

***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.***

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Response to Anonymous Referee #2

We thank the referee for its relevant and judicious remarks. We resume here point by point the discussed elements. The response is based on a new version of the manuscript (in supplement).

In the third paragraph of its comment, the referee indicates that the innovative as-

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pect of the approach is little clear; and that the comparison of the various modelling options must be more detailed. Concerning this last point, the part at issue was completely rewritten (see Section 4.2 of the new version of the manuscript). The new analysis is based on three indexes (Nash index and also the two indexes specific to peak flow), which highlighted additional remarks. New figures (n°5,6,7,8) and new tables (n°7,8,9,10) were also added. Concerning the innovative aspects of the manuscript: indeed, they are little clear in the former version. Briefly, what we try to establish is: The study concern a coupling of models, which must be adapted to the context of flood and inundation forecasting of the Gardon river: it must be fast, able to estimate water levels, discharges, flooded areas. . . For this purpose, the presented coupling seems adapted. In the manuscript, we detail this coupling, then analyze these results for some events, in terms of floods hydrographs; then, secondly, the results of the coupling are compared with those of other modelling options (always in terms of floods hydrographs). These comparisons aim at bringing elements of responses to the following questionings: 1) Is a simplified routing model as relevant as a hydraulic model based on the full Saint-Venant equations, for estimating the discharges at the Ners, Russan and Remoulins stations (coupling vs Lag&Route option)? This Lag&Route approach does not allow to model the flooded zones; the issue of our paper is to estimate if there are important gaps for the discharges modelling. 2) Is adding lateral inflows justified for all events? In other words, is the choice of a coupling appropriate, or is a simple hydraulic model, without lateral inflows, could suit (coupling vs SVMOD option)? 3) What is the impact of the quality of modellings injected at Anduze and Alès on the results of the coupling in the downstream part (coupling vs COUPLOBS option)? In the new version of the manuscript, these questioning are clearly detailed in the introduction, and reminded at the beginning of Section 4.2. It should be noted that in the manuscript, we are only interested in the reconstruction of hydrographs: results of the modelling of the flooded areas, or of a forecasting use, are not detailed, for the sake of clarity. However, these elements are discussed (see Section 5.2).

In the fourth paragraph, the referee evokes the use of a bidirectional (online) coupling,

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which seems more adapted for modelling the Gardon river. We share the opinion of the referee. However, we think this type of coupling is more delicate to use in the context of flood and inundation forecasting. For this purpose, an unidirectional (offline) coupling seems more adapted: another hydrologic model can be easily implemented, what is an interesting criterion as, actually, there is not clear consensus as for a preferential hydrologic model for modelling flash floods (Hapuarachchi et al., 2011); furthermore, an unidirectional coupling is numerically less heavy, and its calculation time are shorter and more interesting for the forecast. These comments are developed in the new version of the manuscript (see Sections 3.1 and 3.2).

Comments of the fifth paragraph: see previous comments.

Paragraphs 7-8: negative Nash indexes are effectively observed at the Alès station, in the case of events n°5, 6 and 7 (see table 4); and at Ners and Russan for the SVMOD (see table 8) and SVOBS (table 10) options in the case of events n°1 and 5. Negative Nash indexes at Alès signify a bad adaptation of the S and V0 parameters, calibrated at the Anduze station. This remark is detailed at new Section 4.1.1. Concerning the SVMOD and SVOBS options, negative Nash results from not adding lateral inflows, which play an important role for these two events, the associated rains having been the most important in the intermediary-downstream part of the Gardon river basin. We show that ignore lateral inflows led to very bad qualities modellings at the stations. It is more finely detailed at sections 4.2.2 and 4.2.4.

Concerning the quality of the English: we tried to refine the translation.

Concerning the modifications of the outline: - The summary, the introduction and the conclusion were largely rewritten. - Sections 3.1 and 3.2 were added, and should allow the reader to better understand the choices of modelling made. - The description of the application of the coupling to the Gardon river (former Section 3.1) was completed, and moved after the description of both models (new Sections 3.4 and 3.5). - Part 4.2 was completely rewritten: it contains now 4 sub-sections, instead of 3 in the former

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version of the manuscript. - The discussion (Section 5) was also modified: the former sub-section 5.1 was deleted; the former section 5.2 becomes the section 5.1 of the new version. Finally, the new Section 5.2 discusses the usefulness of the coupling for forecasting purposes, and for the flooded areas modelling.

Concerning figures and tables: Four tables were added (n°7,8,9,10), and are described at new Section 4.2. The figure 4 was improved. The former figures 5, 6, 7 were deleted, and are replaced by figures 5, 6, 7 and 8 in the new version.

References: Hapuarachchi, H.A.P., Wang, Q.J., and Pagano, T.C.: A review of advances in flash flood forecasting, *Hydrol. Process.*, 25, 2771-2784, doi:10.1002/hyp.8040, 2011.

Please also note the supplement to this comment:

<http://www.nat-hazards-earth-syst-sci-discuss.net/1/C2904/2014/nhessd-1-C2904-2014-supplement.pdf>

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Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 1, 4635, 2013.

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