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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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This article presents the use of antecedent soil moisture indices to initialize an event-based model. The model is applied 16 flood events in a small catchment in Morocco, on which it is difficult to get continuous records. Three antecedent moisture indices are tested, based on antecedent streamflow, rainfall and a soil moisture accounting (SMA) procedure respectively. Results indicate that the third approach is the most satisfactory in terms of flow simulation. Then the authors try to evaluate the potential usefulness of satellite-based moisture estimates by relating them to the SMA simulations.

The article addresses a critical topic that is faced in many regions where it is difficult to maintain continuous hydrometeorological records. The article is generally clear,

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but I think a number of points could be improved or further discussed. Below are some detailed comments that could be accounted for by the authors when revising their manuscript. Moderate revision is requested.

Specific comments:

1. Page 9363, line 26: More recently, Durbude et al. (2011) proposed an alternative, more efficient event-based version of the SCS-CN model, starting from the continuous model formulation proposed by Michel et al. (2005). Should this be accounted for in this work?

2. Page 9364, line 6: Actually, the article by Michel et al. (2005) questions the mathematical basis of the SCS-CN method and shows that it introduces confusion between intrinsic model parameters and initial conditions. Instead, the article proposes a more rigorous set of equations that can be used in a continuous model. So maybe the way this article is cited is not fully appropriate. This work could be accounted for in this study.

3. Page 9364: The literature review could also mention the attempts made to assimilate remotely-sensed soil moisture information in rainfall-runoff model. I am thinking about the tests made within the AIMWATER project a decade ago (Loumagne et al., 2001; Francois et al., 2003; Oudin et al., 2003), but there were also other more recent attempts in the literature that could be mentioned (e.g. Beck et al., 2009; Brocca et al., 2012; Bronstert et al., 2012).

4. Page 9365, section 2.1: I understand the problems in data availability and quality, but it would have been interesting to test the approach on another catchment, possibly with contrasted conditions. This would have provided more general conclusions. If this is not possible, the authors could present their point of view on the generality of the approach and its transposability to other catchments, given their knowledge on rainfall-runoff modelling in this type of catchments.

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5. Page 9367: The selection of the 16 events is based on flow observations, probably using the largest events over the test period. However, in an operational flood forecasting context, it is also interesting to know how the model would react for large rainfall events that did not produce significant flood events. It would be useful to check that the model is not too reactive in these cases. The event selection could therefore be extended to such cases if data are available.

6. Page 9374: It would be interesting to introduce a model version in which the initial soil moisture is fixed at the median optimized value for all events. This would be a simple benchmark, which would help underlining the relative impact of initial conditions on model efficiency on this basin.

7. Page 9374, lines 21-23: The causes for model failure may be manifold: the model structure, parameter values or streamflow measurements may also be blamed for low model efficiency.

8. Page 9374: The leave-one-out procedure implemented here to evaluate the model is not very demanding for the model evaluation, since it will favour parameter stability. Would a split-sample technique, that would more drastically limit the available information for calibration, provide the same results (in terms of level of efficiency)?

9. Page 9375: One would have expected that modelling tests are also made using remotely sensed data, else one has the feeling to stop in the middle of the ford. Data availability seems to be a strong constraint, but could the event selection be done in such a way that there are at least a few events that can be used to illustrate results obtained using remotely-sensed data?

10. Page 9375, line 25: write "with Table 3"

11. Figure 5: Text on the graphs is very small and difficult to read.

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