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Hydrology and Earth System Sciences Discussions

Interactive comment on "Estimation of antecedent wetness conditions for flood modelling in Northern Morocco" *by* Y. Tramblay et al.

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Dear Charles Perrin, thank you for your interest in our work and for the useful comments that helped us to improve the manuscript. Please find below our answers to your comments N°1 to N°11.

1 & 2: Different authors provided different formulations of the SCS-CN model, including Michel et al. (2005), Sahu et al. (2007) or Durbude et al. (2011). In particular, Sahu and al. (2010) compared 5 different versions of the SCS-CN model for 76 catchments (mainly agricultural) in the US. For the 5 different versions tested, the mean root mean square errors for the discharge simulations were ranging between 4.85 and 5.23 (mm). These differences can be considered small with regards to other sources of uncertainty

than the model structures, such as the rating curves or measurements errors (see your comment n°7). More, the differences between the models were more important for wet catchments, when for catchments with semi-arid to arid conditions (as it is the case of the present study) the different model versions provided similar results.

Nonetheless, we do believe that improvements in model structures are an important task in hydrology. In the present study, we choose to use the HEC-HMS software, a standard tool for hydrologic simulation used by engineers worldwide. The HEC-HMS software includes the standard version of the SCS-CN model. Since it is a pilot study in Morocco, we wanted first to demonstrate the possibility to perform rainfall-runoff modeling at the event scale using standard tools, in order to be able to compare our findings with the results in other regions (Southern France, Spain, USA..). The results obtained are satisfactory since the floods are reproduced in a realistic way. Additionally, the daily SMA model considered in the present study has been also chosen since it is currently used in real-world applications for flood forecasting in southern France (Javelle et al. 2010). Further research should aim at testing other model formulations as well as to include in tools such as HEC-HMS the most efficient model versions.

The reference to Michel et al. 2005 has been modified, we included in section 3.3: "Different versions of this model have been proposed (Michel et al., 2005), however here the classical version has been chosen for a better comparability of the results with other studies."

References cited

Sahu, R.K., Mishra, S.K., Eldho, T.I., Jain, M.K. 2007. An advanced soil moisture accounting procedure for SCS curve number method. Hydrol. Process. 21, 2872–2881.

Sahu, R.K., Mishra, S.K., Eldho, T.I. 2010. Comparative evaluation of SCS-CN-inspired models in applications to classified datasets. Agricultural Water Management 97 (2010) 749–756

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3: We added the suggested references in the introduction.

4 & 5: Data collection of historic hydrological records is an important issue in Morroco. We used all the data available for this catchment, the data has been collected manually from the paper records with the great help of the agents of the Hydro-meteorology division. Real-time transmission of precipitation and discharge measurements is currently being implemented in this catchment (and others in Morocco), soon it will be possible to test real-time applications for flood monitoring and forecast on a much larger database. Again, this is a pilot study in Morocco, now our goal is to implement and test this type of approach (also with different types of models) in other catchments. The ultimate objective is to develop regional estimation methods for the model parameters, to provide guidelines for the application of such models in the case of ungauged basins. We improved the conclusions and perspective section with addressing these concerns.

6: This is a very interesting suggestion; we implemented it in the results. We modified the whole section 4.1 and 4.2 to better describe the methodology and the benchmark model with a median S.

7: In section 4.1 we added: "However the causes for model failure may be manifold: the model structure, parameter values or stream flow measurements may also be blamed for low model efficiency."

8: The leave-one-out procedure provides a systematic cross-validation of the model. With a small sample size, the risk is to select only large/small flood events with dry/wet antecedent conditions in the calibration and validation samples, leading to a biased evaluation of model efficiency. In our case study, using a systematic validation with the leave-one-out procedure ensure that model validation results do not change depending on the selection of calibration and validation samples. However we addressed your concern by adding a standard split-sample procedure, the results are comparable with the leave-one out approach.

9: As you can see in table 1, unfortunately there are only 3 events since 2002 (the

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starting date for AMSRE data and ASCAT starts in 2007). Consequently, it is impossible to build a regression with only 3 points. However, the initial condition of the event-based model is highly correlated with the SMA model output, and both AMSRE and ASCAT data are themselves well correlated with the SMA output. This shows the potential interest in remote sensing data to estimate the initial conditions, avoiding the use of a SMA model that requires long time series of precipitation and evapotranspiration.

10: done

11: In the HESSD version, the figure is small since it has been reduced in size to fit a landscape page setting. However we provided this picture in portrait format and in high quality (600dpi, font size =16) so it should appear nicely in the HESS format. If it is not the case, we will then modify to figure.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 9361, 2012.