Review of the manuscript

Extreme runoff response to short-duration convective rainfall in South-West Germany

by V. Ruiz-Villanueva, M. Borga, D. Zocatelli, L. Marchi, E. Gaume, U. Ehret and E. Zehe

General comment and recommendation:

This is an interesting paper about a flash-flood event in South-West Germany for which specific data were collected after the event and analysed using a well-established methodology already applied by the authors to several events which occurred in various climatic and geomorphologic contexts. I make hereafter some specific and detailed comments that could be considered to improve the manuscript. In addition, the paper needs to be improved regarding the use of English. The authors should consider hiring a professional technical writer/editor to help them with the text.

In my opinion, the paper can be accepted after minor revision.

Specific comments:

Radar QPE:

A big work dedicated to the radar QPE is briefly summarized in p8. The configuration of the 2 C-band radars with respect to the Starzel catchment is interesting. I understand the data from the 2 radars were merged depending on the computed PIA to produce a single radar QPE (L233 -234). One suggestion:

- it could be interesting to derive QPEs for each radar separately in order to get some idea, from the differences between the 2, on the error of the rainfall inputs and the subsequent impact on the hydrological model results.

Rather than the cited reference (Delrieu et al. 2000), the good referencing for the mountain reference technique (MRT) is:

Delrieu, G., Caoudal, S. and Creutin, J.D., 1997. Feasibility of using mountain return for the correction of ground-based X-band weather radar data. Journal of Atmospheric and Oceanic Technology, 14(3): 368-385.

Serrar, S., Delrieu, G., Creutin, J.D. and Uijlenhoet, R., 2000. Mountain reference technique: Use of mountain returns to calibrate weather radars operating at attenuating wavelengths. Journal of Geophysical Research-Atmospheres, 105(D2): 2281-2290.

In addition, note that Bouilloud et al. (2010) proposed a procedure for radar QPE in the context of post-event surveys for *non-attenuated frequencies* (S-band radars). These authors also performed a case study for a Slovenian rain event where the MRT was effectively implemented for the first time at C-band. The reference of this article is:

Bouilloud, L., Delrieu, G., Boudevillain, B., Borga, M. and Zanon, F., 2009. Radar rainfall estimation for the post-event analysis of a Slovenian flash-flood case: application of the Mountain Reference Technique at C-band frequency. Hydrol. Earth Syst. Sci., 13(7): 1349-1360.

Spatial moments of catchment rainfall

Maybe everything about the concept of "spatial moments of catchment rainfall" is made clear in the paper by Zocatelli et al. (2010). However, I found the presentation of the concept and the results in the paper under review quite difficult to understand:

- In L302, I suggest to rephrase as: the so-called "flow distance".
- In L306-307, I guess the flow distance is a distance and the runoff travel time is a time, so this sentence doesn't hold…
- Equations (1) and (2) need to be carefully written: in (1) why do you use the absolute value bars for A? I suggest to use $\bar{d}$ instead of d_{ave}. In (2), what is g_1? T is not a standard notation for time t?
- The interpretation of δ_2 and Δ_2 is far from intuitive and I am wondering if these two variables are really useful in the present context (they are apparently not needed for the definition of the "catchment scale storm velocity").
- It is difficult to recognize in (2) a "storm velocity"; maybe a basic equation would help, in addition to the final result of the calculation.
- The rest of the section (L357-387) is hard to understand. The evolution in time of the storm velocity, as displayed in Fig. 7e is quite erratic: wouldn't it be useful to smooth and/or to display only the values for the significant rain sequences (the 5m/s peak captures the attention of the reader)?
- L384-385: this sentence is not understandable to me.
- How does the "catchment scale storm velocity" compares with the "storm velocity" as could be derived for instance from standard cross-correlation techniques applied to the radar space-time series?

Details:

L21: abstracts should normally not include references

L137: mm/a?

L139 and everywhere else: prefer $m^3s^{-1}km^{-2}$ to $m^3/(s\,km^2)$; in this specific sentence, the unit discharges should be cancelled or put between parentheses.

L149: reference to Fig. 3 is not relevant in this sentence since there is no frequency information in Fig. 3.

Fig. 5 is not really readable with its grey scale; isolines should be used instead. It could be interesting to display in Fig. 6 the distribution of the exceedance areas for the QPEs derived for the two radars separately, if available.

L288: woudn't the reference to the KOSTRA methodology be useful in section 2?

L308: "may be used as"

L328: "indicates indicate"

L442: "with each other"

L498: the legend of Fig. 8a (inside the figure) is incomplete

L554-559: do not forget in the comment of these figures that the hydrological model was calibrated against the IPEC informations.

L560 and other occurrences: I do not find the term “water balance” appropriate here; rainfall-runoff balance would be more adequate in my view.

L545: “and to 20 and 40 mm h^{-1}”

L603: I suggest to rephrase as “simulated peak values are substantially lower than the specific values obtained by the IPEC”; same thing in the next sentence. The terms over-estimation and under-estimation suggest that one of the estimation (IPEC or model) is closer to the true value, which is hard to establish.

L643-647: for point (iii) I suggest to rephrase as “(iii) the spatial distribution of rainfall within the watershed characterized by the two descriptors delta1 and delta2” and for point (iv) “(iv) the storm dynamics characterized by the catchtment scale storm velocity”