HESS Review of Atencia Llasat Garrote Mediero: Effect of radar rainfall time resolution on the predictive capability of a distributed hydrologic model

General Comments

This is an interesting paper that combines radar-rainfall estimation using WPMM (Window Probability Matching Method which matches raingauge and reflectivity probability distributions) and advection correction methods (which accounts for storm movement in pixel rainfall estimation over a time-interval) with distributed hydrological modelling to investigate model simulation sensitivity to rainfall time-resolution for flash floods. It also attempts to treat rainfall at different resolutions as independent ensemble members, along with taking account of uncertainty in model states and discharge measurements, in a probabilistic model calibration. I am less convinced by the utility of the latter, brings added complexity to the paper and tends to hide judgements on the plausibility of the hydrological model. However, it also has interest.

Application of WPMM has novelty, using a nonparametric Kernel density function approach (and comparison with parametric approaches) to overcome problems in the distribution tails. A clearer comparison and discussion of the two approaches is required when the results are first presented. Categorisation into rainfall types adds further complexity to the method, and brings further issues that are discussed. Application of the advection correction approach also has novelty and draws on relevant literature sources.

Choice of the RIBS model seems a reasonable one, with infiltration excess runoff probably dominating the case study Spanish catchment; but the meaning of return flow needs clarification or a change of terminology.

Overall, the paper is deserving of publication. It could be much improved through detailed attention to the English, so as to improve readability. Thus I recommend provisional acceptance subject to this being done, together with addressing other detailed comments presented below. The amended paper will need to be re-reviewed.

Detailed Comments

The English needs detailed attention by a native-English speaker: examples of problems on the first page are given below.

7996 line 3 rainfall surface data introduced – rephrase to estimates of surface rainfall used

Line 5 model results – model predictions

Line 6 composed radar – composite radar

Line 6 6-minute

Line 10 in both convective and stratiform Z/R relations – rephrase

Line 22 for rainfall estimation.

Line 23 on basin processes….especially for convective…

Line 24 Is the Bell and Moore (2000) in the References the right one? Think it should be HESS, 4(4), 653-667, (2000).

7998 line 4 Using 1000 km^2 as the "usual basin size for flash-flood prone basins" is rather strange, and seems rather large to me.

line 20 The literature shows many Z/R relations…to more recent ones for different climate types.

Line 28 other methods for obtaining

8000 line 12 The sensitivity of time-resolution on distributed hydrological models is addresse in Bell and Moore (2000)

8002 3.1 line 6   Sempere-Torres et al, 2000;

Line 10 "huge sub-estimation" - rephrase – due to gross underestimation.

8004 line 27 non-univocal - better to use "ambiguous" as in more common usage.

8005 line 4 commented on previously. Subsequently, the ambiguous relation between…as two independent unambiguous datasets.

8006 line 19 where the transformed field

8007 "return flow" requires closer definition: is it saturation excess surface runoff?

8010 line 10 GSA – define as Global Sensitivity Analysis

Line 21 Nash-Sutcliffe Efficiency (NSE) were selected…..The NSE was used

8011 line 4 $T\,s$ better written as T_s – also occurs elsewhere

Line 11 of goodness-of-fit tests

8012 Is it better to change the terminology from BIAS to "log ratio bias" and Error to "bias" (or "mean error")?

Lines 3-10 Better style to introduce equations sequentially within sentence construct, and not just a list outside the sentence.

8013 line 9 "that are not held between the prediction intervals" – should this read "that are within the prediction intervals"?

Lines 6-15 Again, better to introduce the equations as part of the sentence construct.

8014 line 6 In Table 4 the eight

Line 1-15 There needs to be more discussion here on the relative merits of parametric and non-parametric approaches: this is discussed only later on page 8017.

line 13 "is own case data" – actually only 2 out of 4 cases. Comment on this case specific calibration in relation to flood forecasting application.

Line 20 Clarify why gamma function chosen rather than non-parametric kernel estimator.

8015 line 2at six river gauging stations.

Line 13 value for a 15 min time-interval.

8016 line 15 Because of this, an effort was made to couple radar data with a hydrological model for flash-flood cases recorded in Catalonia. This contribution provides a good example of….traditional Z/R power-law…

Line 21 caused by the heavy precipitation

8017 line 1 minimumum root mean square error is obtained

Line 3 However, the results – not only in the lower tail of the distribution but also in the higher reflectivity tail – show…

Line 10 "potential form" and potential factor" – consider change of terminology

Line 14 of reflectivity into rainfall intensity…due to the convex shape of the WPMM function in the semilog….

Line 26 could be related to under-estimation of reflectivity

8018 better line 3   QPE results

Lines 15-17 Clarify how theis overall result was obtained.

8019 lines 11-12 Could link to findings and discussion of this by Bell and Moore (2000)

Line 18 "a previous analysis" – is the intended meaning "a further analysis"?

8020 lines 22-24 Should this be the paper HESS, 4(4), 653-667, (2000)?

8029 Table 4. Validation results for the eight Z/R relationships in..

September 06 in table

8030 "to the same rainfall estimation" – rephrase to clarify meaning

8031 Median R^2 Efficiencies are low suggesting low model performance – does this deserve comment? There is no visibility of observed and simulated hydrographs to judge plausibility of hydrological model behaviour and performance. This is needed, and to be commented on.

8032 Fig 1. Boundary of Catalonia with DEM relief.

On map key, contour should read boundary. Not clear if Basin boundary is Catalonia boundary. Need to get this right.