General comments

The manuscript presents a methodology for identifying convective rainfall events based on a dense rain-gauge measurement network. Overall the manuscript is clearly written and the main methodology of applying optical flow to extract rainfall residual fields to identify features of convective rainfall is justified. However, I have several significant questions that the authors should address and expand the work on.

Major comments

1) The literature review seems mostly focussed on rainfall prediction, even though that is not the topic of the manuscript. Thus large parts of the literature review seem irrelevant to the current topic. The authors should refine the review to focus on topics relevant to the study, especially methods used to identify convective rainfall. It would also be useful to review any studies using similar rain-gauge datasets.
2) Rain gauge observations and data quality
    1. Please provide technical details on the rain gauge instruments, e.g. the type of the instruments.
    2. Please provide more details on the applied QA/QC procedures, especially outlier detection
    3. There are large parts of the grid where there are no rain gauges in the grid. How does this impact the results? The authors should also provide a figure that shows the number of rain gauges per grid cell (e.g. as a heatmap) to allow better estimate the spatial coverage. The authors should also provide the full size of the grid in addition to the grid resolution and display the no-data area (not covered by the measurements) in some figure.
    4. According to table 1, there is a significant amount of outliers and no-data values in all stations. How do these numbers relate to studies using similar measurement networks? Is this amount of outliers normal or exceptional?
3) The success of optical flow depends on the temporal consistency of the input data. The authors should analyse the temporal consistency of the fields e.g. through autocorrelation.
4) The authors apply a smoothing algorithm to the gridded observations to obtain the precipitation fields that are then further processed. This smoothing most likely impacts the results significantly (e.g, the size of the kernel used in the smoothing would directly impact the peak positive residual area)
    1. Please provide a detailed description of the smoothing algorithm applied.
    2. How sensitive are the results to the selected smoothing kernel size? From Fig. 4 it is apparent that the impact of a single measurement site extends quite far most likely through the smoothing. The authors should perform sensitivity analysis of the smoothing kernel size at least on a subset of the data to understand what the impact is.
    3. Given that the smoothing appears to have a significant impact and the obtained motion field vectors are quite small, I am curious whether the smoothing actually has more impact on the residuals than the optical flow. The authors should analyse this by estimating the residual from only the smoothed fields and analyse how the results differ.

5) Validity of estimated motion fields

    1. The obtained motion speeds seem very low. For example, in Fig. 3 the p90 speed is 0.64 m/s or 2.3 km/h. This seems really too low to correspond to the motion speed of a large-scale precipitation system (although, I am not familiar with the rainfall climatology in Bangkok). Are these motion speeds actually expected for large-scale precipitation systems in the area?
    2. How temporally consistent are the obtained motion fields? As with the rainfall fields, I would appreciate analysis on the temporal consistency for example through auto-correlation analysis.
    3. In the caption of figure 5 the authors state "The vector field exhibits spatially coherent motion patterns consistent with the advection of precipitation systems over the study area." What observations or data source (radar images, model, etc) is the motion field compared to justify this statement?

6) The authors present rules for classifying the storm-level events to convective and non-convective. However, the thresholds used in the rules are not justified in any way. The authors should present the exploratory analysis that was used to identify the thresholds.

7) Statistical analysis

    1. Please provide units for all of the characteristics.
    2. Please provide statistics on the duration of the storm events. Also the distributions of e.g. strong residual frames within the storm duration is of interest. Is it possible (given the 120min gap allowed in the events) that a storm event would be, for example, convective only in the beginning and continue as non-convective?
    3. In order to allow comparison to e.g. threshold-based methods for identifying convective storm, please provide information on the distritbution of rainfall intensities in the events.

8) Visualization improvements

    1. Figure 2: it would be useful to show the full domain size in the figure or caption
    2. Figures 3, 4 and 5: since the case is the same, please use the same colorscale to allow for easier comparison.
    3. Figure 6: Please re-draw the figure using a colormap that better distinguishes between bins with 0 and 1 values.
    4. Figure 8, 9: Please make sure all figures have understandable axis labels and titles, rather than some technical variables used in the analysis scripts
    5. Figure 9: is there some reason for the point labels, e.g. are they referred to in the text? If not, please remove them.

9) There are several sections in the manuscript that appear to be repeating content. The authors should revise the manuscript to make sure that the content is not repeated unless it is actually necessary. Examples of repetition:

- sections 4.1 and 4.2 are mostly repetition of section 3
- section 7.4. is mostly repeating section 6

- lines 587-589: these results are repeated in the next section

10) I would appreciate some discussion in the conclusions on the use of opportunistic rainfall measurements (e.g. personal weather stations, microwave link measurements) in the proposed methodology.

11) On line 629-630, the authors state that “An important implication of this formulation is that convective initiation can be analyzed using rain-gauge observations alone.”