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Hydrology and Earth System Sciences Discussions

Interactive comment on "The benefit of high-resolution operational weather forecasts for flash flood warning" *by* J. Younis et al.

Anonymous Referee #6

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General comments: The paper deals with a very important topic in hydrologic forecasting, which is the forecasting and the early warning of flash floods, and addresses a question that is relevant to HESS. The authors present an interesting approach to forecast flash floods, applied to the French Cevennes-Vivarais region. The abstract is clear and reflects the contents of the paper, which is well structured by showing a case-study followed by a long-term analysis of forecasted exceedances of critical flood thresholds in the region under study.

The authors clearly outlined the assumptions and presented the data and methods used. However, the bibliographical review on flash flood forecasting in the introduction is very insufficient. There are several articles already published on the topic (as for instance, those mentioned below, including the article of Reed et al., 2007, where a

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distributed hydrologic model and a threshold approach are presented). We recommend the authors to improve the bibliographical review in order to better outline the originality of their contribution. As it is, the paper focuses only on the French case and on French studies and the reader misses a validation outside this French region or a link to other approaches in the literature.

Finally, the paper needs a review on the use of the English before final publication.

Specific comments:

- Introduction: please, check for improving the bibliographical review with comments on other approaches, as for instance, those in the references below. Also, for instance, the authors say on page 348, line 9: "One accepted method is...", and oppose their approach to the one presented in Georgakakos (2006) (lines 26-28). However, what are the other "accepted"; methods existing in the literature and how their approaches compare to the one proposed by the authors?

Reed, S., Schaake, J., Zhang, Z, A distributed hydrologic model and threshold frequency-based method for flash flood forecasting at ungauged locations. Journal of Hydrology, Vol. 337, Issue 3-4, 30 April 2007, Pages 402-420.

Chen, S.-T., Yu, P.-S., Real-time probabilistic forecasting of flood stages. Journal of Hydrology, Vol. 340, Issue 1-2, 30 June 2007, Pages 63-77.

Estupina-Borrell, V., Dartus, D., Ababou, R., Flash flood modeling with the MARINE hydrological distributed model. Hydrology and Earth System Sciences Discussions, Vol. 3, Issue 6, 2006, Pages 3397-3438.

Piotrowski, A., Napiorkowski, J.J., Rowinski, P.M., Flash-flood forecasting by means of neural networks and nearest neighbour approach - A comparative study. Nonlinear Processes in Geophysics, Vol. 13, Issue 4, 2006, Pages 443-448.

Ntelekos, A.A., Georgakakos, K.P., Krajewski, W.F. On the uncertainties of flash flood guidance: Toward probabilistic forecasting of flash floods. Journal of Hydrometeorol-

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ogy Vol. 7, Issue 5, October 2006, Pages 896-915.

- p.348, ls.14-19: the authors introduce the topic of physical processes at the origin of runoff production during floods. It would be interesting if the reader could have more insights into this aspect with a focus on flash floods, the topic of the paper: what are the predominant physical processes in the case of flash floods? Have any catchment experiments or numerical modelling experiments been done on the subject? References to international published papers would be appreciated here.

- p.350, l.8 and figure 2: since the authors are comparing rain gauge data with radar data, saying that one is confirmed by the other, and as it is said later on page 352 that calibration based on rainfall data was not used, it would be interesting to have few words on how precipitation amounts from radar data were obtained. Besides, there is a mismatch between the text (says: the 24h rainfall accumulations) and the figure (caption says: 48h rainfall accumulations).

- p.350, l.10 to 20: the whole paragraph is very confusing and needs to be rewritten. The links between the maximum specific discharges presented in Fig. 3 for a family of catchments and the hydrographs presented in Fig. 4 for a specific catchment is not fully examined. For instance, considering that the area is a very heterogeneous one, how far can the catchment represented in Fig.4 be considered representative of the average behaviour of the catchments within in the area? When referring to "estimated peaks" in Fig.4, are the authors referring to observed or simulated discharges? It is difficult to see the differences between observed and simulated hydrographs in the figure and maybe it would be more suitable to make reference to the regression-type graph (Q simulated x Q obs in Fig.5). Besides, the caption of Fig. 4 does not correspond to the symbols in the legend. Also, the last sentence lacks precision: what do the authors mean by saying that "this figure" (Fig. 4?) points out the "characteristic size of the watershed affected by the flood for which" rainfall has to be "correctly forecasted"? What is the characteristic size? In Fig. 4 there is only question of a catchment of 262 km^2 (and, if the authors are referring to Fig. 3, the catchment areas there correspond to a wide

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range going from 10 to 2000 km^2).

- p.351, l.28: what are these "default values" of parameters and how were they computed?

- p. 353, line 8: the French national database is rather known as "Banque HYDRO" and not "Banque d'Eau".

- p. 354: In the French database, the 2-yr flood is usually presented for each gauge station in a summary of the main statistical properties of the data collected. Did the authors check if the "Qcritical obs" for the high level corresponded to the 1-2yr flood (as it is stated on line 5 that it "frequently" does)? How did they equal or differ? Also, how do the "Qcritical obs" and the "Qcritical sim" compare?

- p. 355, 4.1: the section is not clear. It is called "hydrological regime and calculation of thresholds", but, as results, the calculated thresholds are not shown. It would be interesting to have a table with observed and simulated thresholds, together with some statistical quantiles (2-yr flood, for instance) for each catchment.

As for the "hydrological regime", the authors say that the "hydrological regime of the river basins in the Cevennes-Vivarais region is proposed in Fig. 4", which, however just illustrate one river basin. It should be explicitly said if this catchment is representative of others and if the time period in question corresponds to the river regime (if it is stationary). Maybe it should be presented here a graph of mean monthly discharges (over time and space), which is what really describe the "hydrological regime" of a region. Otherwise, what is presented is the discharge evolution for the years 1994 to 1998 for a given catchment.

In Fig. 5, one can rather see a particular over-estimation of simulated discharges in the case of the Vidourle catchment, especially for small values of Q. I suggest the authors to rewrite the comments to the graph.

Page 356, line 1: what do the authors mean by "the results worsen as the severity class

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increases"? The number plotted in figure 6 should be a relative frequency (number of occurrences/total number) if one wants to compare the categories among themselves.

Page 356, line 8: was this time shift evaluated to check if there is a systematic bias in the timing of the simulations?

- p. 357, results 4.2: it would be interesting to have the results for the Ardeche catchment (not shown). I suggest to merge figure 2 and 7 in one, and add a figure on more results on the effective early warning over the studied catchments for the flood event analyzed.

- p. 359, line 26: precise here that this is specifically the case for severe, i.e., rare, flood events.

- p. 359, line 28: do the authors mean "although the forecasted rainfalls are often too wide spread..."? The sentence is not clear and should be rewritten.

- p. 360: in the "summary and conclusions" section, it would be interesting to have some sentences on the uncertainties associated to flash flood forecasting and the limits of the deterministic forecasting approach presented by the authors.

Technical corrections:

P. 347, line 6: "in French", should appear in the list of references only, and not in the text, especially because this is not the only reference in French cited in the paper.

Figure 1: check for "stream gauges" in the legend.

Figure 6: the legend should mention the link between "category" 1 to 4 and the four thresholds.

Figure 8: the plot is too small and difficult to read.

As examples, some language misuses or grammar mistakes are listed below (not exhaustive):

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- P. 346, l.19: "As a case study,"

- P. 346, lines 18 and 21: replace "are being" and "are driving" to "are", "drives", respectively.

- P. 346, line 24: replace "to determine" to "to forecast"

- P. 347, line 2: replace "loss of life" to "life losses"

- P. 347, line 6: "Besides the economic impact, flash floods are live threatening"

- P. 347, line 14: punctuation is missing at the end of the sentence.

- P. 347, line 25: "new forecasting methodologies".

- P. 348, line 9: "is called".

- P. 348, line 12-13: "Depending on the method, the antecedent... is also taken into account".

- P. 348, lines 27 and 29: replace "is being" to "is"

- P. 349, line 1: "threshold concept"

- P. 349, line 4: do you mean "a 6-month forecasting control run."? Not clear.

- P. 349, line 16: punctuation is missing at the end of the sentence.

- P. 350, line 4: "over the Gard."

- P. 350, line 7: "Delrieu et al. (2005)."

- P. 351, line 3: "more details"

- P. 351, line 5-6: "In LISFLOOD, for the simulation..."

- P. 351, line 28: "were used"

- P. 352, line 4: "was used"

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- P. 353, line 9: "Only those stations where the influence... can be assumed to be little were selected."

- P. 353, line 11: "..hourly data were also available from..."

- P. 354, line 26: "false alarms, which..."

- P. 356, line 28: "This has been also observed for..."

- P. 357, line 11: missing punctuation between two sentences.

- P. 357, line 27: "..of the forecasted event".

- P. 358, line 22-26: "for a six-month period", "for the six-month analysis", and so on.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 345, 2008.