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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "A coupling of hydrologic and hydraulic models appropriate for the fast floods of the Gardon river basin (France): results and comparisons with others modelling options" *by* O. Laganier et al.

Anonymous Referee #1

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This manuscript compares two modelling options for the simulation of flood wave propagations in the Gard river valley (South of France), frequently affected by severe flash floods. The two tested options are (1) a simple lag and route conceptual model with a constant propagation velocity VO (adjusted for each individual flood event!) and a parameter K0 controlling the flood wave attenuation during its propagation and (2) a 1-D hydraulic model based on the resolution of the full Saint-Venant equation. An analysis of the sensitivity of the simulation results to the accuracy of the upstream and lateral inflow hydrographs used to feed the propagation models is also proposed. This sen-

sitivity analysis has little to do with the main issue of the paper, it is relatively basic (removal of some inputs or replacement of simulated hydrographs by measured hydrographs) but helps to evaluate the overall consistency of the simulation results and observed data: the best results in terms of Nash criteria are obtained when the most accurate inputs are used (Figure 5);

The manuscript is clear and well-structured and the language could be significantly improved. But the whole work does not appear sufficiently mature to be published in its present state. A significant amount of additional work has to be realized before publishing these results to explore key questions that are neglected. The authors did apparently work with a version of the lag and route model previously calibrated (Tramblay et al., 2011) on the upper part of the Gard river watershed which has very different characteristics than the study stream reaches: steeper slopes, narrower valleys. The values of the calibrated parameters and especially of the diffusion parameter K0 are never discussed in the paper. I suspect that this diffusion factor has little influence on the shape of the flood hydrographs in this upper part of the watershed, where the shape is dominated by the flood concentration process. It can therefore hardly have been accurately calibrated in the cited previous study. According to the results (fig. 6), the lower performances of the lag and route model comes from a too large attenuation of the flood wave by the model in the downstream reaches of the Gard river. K0 seems to be a key factor controlling the results and should be calibrated on the downstream measured data for a fair and fruitful comparison with the 1-D hydraulic model. The authors should absolutely conduct this calibration. Their results in the present state can not be generalized and reflects to my opinion a misuse of the simple conceptual model. Some additional comments:

1) The Lag and Route model is based on a cascade of linear reservoirs (this could be stated clearly in the manuscript) which is a very basic a probably not the best suited choice. Moreover, one important parameter of the cascade – the number of reservoirs – is controlled by the size of the cells of the digital elevation model and not by the

model user. This poses question of control of the adjustment factors of the model and extrapolation. Muskingum or Hayami models which are as simple to implement as the proposed model would certainly have been more suited choices.

2) The propagation velocity should not vary from one event to the other. Ideally, if it appears that propagation times vary, a relation between this parameter and the discharge values should be adjusted.

3) A clearer separation between calibration and validation data sets should be done in the work

4) The authors could also test how the models behave for the extreme event that occurred in 2002 in the region, which inundated the Gard river flood plain and which has been well documented. It is the event on which Bonnifait et al. (2009) have worked. This would enable a comparison with this previous work.

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