts are available consistently. We analysed the daily precipitation maxima, as well as all days with precipitation amounts higher than 50 mm/day. With these analyses we were not able to detect significant trends either. Parts of the analyses were published in a conference poster at EGU (Meyer et al., 2020). Our conclusion was that daily data is insufficient for thunderstorm events, even though the daily precipitation sum should reliably indicate extreme precipitation events. However, we believe we missed many thunderstorm cells within the coarse network of the stations. As both, the long term coarsely resolved dataset as well as the highly resolved, short-term dataset presented in this manuscript, show the same results, we considered the hypothesis II (increase in precipitation) as rejected for the analysed time period. We will extend the discussion by one section about the data base length and the previous findings of the daily station data.*

→ *Meyer, J., Douinot, A., Zehe, E., Tamez-Meléndez, C., Francis, O., and Pfister, L.: Impact of Atmospheric Circulation on Flooding Occurrence and Type in Luxembourg (Central Western Europe), EGU General Assembly 2020, Online, 4–8 May 2020, EGU2020-13953, https://doi.org/10.5194/egusphere-egu2020-13953, 2020*

Regarding the trend found in the data, especially based on the rainfall analysis for the 20 years of RADOLAN data: What does the trend look like if you take out the extreme years 2016 and 2018? I.e., are the trends we see a result of recent extremes?

→ *Regarding the RADOLAN dataset, we did not find a trend. In the sum, 2016 does also not show unusually high values. Maybe you meant 2006? See below the graphs following the experiments. Especially leaving out the many threshold exceedances in 2006 shows the originally hypothesised trend in extreme precipitation events. We will discuss the influence of these extreme years more thoroughly.*



→ *Figure 1: Number of RADOLAN grid cells with hourly precipitation intensities exceeding the threshold of 40 mm/h. Top plot: including the entire time series, middle plot: excluding the two years, 2016 and 2018, third plot, excluding the two most extreme years 2006 and 2018.*

I wonder if it would make more sense to look back from observed flash floods and extract the ERA5 reanalysis data for these times and locations, instead of partially picking events based on the shorter RADOLAN dataset?

→ *This was indeed an option. The atmospheric parameters relevant for the extreme precipitation and subsequent flash floods should, however, be "most characteristic" directly before the onset of the rainfall event. That is why we chose the time just before the corresponding precipitation event. Flash floods might occur a few hours after the onset and peak of the precipitation event. Moreover, the actual times and locations of the flash flood occurrences were hard to determine, as the sources* *of our database (e.g. reinsurance, newspaper) name mainly damages or event descriptions, rather than hydrologically relevant data. Therefore, we identified a high intensity rainfall event in the ERA5 grid cell of the flash flood to extract a time. As in some cases this approach did not lead to matches, we will extend this approach to search for identified rainfall events the neighbouring ERA5 grid cells as well and lower the threshold where necessary, to be sure to identify a rainfall event for each flash flood within the spatial and temporal extent of the RADOLAN data. For the flash floods that occurred outside the spatial or temporal range of the RADOLAN data, we extracted ERA5 data during the evening (6 pm) of the day and location of the flash flood independent of the RADOLAN data.*

Flood data base

The first thing I was wondering is how certain the authors are about the increase in the number of reports from 1981 until 2020. Lines 241 – 242 "While barely any events were reported before 2006, two remarkable years are 2016 and 2018, when flash floods occurred particularly often in the study area (23 and 20 occurrences respectively)." Is there a chance that the number of reports also significantly increased over that period? Although I do believe that there is an increase, it may be good to support it by actual discharge time series of the catchments in the study area.

→ *Before the choice of using a database that was collected through various sources, we analysed discharge data in the region (entire Moselle catchment). Therefore, we collected data for time series as long as possible. Long times series are, however, mainly available for large rivers, such as the Moselle or other bigger stream gauges, but not for catchments, in which flash floods occur. Moreover, data is often only available on a daily resolution. We have conducted several analyses of specific discharge using 79 stations within the region with catchments < 300 km² and found it hard to extract flash floods or high floods from these data. High flows in the past (1980s) were often caused by zonal precipitation in the Vosges mountains. Some regional flash floods that were of major importance and that we know well (i.e. Ernz Blanche 2016 & 2018), were to some extent detected by discharge data, but the overall time series are too short for any long-term analysis. Other events were so small and even outside streams, that they were not even captured by any stream gauge. We concluded that the inconsistencies in this type of streamflow-based dataset would be even bigger than the one presented in the manuscript. Apart from actual flash floods we have also made analyses about the number of scientific reports on the topic, which also started to increase around that time period (beginning 2000), when the topic received more attention. While a better database would be desirable, flash floods rely on site inspections.*

→ *The cleanest way to think of, is taking back the first sub-hypothesis about the increase in flash floods. While we do believe, that there was an increase, the database cannot be independent and consistent enough to clearly answer this hypothesis.*

This also directly leads to how the authors have defined a flash flood. This was not directly to clear to me when reading the manuscript. In addition, is a flash flood that occurred on a certain day counted double if it occurred in a different location on the same day? It would be biased to base the frequency of occurrence on such a double counting, while it actually says something about the intensity and spatial extent of the flash flood (and rainfall events). This is also highly relevant, but not the objective of this study.

→ *We will try to sharpen the definition of flash floods, as stated in detail in the response to RC1.*

→ *Flash floods were indeed counted twice if two occurred on the same day in neighbouring catchments. While the meso-scale atmospheric situation might be the same, the floods* *develop independently from one another. We therefore find it valid to count each flood separately.*

Concluding, would it be good to take a step back and (1) define what a flash flood is in this study, and (2) search for the events in time that correspond to this definition backed-up by both the literature study and discharge time series? I am aware of the amount of extra work this asks for, but it would make the conclusions stronger.

→ *Regarding point (1), we will work on a clearer definition according to the details stated in the reply to the other reviewers. Regarding point (2), this would be extremely challenging, as described above. Highly resolved data would catch quickly rising floods, but these are only available for a short period of time and for a few stations of larger rivers (last two decades). Therefore, most floods occur unmeasured.*

Specific comments:

Lines 32 – 33: I would make this sentence a bit longer (to increase readability): E.g. "Flash floods, generally originating from severe convective storm fed by deep moist convection, rank among the most destructive hazards and result in economic losses, damage to infrastructure and high mortality rates (refs)." Or something similar, of course.

→ *Thank you, we will revise this.*

Lines 84 – 86 "This generally occurs in case of very weak pressure/geopotential gradients when the mean wind speed and the bulk shear between the surface and the lower to mid troposphere are weak.": True, but what about orography enhancing this?

→ *Indeed, orography definitely plays a role in modifying the near-surface wind field (convergence zones), which often leads to the initiation of storms near (low) mountain ranges (http://www.eumetrain.org/satmanu/CMs/ConOro/print.htm). Many events around Luxembourg are also connected to the surrounding mountainous areas of the Moselle valley, or even guided by the orographic transition from Gutland to Ösling, as Schmithüsen wrote in "Das Luxemburger Land" in 1940. We will add a sentence about this.*

Lines 88 – 109: I think this paragraph can be shortened. The authors give an extensive overview of proxy parameters used in literature. This is appreciated, but it is, in my opinion, a bit too long and distracting from the main message in the introduction. Perhaps give a couple of examples and then come to the main point of the paragraph.

→ *Okay, we will consider shortening it, even though we think that it is important to get a feeling for realistic ranges of the parameters.*

Lines 116 – 118 "In addition, relative humidity levels decrease at low levels of the atmosphere, connected to rising temperatures, which also reduces the number of thunderstorms (Taszarek et al., 2021a).": Although I am not an expert on this topic, I can image that with higher temperatures evapotranspiration also increases, which leads to higher moisture contents again (besides the fact that the air can contain more moisture at higher temperatures). As said, I am not an expert on this, but I think the statement at least calls for more references.

→ *This is indeed expressed a bit unfortunate and we will clarify this statement and add extra references here. Unfavourable environments for the initiation of deep moist convection seem to* *have increased according to Taszarek et al., 2021 a. This is despite an increase in instability (CAPE), as the convective inhibition (CIN) seemed to increase at the same rate. Leopore et al., 2021 and our study found equivalent results. The hindrance of the vertical rearrangements is probably the limiting factor according to the above-mentioned studies. Of course, the saturation vapor pressure increases with increasing temperature, and there is an increase of low-level moisture. Yet, especially on hot summer days, when soils are dry, there are water limitations for evapotranspiration. Overall, the rising air temperatures seem to outweigh the increase in specific moisture and the relative humidity is after all lower. We will check some further literature about evaporation.*

→ *Lepore, C., Abernathey, R., Henderson, N., Allen, J. T., & Tippett, M. K. (2021). Future global convective environments in CMIP6 models. Earth's Future, 9, e2021EF002277. https://doi.org/10.1029/2021EF002277*

Line 142 “May to August”: Doesn't that leave out some potential late-summer storms in September?

→ *It is leaving out one flood event that occurred in the very beginning of September. From a climatological perspective, most thunderstorms occur during the months May-August (Flohn, 2954, Weischet & Endlicher, 2000). In September, the weather is a lot calmer. Therefore, we believe that the omission of this month will not change the study’s results.*

→ *Flohn H. 1954: Witterung und Klima in Mitteleuropa, 2. Auflage. Forschungen zur Deutschen Landeskunde, 78, S. Hirzel Verlag, Stuttgart, S. 214.*
Weischet, W. & W. Endlicher. 2000. Regionale Klimatologie. Teil 2. Die Alte Welt. Teubner.Stuttgart, Leipzig. 625 pp.

Lines 157 – 159: Can you add some more information about the RADOLAN product? E.g., what kind of radars used, adjusted with rain gauges and how? Hence, how 'good' or reliable is this dataset? Were there any changes in the radar product during the 20 years that also results in different estimations over the years?

→ *Good point. Thanks. A more detailed description of the underlying radar data set is required in any case. We'll catch up on this. The underlying dataset is the Radar-based Precipitation Climatology Version 2017.002 (Winterrath et al., 2018), which in turn is based on the standard RADOLAN product. The RADOLAN method is however a real-time application. It uses an ‘online’ rain gauge adjustment, but over the years the product generation was continuously further developed and optimized. Next to quality control and correction of radar artefacts, the gauge adjustment changed. However, innovations always bring with them a discontinuity in the series of measurements. For this reason, processing of the RADOLAN data for climatological questions was started in June 2014 as part of the "Radar Climatology" project.*

→ *Quasi gauge-adjusted five-minute precipitation rate (YW): Winterrath, Tanja; Brendel, Christoph, Hafer, Mario; Junghänel, Thomas; Klameth, Anna; Lengfeld, Katharina; Walawender, Ewelina; Weigl, Elmar; Becker, Andreas (2018): RADKLIM Version 2017.002: Reprocessed quasi gauge-adjusted radar data, 5-minute precipitation sums (YW) DOI: 10.5676/DWD/RADKLIM_YW_V2017.002*

Lines 160 – 161 “an extended rain gauge adjustment with supplementary local rain gauges”: How many rain gauges were used, what time step was used and what kind of adjustment have the authors applied?

→ *In order to ensure a comparable standard, we stuck to the same methodology for the rain gauge adjustment that the original RADOLAN/RADKLIM data is based on, but just with the additional rain gauges (Annotation: the original RADOLAN/RADKLIM product is already rain gauge adjusted → see RADKLIM and RADOLAN documentation stated at the previous reply). Thus, a densification of the measuring network is (in comparison to the original product) achieved. The adjustment technique is the best combination of the multiplicative and the additive adjustment (Bartels et al. (2004), Wood et al. (2000) and Wilson and Brandes (1979)). The time step used was*

1 hour. From the radar perspective it is the 12 five minutes rain rates within one hour, which is the same time step used in the original RADOLAN/RADKLIM product.

→ *The extra stations used, were – in Luxembourg - mainly the stations of the ASTA network (Administration des services techniques de l'agriculture) (ranging from 7 to 40 extra stations), and – in Germany – the stations of the agricultural-meteorological network of the state of Rhineland-Palatinate (ranging from 10 to 50 extra stations), which were quality controlled based on Sveruk, 1985 and Michaelides, 2008.*

→ *Bartels, H., Weigl., E., Reich, T., Lang, P., Wagner, A., Kohler, O. und Gerlach, N., (2004): Projekt Radolan. Zusammenfassender Abschlussbericht für die Projektlaufzeit 1997 bis 2004. https://www.dwd.de/DE/leistungen/radolan/radolan_info/abschlussbericht_pdf.pdf?__blob=publicationFile&v=2*

→ *Wood, S. J., D. A. Jones, and R. J. Moore (2000): Static and dynamic calibration of radar data for hydrological use, Hydrology and Earth System Sciences, 4(4), 545-554.*

→ *Wilson, J. W., and E. A. Brandes (1979), Radar measurement of rainfall - summary, Bull. Amer. Meteorol. Soc., 60(9), 1048-1058.*

→ *Sevruk, B. (1985). Correction of precipitation measurements summary report. In Correction of precipitation measurements. Swiss Federal Institute of Technology.*

→ *Michaelides, S. C. (Ed.). (2008). Precipitation: Advances in measurement, estimation, and prediction. Springer Science & Business Media.*

Lines 161 – 162 "We extracted the events for the database from the radar database by identifying 1x1 km grid cells with precipitation amounts ≥ 40 mm h^{-1}": But you do not have RADOLAN coverage in the full study area? Or is the study area constrained to the area covered by the RADOLAN observations?

→ *Unfortunately, the south-western part of the study area is not covered by the RADOLAN radar data. The ERA5 data was used from the entire squared study area. Flash floods were collected all over the study area, however, the included French regions are partly less densely populated and might under sample a bit. We will make this clearer when describing the database.*

Lines 172 – 174: Is this database giving all the floods for the study domain and which catchments does it contain?

→ *This sentence seems misleading now and we should delete "all". The question about catchments is a difficult one, as some floods occurred on hillslopes or streets that are within a catchment, but not really linked to its stream. In the database in the supplement, streams are mentioned, where they could be connected to the event.*

Lines 177 – 178: "The maximum hourly precipitation value was considered the trigger for the flash flood and atmospheric parameters were extracted from the identified grid cell and time.": What about the cells around this grid cell, as their parameters may also have influenced the rainfall that fell there?

→ *Averaging precipitation would lower the actual observed intensities, that are relevant for e.g. infiltration excess. Regarding atmospheric data, ERA5 is much coarser (0.25°x0.25°) than the radar dataset (1km x 1 km) and many thunderstorm cells. So, the atmospheric value that is extracted from ERA5 should be the same for neighbouring RADOLAN grid cells most of the time. Regarding neighbouring ERA5 grid cells, we have had some internal discussions. We discussed searching maxima/minima from the neighbouring ERA5 grid cells, as well as calculating the mean of 9 cells, to get a more representative value. This approach would however complicate the combined parameter analysis, as the mean values are sometimes higher/lower (especially for CAPE or CIN) than the values in one grid cell. We assumed that the large number of precipitation events statistically averages the differences.*

Lines 178 – 180: How did you find the flash floods here and the rainfall intensities, as this is outside the RADOLAN data coverage? In addition, do you have time series of the catchments, which could already indicate the presence and timing of a flash flood?

→ *There are only a few flash floods (11/83) outside the spatial (5) and the temporal coverage (6) of the RADOLAN data. For these we do not know the exact occurrence time and rainfall intensity. Unfortunately, we do not have discharge time series of these events.*

Line 203 "extremely rare in Central Europe": just out of interest (and perhaps worth mentioning), how rare is it (quantified)?

→ *This is an interesting question. Please find below the distribution of the K-Index within the study area & time. Out of 32235840 values in the grid cells of the study area, a K-Index ≥ 35°C occurred 99781 times, which equals 0.31 % of the cases. We will add "(< 0.5%)" to this sentence.*

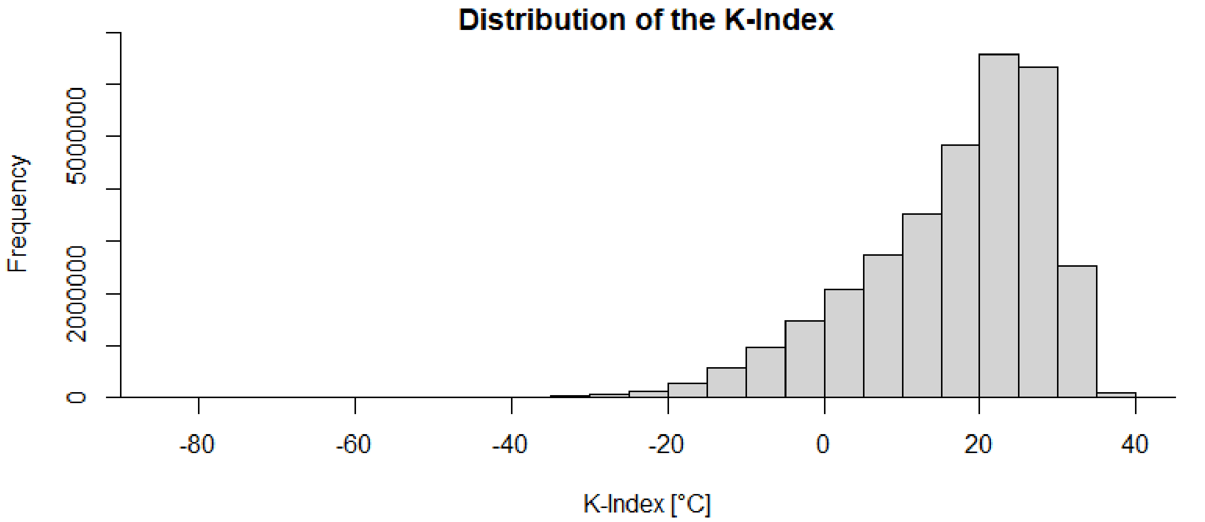


Figure 2: The distribution of the occurrence of the K-Index within the study area and time.

Line 206 "700 hPa": Why have the authors chosen to pick the 700 hPa level?

→ *700 hPa is the middle of the lower, weather relevant part of the atmosphere between the surface and 500 hPa. This pressure level is a standard synoptic proxy used for simple, quick severe weather forecasts. The explanation for this somehow got lost in the final manuscript and will be added again.*

Line 215 "soil moisture (Swvl) [m^3 m^{-3}] at depths of 0-7 cm, 7-28 cm, and 28-100 cm from ERA5": Why have the authors chosen for these three depths and would it make sense to average them in some way, as they will be (cor)related to each other?

→ *These are the levels given by the ERA5 model. The fourth, deeper level (100-289 cm) was neglected as less relevant for fast runoff reactions and less sensitive. As they don't occur in any combined analyses, we think, that it is not important that they are related to one another. As especially the highest soil level seems to be of importance, averaging would straighten out this result.*

Lines 222 – 223 "Therefore, we chose upper or lower boundaries including 75 % of extreme events.": Do the authors mean the events IQR of the extreme events or did I understand it incorrectly?

→ *Depending on the parameters, we used the quartile as an upper or lower threshold but considered all events above or below. E.g. for the K-Index: "The higher, the more heavy precipitation events." Therefore, we selected all values above the lower quartile. We will revise the text to be clearer.*

Line 248 "Between 2001 and 2020, we observed a slight increase in the number of events per year (Figure 3a).": But not a significant one, right?

→ *Yes, that is true. We will be more precise with the wording.*

Lines 266 – 267 "Moisture conditions during extreme precipitation and flash flood events were found to be mostly within the upper percentiles of the overall simulated values.": That is also what you expect seeing the Clausius-Clapeyron (CC) relation and in fact even the 2CC relation for extreme precipitation. It probably deserves mentioning that, including some references (e.g. Lenderink & Van Meijgaard, 2008; Mishra et al., 2012; Manola et al., 2018; Wasko et al., 2018; Dahm et al., 2019).

→ *Yes, that is true. We will add this to the discussion.*

Lines 269 – 270 "All moisture parameters, and especially RH tend to be even higher during flash flood events compared to general extreme precipitation events (Figure 4d-f).": As clearly not all heavy rainfall events lead to flash flood events, can you also give some event statistics (earlier in the manuscript) between the two groups? What were average rainfall intensities in both groups, does the duration differ, does the size of the rainfall storms differ, etc.? This will give an idea why we see differences between the two groups. Lines 274 – 277: This also says a lot about the initial catchment wetness prior to a flash flood event. As stated earlier by the authors, the wetter, the quicker a flash flood can occur. Now, from these results, I do not directly see a significant difference between the three groups. Only the 'P' group has somewhat lower initial soil moisture values, which gives the impression that heavy, convective rainfall does more often occur during drier periods. Something which corresponds a bit to the summer weather patterns in Northwest Europe. It also suggests that initial soil moisture conditions were on average not different from other days in the studied periods, so the flash floods are mostly a result of the weather system and not initial conditions here.
In addition, perhaps it is interesting to show the soil moisture as a relative scale (so % of the capacity).

→ *Okay, we see the possible added value this comparison of P events that do lead to flooding and P events, where no flooding is reported in our database. We will try to add a short section about this to the manuscript. While it is not helpful to answer any of the hypotheses, it might give interesting additional information about the identification of atmospheric parameters and P events. However, regarding the large amount of P events in comparison to P events leading to flooding we are unsure, whether this brings clear results.*

→ *We should reformulate the text to be clearer. As we are comparing only soil moisture during P events and during FF events, there is a difference. We did not mention that normal conditions and the ones during FF are very similar. This indeed means that it is often dry before heavy precipitation events in the summer. However, if it is normal instead, then flooding is likelier.*

→ *The soil moisture in m^3/m^3 is on a relative scale already. Percentage of the capacity might indeed be a nice feature to better assess the saturation state of the soil, but not easily available. While volumetric saturation of the soil moisture, saturation of soil moisture and field capacity are partly available as an ERA5 dataset, we don't think this data makes real sense on such a course resolution. We dragged it along as a nice additional feature, but do not want to really put an emphasis on these results.*

Line 291 "These findings were particularly significant for the northern part of the study area (Figure 5b).": Any idea why in the north?

→ *No, unfortunately not. As CAPE is very sensitive to near surface moisture and temperature, this might be linked to a stronger increase in near-surface moisture. There might also be an orographic dependence that we could check.*

Lines 332 – 335: How is the trend if you take out 2016 and 2018?

→ *When setting 2016 and 2018 to 0 flash flood occurrences, the trend is a bit less strong (decrease in slope from 0.203 to 0.07), of course. Yet, it is still significant at p=0.005.*

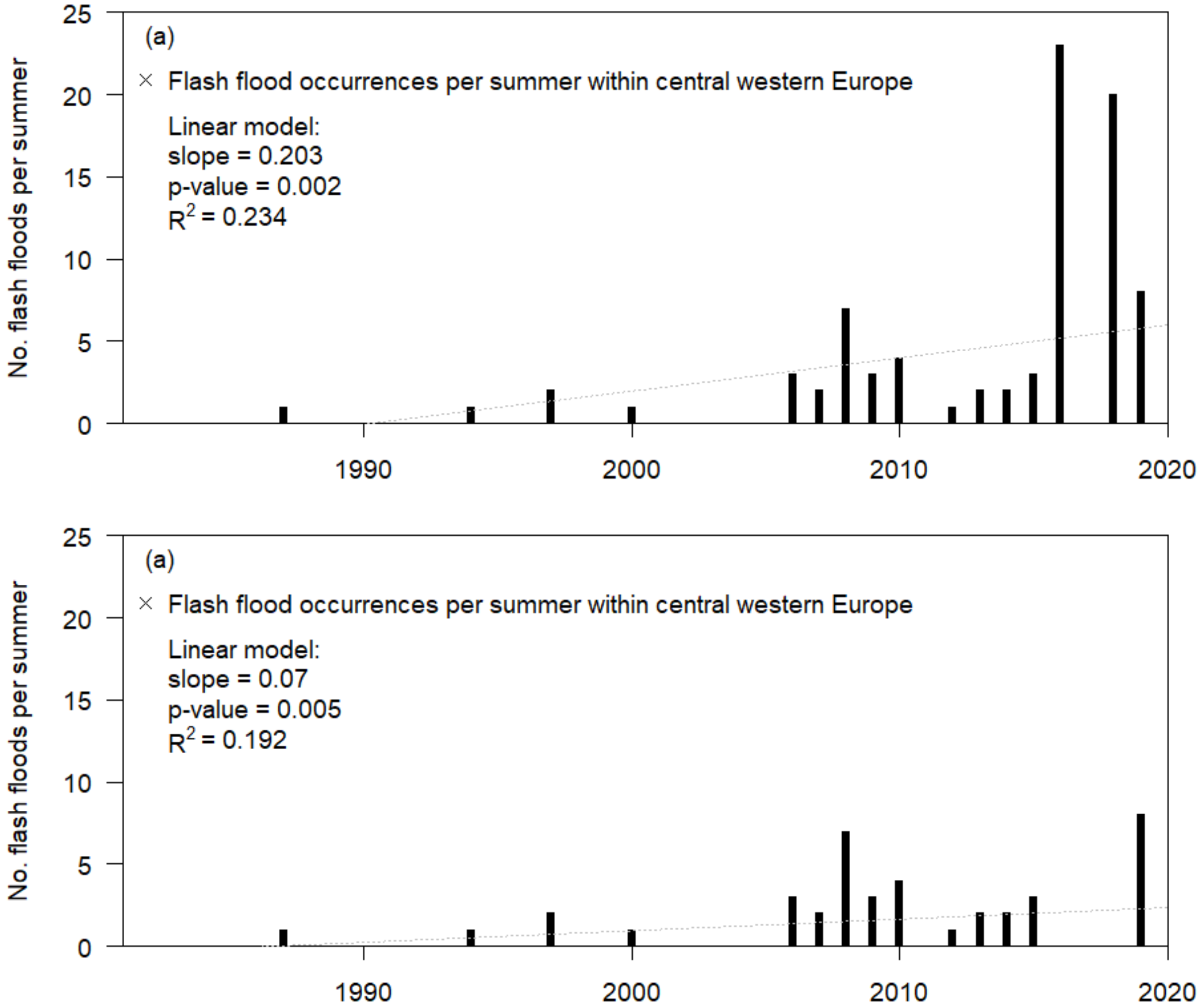


Figure 3: Occurrence of flash flood events within central western Europe between 1981 and 2020 as shown in the manuscript. Panel (a) shows the number of flash flood occurrences per year, panel (b) shows the same graph and trend analysis excluding 2016 and 2018.

Lines 361 – 362 "Regarding low wind speeds and weak bulk shear, we found slightly increasing but barely significant trends.": But you did find a significant trend for LLS, right?

→ *Yes, we will rephrase it more precisely.*

Lines 380 – 382: This might also be related to the finite gauge-adjusted radar dataset of 20 years.

→ *"While atmospheric conditions tend to become more unstable, and overall warmer air masses potentially possess a higher amount of water vapour, the expected increase in (convective) precipitation events were not obvious from the analysed data." – Yes, this may be likely. We will add this and clarify, that the lengths of the time series differ.*

Lines 407 – 409 "Future analyses could incorporate the intra-annual temporal distribution of extreme precipitation events. Perhaps, formerly evenly distributed rainfall events tend to occur more condensed within a few days.": This is something you could already focus on in this study, by also looking at longer event durations. So what if you don't only look at 1-h accumulations, but also 6-h, 24-h, etc?

→ *This statement was referring to the clustering of events, e.g. like in 2016 or 2018, that might also be followed by a dry summer, but caused high casualties because of their accumulated occurrence within 1-2 weeks. I think it would require more than just looking at 6h or 24h accumulations, but also the accumulation of these on consecutive days and their accumulation before flash flood occurrences. While there are options to do these analyses with the dataset, it would require an extra supplement.*

Lines 420 – 422 "In addition to the hypothesis, we found mostly higher upper (0-7 cm) and lower (28-100 cm) layer soil moisture during flash flood events compared to general extreme precipitation events.": This did not seem that significant in the results.

→ *Compared to the precipitation events we do see (significant?) differences - compared to the overall values not. As we agreed on earlier, this says more about the pre-conditions during heavy precipitation events. It seems, that thunderstorms usually follow some sort of dry period. Yet, if they occur in wet or "normal" conditions, this might lead to a flash flood.*

Figure 1c: I suggest to put here an actual DEM with a higher resolution, which makes the mountain ranges and the differences between them clearer.

→ *As this Figure was only used for the explanation of model data, we opted to show the model topography. An actual DEM will be added as Fig. 1d. It will furthermore highlight the contrast in resolution.*

Figure 4: Would the differences (which are clearly present!) become clearer when you take the P and FF events out of the all group?

→ *We tried this nice suggestion but did not get clearer results. Using the current methods there are only 6588 P events and 84 FF events (out of which 45 are overlapping) that compare to a total of 32235840 values in the "all" section. Therefore, the elimination of these few data points did not make a visible difference.*

Figure 5:
1. An idea for the figure, make the colour scale discrete instead of continuous, then it is easier to distinguish the actual values.

→ *As with simulated values we are untrue about the "truth" of the "actual values". Therefore, we prefer the continuous scale, as we believe that it gives good enough tendencies and directions of the values.*

2. In addition, the slope is in [unit] per year. So, don't forget to give the unit.

→ *Thanks. We will correct this.*

3. To get an idea of the timeseries underneath, could the authors provide for one pixel the timeseries + trend?

→ *This can be added to the supplements. We can try to find a somewhat representative pixel, if that exists for the varying trends. In the conference contribution below, there are the timelines of the grid cell in Eastern Luxemburg, where some flash floods occurred in 2016 and 2018. (Meyer, J., Douinot, A., Neuper, M., Mathias, L., Tamez-Meléndez, C., Zehe, E., and Pfister, L.: Identifying and linking flash flood prone atmospheric conditions to flooding occurrences in central Western Europe, EGU General Assembly 2021, online, 19–30 Apr 2021, EGU21-12522, https://doi.org/10.5194/egusphere-egu21-12522, 2021).*

Technical corrections

→ *Thank you for pointing out these errors. We will adjust them accordingly.*