

Interactive comment on “Multi-model comparison of a major flood in the groundwater-fed basin of the Somme River (France)” by F. Habets et al.

Anonymous Referee #1

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General comments:

This paper presents a comparison of the performances of four hydrological models applied over the Somme river basin, north of France. After a short description of the main characteristics of the river basin, the main features of the models are presented. The implementation of each model for the simulation of river discharges and piezometric levels over an 18-year period is presented and the results are compared. The paper mainly stress that the four models are unable to accurately simulate both river flows and piezometric levels during high flows, mainly due to the role of the unsaturated zone on the river (which depth variation is not dynamically taken into account in the models) and aquifer hydrodynamic. The paper concludes raising an interesting question on

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whether it is necessary to apply complex land surface schemes on river basins where groundwater plays a significant role instead of using groundwater models. The paper is clear, well presented and illustrated and the English seems good to this reviewer. After answering for further information requested in specific comments and corrected some technical corrections, it may be of benefit to accept this paper to publication on HESS journal.

Specific comments:

- Line 18-20 on page 6148; the authors indicate that there is a delay, but it is not clear between unsaturated flow and what? It may be SI, but this has to be detailed a bit. Also, the resulting average percolation rate is interesting but maybe providing the min and max values could describe how variable this process simulation is between models. - Line 11-15 on page 6148; an analysis of the differences between models in terms of storage in the aquifers could perhaps be intended comparing UF and BF low flows or peak flows delay? Fig 3 seems to present differences between models? - Line 24-26 on page 6148; what is the geological context of the Pang-Lambourne study? Is it close to that of the Somme? - Line 1- 3 on page 6149; this conclusion is ok but when looking at IRZ on table 1, it appears that the simulated values are rather the same for all models, so the main differences lie in the way the models simulate the seasonal behaviour of both the unsaturated and the saturated zone. - Line 26 – 27 on page 6149; to facilitate the comparison with figure 3, it could be better to present the same time scale (Sept → Aug) for graphs 5 and 9. - Line 1 – 2 on page 6150; the differences noticed could also be due to geological heterogeneities not accounted for by the models or linked to their calibration processes. - Line 15 – 16 on page 6150; an alternative assessment could be that peak flows are over-estimated because the recession slope seems to be fairly well simulated compared to the observed one (for example in 89, 90, 91, 93, 95). - Line 2 - 3 on page 6152; wouldn't be much fair to write that "SIM is the model that better fit the observed river high flow during the first 50 days"? By the way, this figure demonstrates again that the recession slope is fairly

well simulated. . . - Line 11 on page 6153; here the Marthe model shows a less good simulation of the recession than SIM and Modcou. - Line 5 – 6 on page 6154; maybe the average of the piezometric levels of the wells located into the flooded areas could be plotted for an interesting comparison and a kind of validation of the inundated area detected? - Line 24 on page 6157; “It was shown”.. maybe it could be better to cite the fig 3 for example?

Technical corrections:

- Maybe the authors should systematically use piezometric “level” instead of “head” to be precise (the piezometric head can be understood as a specific measurement of water pressure above a reference). - Line 9 on page 6137, the link between a negative (?) matrix potential and the activation of the fissure flows as an explanation for the rapid increase of the piezometric head should be detailed a bit if mentioned. - Please give the internet link allowing to download the Amraoui’s references (<http://www.brgm.fr/publication.jsp>) - Figure 6 caption: “the observations are interpolated linearly between each observation”, in case of missing data? - Figure 12 caption: “saturated area simulated by CSLM” add “in yellow”?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 6135, 2009.

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