Hydrol. Earth Syst. Sci. Discuss., 5, S134–S137, 2008
www.hydrol-earth-syst-sci-discuss.net/5/S134/2008/

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 #8

Received and published: 25 March 2008

General comments:

The paper presents a feasibility study on the usefulness of distributed hydrological modeling forced by high-resolution operational weather forecast to provide early warning in a Mediterranean area which is subject to heavy rainfall events leading to flash-floods. The methodology has already been tested on large river basins and the originality of the paper is to test it in a very different context (short concentration times, heavy rainfall events) where the limits of the methodology are likely to be attained. Indeed the methods relies on the application of the distributed model LISFLOOD using daily operational rainfall and stream flow. Different levels of warning thresholds, corresponding to selected quantiles, in the observed and simulated stream flow distributions are chosen and the model is tested on its ability to predict the exceedance of

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these thresholds, not on the absolute value of the simulated stream flow. The methodology is tested in adverse conditions as, in the selected region, rainfall events last less than one day and concentration times of the catchments are of a few hours. Despite these difficulties, the method is shown to be valuable to improve early warning, with a warning delay of about 24h. In general, the paper is well written, although some parts should be explained more clearly (see specific comments). If the comments below are addressed, the paper will be suitable for publication in Hydrology and Earth System Sciences.

Specific comments:

p. 347, lines 12. There is still no certainty about the impact of climate changes on rainfall regimes. I would suggest to be more cautiaus with this sentence, or to provide references about that. p. 351, lines 5-10. The description of the LISFLOOD model is not well written p. 351, line 23: Could you justify the use of a 1 km2 grid? p. 351, lines 26-29. The model has been set up at the regional scale, without any calibration. Available discharge data were only used for verification, which is a very instructive task. However did the authors try to calibrate the model and compare their threshold warning system using a calibrated and a non calibrated model? p. 353, line 11 “can be assumed to be small” instead of “can be assumed to be little” p. 354, lines 7-17. The methodology consisting in defining exceedance thresholds both from data and model results is interesting and avoid to use absolute values of simulated stream flow for warning. It is argued that the method allows to compensate for systematic over- or under-estimation of stream flows. However, do the authors use some criteria to determine if the simulated discharge distribution is close enough to the observed one for their method to be applicable? It would be interesting to evaluate what would be the performance of the proposed method for instance with a random rainfall field, in order to get a bottom line for the method performance. p. 355, lines 1-4. The argumentation provided here is not very clear p. 355, lines 14-19. In order to fully understand what is the model performance, more details about thresh-

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olds should be given in the results section. I would suggest the authors to provide, for each catchment, the values of the observed and simulated thresholds and to show the observed and simulated discharge distributions. It would provide the reader with a better view of model performance. p. 356, lines 11-14. The authors compare their threshold approach with a traditional simulation of discharges and the warning using specified discharge thresholds. The authors mention that their simulations tend to underestimate high discharge values. Could they compare their approach with the more traditional one to better show the value of their method? p. 356-357, section 4.2. On the September 2002, higher rainfall resolution (hourly data) is available. The authors compare the discharge simulations with the observations. They show that, even with a better rainfall inputs, the model still underestimates the discharge. On the other hand, the threshold method shows that higher warning thresholds are exceeded and that a warning with a lead time of about 24h could have been emitted. They show the power of the methods, despite the deficiency in the simulation of stream flows. In a second step, the authors, show that, even with a coarser rainfall (high resolution weather forecast over a 7 km grid) warning would have been emitted and the severity of the storm could have been anticipated. Some indications on the nature of the forecast is missing (for non specialists of meteorology): does the forecast provides the accumulated rainfall over the next 12 hours period (in this case how is the cumulated rainfall disaggregated?) or an hourly simulation of the next 12 hours, which can be used as input of the model? p. 358-359, section 4.3. Finally the authors presents an evaluation of their threshold method using a 6-month period of weather forecast. Could they give more precision on the way the forecast is used? Does the forecast provides hourly rainfall fields for the next 12 hours? Is the model reinitialized when a new forecast is provided? p. 359, line 9. As before could the authors provide the values of the observed thresholds? p. 359 lines 17-18. The sentence is not clear p. 359 lines 23-25. The authors argue that false warning are less important than missed warning. We can agree on that, however, if there is too much false warning, it is probable that people will no more trust the system and that they could not take care of warnings when a

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real event occurs p. 359, section 4.3. The authors could also insist on the fact that a good weather prediction of rainfall is a prerequisite for any warning system. They show that the forecast was giving high rainfall northern than what was really observed and that it might be critical for the efficiency of warning: if warning is emitted on the wrong catchment, the system would collapse.. p. 360 lines 24-26 Modify the sentence (see comment above)

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