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Hydrology and Earth System Sciences Discussions

Interactive comment on "A pilot operational flood warning system in Andalusia (Spain): presentation and first results" *by* P.-A. Versini et al.

Anonymous Referee #1

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General comment and recommendation

This is an interesting paper which describes a flood warning system (FWS) specifically tailored for flash flood events. The objective of the FWS is to provide distributed flood forecasts and warnings over the Guadalhorce basin in Andalusia (South of Spain) (3200 km2). The basin includes the city of Málaga. The hydrological model incorporated into the system is developed to be applicable over ungauged basins and it is based on a modified Curve Number procedure for the computation of flood runoff. The FWS includes also procedures for the generation of warnings based only on distributed rainfall estimates. The manuscript describes the modules of the FWS and a first application to two flood events. Moreover, the manuscript provides a discussion about

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the potential integration between high-resolution/short-anticipation warnings provided by the FWS and low-resolution/long-anticipation warnings provided by the European Flood Alert System (EFAS). Flood forecasts generated by the EFAS for the two flood events are presented and discussed. I make hereafter some specific and detailed comments that could be considered to improve the manuscript. In addition, the paper should be improved regarding the use of English. In my opinion, the paper can be accepted after moderate revision.

Specific comments

CN-based runoff model Section 3.1: Presentation of the distributed rainfall-runoff model Since its original development, the curve number (CN) method has been modified and adapted for application in continuous hydrologic modeling by making additional assumptions with respect to the applicability of the basic concept to a continuously variable precipitation input. The original concept did not explicitly include time as a variable and only predicted the total storm runoff volume. Although the basic definition of the curve number has not been changed, the method is now often used in continuous models in a much different context than originally intended. The authors introduce a procedure which accounts for the reduction of the potential runoff coefficient during a rainfall hiatus. The model adjustment proposed by the authors is based on using a period of 24 hours to "accumulate rainfall after subtracting the initial abstraction" (P10433). Even though this procedure is used in several modeling packages based on the CN method for continuous runoff simulation, it suffers for some limitations. The 24 hours duration is selected in an arbitrary way (as admitted by the authors) and may fail to cure the model for its weakness. These limitations should be underlined in the model description. Also, the authors should be aware of different procedures which may be effective for the mentioned purpose (see Michel et al., 2005).

Section 3.3: The description of the calibration and validation of the model is not well structured. There are two main points which need to be improved. The first concerns the procedure used to calibrate the model. Considering Table 1 and Table 2, it appears

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that the model was calibrated based on 8 rainfall-runoff events, and that it was validated based on other 3 events, of which one is from the Bobadilla catchment and other two occurred over Teba and Arles basins. However, results reported in Table 2 are not mentioned in Section 3.3. The second issue concerns the procedure used to extend the calibration to the ungauged basins. It is unclear if the authors extrapolated the information contentfrom gauged to ungauged basins either through a priori parameter estimates using local physical characteristics of the watershed or by transferring of parameter sets from donor watersheds on the basis of some measure of hydrological similarity between donor and transfer watershed. These two issues need to be clarified in the revised manuscript.

Details

Abstract: The abstract need to be reshaped. It starts with geographical information and the history of the local Flood Warning System. This is clearly insufficient. The abstract needs to revised and to start with the motivation for the research and the objective of this study.

P10426, L11: Sentence: "Due to the lack of flow measurements, the model was calibrated a priori in most of the basin area". The sentence is unclear, and the terms 'calibration a priori' seems to be wholly inappropriate (see Wagener and Montanari, 2011, for use of a priori information for the extension of information to ungauged basins.

P10426, L16: "prevent". The term is incorrect. It is used as a way 'to provide a forecast with several days. . ."

P10426, L22: "public safety and quality". . . I think that 'quality' is redundant here.

P10427, L28-29: "(i) arnings based on rainfall measurements, and (ii) arnings based on simulated discharges." Please check for the missing 'w'.

P10429, L7: "risk"; risk is combination of hazard and vulnerability. Hazard may be better used here.

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P10431, L9: ‘lager’, instead of ‘larger’

P10433, L11:: ‘the soil drying’. In the absence of strong evapo-transpiration, using the term ‘soil drainage’ is a better option.

P10434, L6-7: “It is initialized with the initial flow Qini measured at the beginning of the event at available gauged cells and extrapolated to the rest (in proportion to the number of drained cells). “ I cannot understand this sentence.

P10435, L3: MOPU? The explanation of the achronim is given in P10438, L5. It should be placed here, where it is met for the first time.

P10436, L7-8: “Only for the Bobadilla Basin, where major discharges were measured, has been selected and used for the calibration.” This sentence is unclear.

P10436, L16: Borga, 2008 is not listed in the references

P10436, L10: Nash, 1969: Probably a better reference here is Nash and Sutcliffe (1970), even though it is interesting to note that the proposed reference is older than the standard one.

P10438, The term IDF (Intensity-Duration-Frequency) has been not previously introduced.

P10438, L14: The authors mention ‘aggregated rainfall’ here. They should clarify what kind of aggregation they mean (in space or in time).

References:

Michel, C., V. Andreassian, and C. Perrin (2005), Soil Conservation Service Curve Number method: How to mend a wrong soil moisture accounting procedure? Water Resour. Res., 41, W02011, doi:10.1029/2004WR003191.

Nash, J. E. and J. V. Sutcliffe (1970), River flow forecasting through conceptual models part I âĂŤ A discussion of principles. Journal of Hydrology, 10 (3), 282–290.

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Wagener, T., and A. Montanari (2011), Convergence of approaches toward reducing uncertainty in predictions in ungauged basins. Water Resour. Res., 47, W06301, doi:10.1029/2010WR009469.

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