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Interactive comment on "A past discharge assimilation system for ensemble streamflow forecasts over France – Part 2: Impact on the ensemble streamflow forecasts" *by* G. Thirel et al.

Anonymous Referee #3

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General comments

This very interesting paper presents the results of an extensive study of the impacts of assimilating measured discharges on ensemble streamflow forecasts. The assimilation system developed in order to improve the initial soil moisture conditions of the hydro-meteorological model was described in Part 1. The evaluation of the benefit on simulated streamflow of six configurations of the assimilation scheme and of a reference simulation was also presented. The best configuration combines the moisture of the two soil layers in the state variable and includes the use of an exponential profile of

the soil hydraulic conductivity. This configuration and its variant without the exponential profile have been tested in the ensemble streamflow forecast system. A large array of appropriate statistical scores has been used on a large number of basins. Impacts on independent basins and the effect of basin area have also been considered. The paper clearly demonstrates the benefit for ensemble streamflow forecasts of using the assimilation system jointly with an improved soil model and this benefit lasts during the range of 10 days investigated in this study.

Specific comments

The methodology is complex because it requires a hydro-meteorological suite, the use of EPS, an assimilation system, and an experimental set-up combining all these components. All information necessary to understand the methodology and the discussion is included in the paper. However the presentation of the methodology could be improved.

For instance, more about the SAFRAN analysis sub-system could be said already in 2.1 (partly moved from 2.3, Page 2460, 4, P. 2463, 4.2, P.2467) and the different uses of the word "analysis" could be made clearer (e.g. Lines 1 – 5 on P. 2463).

The set-up for the impact assessment could be a separate subsection of 4. A synopsis could be provided for a typical hindcast with the day and time of the data used for the SAFRAN analysis, of the data used for the assimilation, of the simulated streamflow analyzed in Part 1, of the state variable in ISBA, of EPS, of ensemble streamflow forecasts (and observed data used for verification).

The scores were averaged for the (148 or 49) stations. This justifies the use of relative values of spread and RMSE, and the use of skill scores (BSS and RPSS). The so-called ratio-spread and ratio-RMSE are normalized with averaged observations in the verification sample, whereas BSS and RPSS are calculated relative the long-term frequency. Skill scores should be used also for the resolution and the reliability.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 2455, 2010.