Reply to review by Anonymous Reviewer 2 - January 2026

Thank you for accepting the review request and taking the time to review the CAMELS-LUX dataset and the accompanying manuscript. Please find our respective comments below.

Major comments:

- After the introduction, the manuscript should first provide the description of the study area. Section 3 (regional context, climate and hydrology) should be moved ahead of the data description. Additionally, the current Figure 4, which displays the spatial distribution of the 56 nested catchments should be placed at the beginning of the manuscript as Figure 1 to give readers early contextual understanding of the study area.
  - → *Okay, we consider to restructure the manuscript regarding the suggested flow and place the overview figure in the beginning of the manuscript. In order to not tear a gap between the regional context and the description of the topography, which is described in detail in section 4, we will reorganize the structure and place the sections 3 & 4 before the current section 2.*
- Line 71: The flags 0 and 1 are not mentioned anywhere in supplement S2. What does flag 2, 3 and 4 in the supplement S2 signify?
  - → *Flag 1 is mentioned in the supplement S2 in the header of Table S2. Flag=0 is no actual flag, but original data and therefore not mentioned in the table. The numbers are the actual stream gauges used to fill data gaps, as written in line 72. We will further clarify the wording.*
- Table B1, which contains catchment names is not cited anywhere in the manuscript. Please cite this table appropriately. Additionally, the catchment name 'White Ernz' in line 187 was not found in the list of Table 2. This needs clarification or correction.
  - → *Thanks for pointing this out. We will cite Table B1 in the Regional Context section with the current Fig. 4.*
  - → *We accidentally used the French name (Ernz Blanche) in Table B2 and the shapefiles and will translate it.*
- Sections 4.2, 4.3 and 4.4 lack explanations on how these indices are varying spatially across Luxembourg and what are the potential reasons behind such variation.
  - → *This is indeed a very interesting point, which we initially also considered. However, despite trying different correlations, no consistent patterns emerged between the catchments - neither in relation to the underlying geology, nor the spatial setup. Therefore, we do not think, that adding maps would help to give an overview over the distribution of the indices (maps are anyways difficult in this nested catchment setup). The scatteredness is in line with previous studies about the TWI in the Attert basin in Luxembourg, e.g. Loritz et al. (2019). We also acknowledge, that the provided Figure 6 does not show clear correlations either. We will improve it in line with the comments by reviewer 1.*
    - *Loritz, R., Kleidon, A., Jackisch, C., Westhoff, M., Ehret, U., Gupta, H., and Zehe, E.: A topographic index explaining hydrological similarity by accounting for the joint controls of runoff formation, Hydrol. Earth Syst. Sci., 23, 3807–3821, https://doi.org/10.5194/hess-23-3807-2019, 2019.*
- What does n stand for in equation 9? Please provide a clear definition.
  - → *In line with comments from the first reviewer, we have removed the subequations in the revised version.*
- As it is mentioned that CAMELS-LUX includes a series of flash floods that occurred in 2016 and 2018, add more details on what difference can be observed in the parameters of the

affected catchment quantitatively. What were the distinct observations from the data during this period which strongly indicates flash floods? Section 6.2 describes atmospheric parameters characterizing thunderstorms, however, it is not clear from the paragraph that the increase/ decrease in the parameters mentioned refers to which catchments.

→ *We prefer not to go to the catchment scale in Section 6.2 for overall interpretations of trends in atmospheric parameters. The catchments and also Luxembourg are very small in comparison to the grid width and accuracy underlying the ERA5 data. Even in our previous study (Meyer et al., 2022), we did not look at individual grid cells, but rather on the mean of 9 grid cells, which is basically the size of the entire study region here. We will revise the text to make it clear that we are talking about general tendencies throughout the entire region rather than strong trends within specific catchments.*

We will add a supplement with a figure showing the data within the time frame of the flash flood occurrence. For synoptical in depth analyses of these events, we would like to refer the reader to Mathias 2019 & 2021. The series of flash floods have occurred and were truly exceptional, they were, however, no textbook examples demonstrating extraordinary atmospheric conditions.

- *Meyer, J., Neuper, M., Mathias, L., Zehe, E., and Pfister, L.: Atmospheric conditions favouring extreme precipitation and flash floods in temperate regions of Europe, Hydrol. Earth Syst. Sci., 26, 6163–6183, https://doi.org/10.5194/hess-26-6163-2022, 2022.*
- *Mathias, L.: Major flood event in the Mullerthal region on 1 June 2018: event analysis and predictability, MeteoLux, (June 2018), 1–17, 2019.*
- *Mathias, L.: Synoptic-mesoscale analysis of the flash-flood producing thunderstorm over the Vallée de l'Ernz on 22 July 2016, MeteoLux, (July 2016), 1–18, 2021.*

- Line 318: Provide numbers/ ranges showing the increase/decrease in the parameters such as specific humidity, q and total column water vapour. Similarly, in line 322 provide a range by how much did CAPE and K index have increased.

  → *We prefer not to repeat hard numbers and ranges from Meyer et al. (2022) in this context. As in that study, we were setting thresholds and analyzing a mean of 9 grid cells above the defined thresholds. Moreover, interannual and spatial variations of the parameters interfere with the trend analyses, requiring the detailed context of the study. Explaining the entire method again appears too complicated within this section of the paper, that just shows possible applications of the data.*

- The manuscript would benefit from a section outlining dataset limitations and possible directions for future enhancements.

  → *We have already touched the limitations in the individual sections, but will try to further emphasize on that. This could imply an outlook, such as further enhancing the data set by extending the time span to more recent years, including spatially distributed data or additional variables like water quality or tracer data. A nice feature could also be automatic updates or including forecasts. Meanwhile, we have already improved the data set by adding more station data for precipitation and air temperature and updating discharge station data according to new "raw" data.*

Comments on data:

- Naming of the time series files of each catchment is same in all the three folders of time scales '15 min', 'hourly' and 'daily'. This can be confusing. It is not possible to

simultaneously open the csv files of the same catchment for the 15 min, hourly and daily scale because of the same file name. Therefore, it is suggested to distinguish the files names of catchments for the three different time scales.

→ *Thank you for this comment, we will rename them:*
CAMELS_LUX_hydromet_timeseries_daily_ID_01,
CAMELS_LUX_hydromet_timeseries_hourly_ID_01,
CAMELS_LUX_hydromet_timeseries_15Min_ID_01

- In many of the randomly picked time series csv files, Qflag was noticed to be zero throughout the column. Please check if this value is constantly zero everywhere. If yes, then what is the purpose of this parameter in the time series?
  - → *The random choice of catchments picked by the reviewer probably included catchments with good measurements. Choosing a catchment (according to Table S2), that does have data gaps that had to be filled will also show values above 0.*
  - → *The purpose, why Q flag was added to the time series, is to give information to users as well as machine learning algorithms, that data are less reliable, as they are interpolated - either linear or from similarly reacting catchments. This often leads to visible shifts in the Q time series, that might - depending on the use - be better than missing values. We would like to refer to our answer to the major comments above about supplement S2 and the last paragraph (line 65 ff) in Section 2.1.*
- In the shapefile of catchments, add the name of catchment and gauge_id columns. Although, grid code is already mentioned, it would be more convenient if instead of grid code, gauge_ids are mentioned.
  - → *Okay, we will duplicate the columns "Station", "stream" and "catchment" from the stream-gauges_CAMELS-LUX.shp.*

Minor comments:

- Line 271: The manuscript references equation 15, but no such equation is present.
  - → *Corrected.*
- Line 319: Please correct 'TCVW' to 'TCWV'.
  - → *Corrected.*