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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.

J. Younis et al.

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Response for C. Reszler (Referee) christian.reszler@joanneum.at Received and published: 2 April 2008

p.348/line 21 The authors propose that the temporal and spatial resolved scales of the meteorological and the hydrological model should be linked. Flash floods are dominated by small temporal and spatial scale processes.

–> yes, made clear in the text

p.351/line 1 The authors note that the LISFLOOD model has been developed particularly for large catchments. A report is cited, that it has been applied in small catchments: I would be interested about the experiences from this application. What is the value of the 1km grid compared to the spatial resolution of the meteorological data and

the weather forecasts? (Are the significant hydrological processes represented at this scale? How are the parameters set for each grid element?)

–> In the work by Everhardus et al. (2002) LISFLOOD was setup on a 100 m resolution for the Toce, a mountainous watershed with a size of 1534 km2 belonging to the Po river basin. The aim of the study was to simulate three flash-floods with a fully calibrated LISFLOOD model, compare it against results obtained by the Raphael project and to test if Tobler’s Pycnophylactic interpolation method can be an alternative for rainfall interpolation. More information can be found within the report by Everhardus et al.

p.353/line 4 How is the hourly temporal resolution of the weather forecasts derived within the meteorological forecast model? Is the radar information used to estimate the short term development?

–> The numerical weather prediction models calculate rainfall fields at every model time step which is typically of the order of seconds to minutes, depending on stability criteria such as Currant-Friedlich-Levy (CFL). These fields are then accumulated and provided by the weather service in pre-defined time steps, in this case hourly time steps. The hydrological model has also been run with an hourly time step, using hourly forcing from the ground observations, radar and forecasting model. Shorter-term developments have not been analysed. Rephrased in the text to make clearer

p.350/line 8 I suggest not to write "confirmed" (see p.356/line 21).

–> ok

p.355/lines 9-13 The threshold exceedance approach does not necessarily require a calibrated model, which makes this method very useful for ungauged catchments. Thresholds relative to the simulated discharges are determined so that systematic errors are compensated for. In this study, during the 12 year simulation for threshold determination some peaks are over- and some peaks are underestimated. Even in the

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September 2002 case study based on high resolution data the peak is underestimated (Fig. 8). Despite the lack of knowing the parameters, can the model performance be evaluated in terms of representing the main flood generation processes? Did you perform any sensitivity analyses?

–> The model parameters are known since the default values have been used. No we did not perform a sensitivity analysis for the different processes.

p.355/lines 15-17 You have done the comparison of the statistical properties between simulations and observations. I think this is very important to show in order to evaluate the model performance and to illustrate the threshold selection.

–> Please see the answers given to Referee 3 on the same subject.

p.354/lines 5-6 The comparison of the return periods may be misunderstood. Is this the estimated return period of the simulated thresholds?

–> Analysis of observed discharge time series for different basins has shown that this cut off value corresponds frequently to the 1-2 year return periods.

p.355/line 24 It would be interesting if you describe more in detail how the results of the contingence tables change with different threshold values.

–> In figure 6 the results of the contingence table is plotted for the different threshold values. The legend has been made clearer now, and a sentence is also added in the text giving more detail on the contingence table.

p.356/line 16 Could you insert a sentence about the initial conditions used: Is the model updated during the 12 hours between two forecasts using the high resolution data (incl. radar)?

–> In this case the initial conditions were not updated with observations. The hydrological conditions prior to the onset of the floods were very dry. Since in this case study the interest is in early warning well before the onset of the floods, an updating of the IC

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would in this case not lead to very different result. In a realtime system, this would of course have to be done. Now made clearer in manuscript

p.358/line 24 What initial conditions are used at each forecast point during the long term analyses?

–> The following text has been added : As initial conditions the output from hourly simulations driven with observed meteorological data from the high station network have been used.

p.359/lines 4-5 In the long term evaluation, it would be interesting, if there are any significant differences in the synoptic meteorological conditions between the analysed events. Does this shift in the weather forecasts in winter occur systematically? Have you got any information about the performance of the meteorological model in different synoptic conditions? In general, the testing period should be extended to include more events.

–> From the data available for this study it was not possible to analyse the performance of the meteorological model as compared to observations. The authors agree that the testing period should be longer and is envisaged in a follow up study.

Technical comments The legend in Fig. 1 contains "stream gauges" twice; I think one circle should denote "synoptic meteorological stations".

–> Ok, corrected

There are a couple of typing errors. Please go through the paper again very carefully and check.

Sandrine Anquetin, Jutta Thielen-del-Pozzo, Jalal Younis April, 25, 2008

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