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Hydrology and Earth System Sciences Discussions

Interactive comment on "How crucial is it to account for the Antecedent Moisture Conditions in flood forecasting? Comparison of event-based and continuous approaches on 178 catchments" *by* L. Berthet et al.

L. Berthet et al.

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Dear Dr. Ehret,

We thank you for your very interesting comments and for the reference you gently provided. Some replys to your comments follow.

1. The operational difficulties with continuous simulation models.

Reply to comment 1: the main difficulty we wanted to point out in the paper was the fact that a continuous mode requires a long warm-up period to initialize the model. If

the modeller is not able to define the initial states from previous run(s) or from physical measurements, then he / she has to use a warm-up period long enough to get a state which is independent from the (arbitrary chosen) inital state. The modeller may indeed do several short runs by storing the complete model state but in such a situation he / she has to wait for a long enough warm-up period. If the modeller wants to issue a forecast at a given date (e.g., right now), he / she needs a long term input dataseries previous to this date (e.g., past data).

Reply to comment 2: we totally agree with this comment. It is of crucial importance that the model-users use the model in a very regular way for all the good reasons you gave.

Reply to comment 3: the issue of snow impact may be of primary importance for some countries. For those catchments, it looks even more necessary to use a model continuously, as you rightfully point out. Here the catchments were without significant snowmelt influence.

2. The impact of the assimilation of the last discharge observation

Reply to comment 1: we agree with the absolute necessity to evaluate the quality of the observed data. In this study, we used the model "offline", meaning that we used past data series to "re-run" the model retrospectively in forecasting mode. Those series have been checked by the operational services which store them in the data base. Consequently, those data are expected to be of higher quality than real-time data. However, since this is a research work, we decided to used validated data not to add more uncertainty sources.

Reply to comment 2: The SMA store level has a strong impact on the simulated discharge on low flow periods. This study was mostly interested in flood events. The main criterion we used – the persistence index – is a quadratic criterion. It is moslty impacted by high flows period but reflects poorly the quality of the model during low flow periods. We agree that in the case of low flow application, the assimilation strategy

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may be different.

Reply to comment 3 and final remarks: our objective in this study was mostly the analysis of the initialization of a flood forecasting model and the impact of data assimilation techniques which are more and more used operationally. The potential of assimilation techniques is indeed limited by the quality of the model: a hydrological model which gives perfect results alone does not need any updating. It is of primary importance to continue working on model structures to make them as reliable as possible. However, models used currently are not so good and we have to propose tools to improve the quality of the forecasts. That is why we chose a model which is used operationnally, which is efficient and uses data assimilation techniques. The discharge assimilation in a model makes the effect of antecedent moisture pattern less influential whatever the model is lumped or distributed (since the model is constrained by a punctual value of discharge). However antecedent moisture patterns may play an important part in some cases.

We will account for your useful comments in the subsequent version of the article to improve its quality.

Yours sincerely, Lionel Berthet, Vazken Andréassian, Charles Perrin et Pierre Javelle

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 1707, 2009.