

Interactive comment on “The use of meteorological analogues to account for LAM QPFuncertainty” by T. Diomede et al.

M. Llasat (Referee)

carmell@am.ub.es

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The paper shows the results of a long and intense research for the improvement of the rainfall and runoff forecasting. It is definitely addressed to relevant scientific questions within the scope of HESS. Although the concept of “analogues” is not new, the value of the paper remains in the comparative analysis of different methodologies to achieve the best results (variables, similarity criteria, methodology to do the forecasting), as well as in its comparison with a deterministic meteorological model. An added value is its application to the runoff forecasting. Results are sufficient to support the interpretations and conclusions (within little exceptions) and both title and abstract are correct. Despite not including all references related to the analogues method, authors give proper credit

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to linked recent works.

The paper tries to synthesize the vast and hard work carried out. This is not an easy task and for this reason some methods and assumptions are not clearly outlined, mainly, if we take into account that this contribution would be very useful for the research of fellow scientists. Sometimes the presentation is hard to read, because authors try to concentrate a lot of information in a short paragraph. My “specific comments” address about these questions. Some parts of the paper could be improved following these comments.

Specific Comments

Pag. 3068, line 19-21: Authors say that they have tested “several combinations of them to characterise the atmospheric circulation over Western Europe and East Atlantic”. Which are these combinations?

Pag 3068, line 24: you should add a map showing the domain area for the analogues method, the integration region considered by the LAMBO and the Reno basin.

Pag 3068, line 28: the analyses correspond to 12:00 UTC, for what hourly interval are the rainfall data accumulated?, how many raingauges are available (this figure is only indicated in the Figure)?, has any quality control to rainfall data been applied?

Pag. 3069, lines 1-3: Authors say that “the forecasts obtained via this approach (referred hereafter as scheme A) have been compared with those provided by an alternative implementation of the method (hereafter, scheme B), based on the proposal of Obled et al. (2002)”. It seems that if the paragraph above makes reference to scheme A, then in scheme B other fields and similarity criteria should be used. However, the difference between both schemes lies on the procedure to calculate the precipitation forecast for the next 72 h, not on the variables used to characterize the atmosphere, neither on the similarity criteria. This paragraph should be rewritten to make it clear.

Pag. 3069, lines 4-12. The explanation of both schemes is not clear. Authors say “each

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current day D_c and each past analogue day D_p is characterised by ECMWF analyses at 12:00UTC of day D and day $D-1$ ". But, when they are choosing the day D_c-1 , are they looking for the n analogous of the day D_c-1 (sample of n analysis D_p-1), or are they choosing the previous day to each analogous D_p (sample of n analysis D_p) to the day D_c ? Obviously the analogue of the day D_c-1 can be different of the previous day of the analogue day D_p . The similarity criterion is applied to day D_c , or also to day D_c-1 ? If you only apply the criterion to day D_c , why do you need to use the day $D-1$ for the precipitation starting on day D ? Is the precipitation forecast obtained for the next 72 h hour by hour? In the scheme B, authors say that "the days D_c and D_p are characterised by ECMWF analyses at 12:00UTC of day D and corresponding model forecasts at +24, +48 and +72 h". They could use the "analysis fields" of the days $D+24$, $D+48$ and $D+72$, or they could use the "forecasted fields", which are they using?. In the same scheme, authors say that "for each of the three different forecast times, the related precipitation forecast is obtained by the 24 h historical raingauge recordings characterising the corresponding past analogue day", which is the period of time for which precipitation is accumulated: 00-00 UTC, 13:00-13:00 UTC, another?

Pag. 3072, line 13: why fall season takes from 4 September to 29 November?

Pag. 3072, lines 17-26: you should clarify that you are testing the two criteria of similarity. Figures 2 and 3: are you using the scheme A or the scheme B?, the hour 0 in the abscises axis coincides with the period 12:00-13:00? Please, clarify.

Pag. 3072, lines 20-23: please, introduce in the text the acronyms showed in figure 2; for instance, it is not clear whether ZW would be the vertical velocity at 700 hPa with the geopotential at 500 hPa or with the geopotential at 850 hPa.

Pag. 3072, lines 27-28: what procedure are you using to calculate the difference between the forecasted precipitation and the real precipitation? Are you obtaining an average precipitation from all the analogues of day D_c and are you averaging afterwards the error for all the period and each hour? How many analogues are you selecting?

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Are you giving a weight in terms of the correlation coefficient, for example? Are you calculating the error hour by hour or within 24-h precipitation? Looking at figure 3 it is possible to see the number of analogues tested, but it would be better to introduce it previously in the text.

Pag. 3073, lines 3-4: what do you think is the cause of the trend observed when sorting by ED?

Pag. 3073, line 19: what criteria have you used to define the different classes of rainfall? You say that “the number of classes and the class boundaries should be suitably defined counting for the climatology and extension of the area involved, as well as the accumulation period of the precipitation”, but you do not explain the methodology followed in your case. The same question will be in relationship with table 2.

Pag. 3074, line 6: authors say that “it is preferable to choose the fifty-element subset as it includes more variability”, but figure 4 shows that the best results for the RPS correspond to the selection of 30 analogues in ED case. Could you please explain, what is the difference between choosing the fifty-element subset or the selection of 30 analogues? What it depends on?

Pag 3074, lines 19-22: authors say that “A further test has been carried out to assess the influence of the domain size, extending the area over which the analogy is investigated (20_W-30_E; 30_N-60_N)”. However, on page 3068 they said that the domain area covers from 10_W to 20_E and from 30_N to 60_N, meanwhile on page 3072 they introduce a third reduced domain area (0_E-20_E; 40_N-50_N) over which the analogy is investigated. Have they used three different domain areas?, why are they comparing the influence of the domain size with the scheme used (in this case, A)?

Pag 3074, line 26: It is not possible for the reader to do any “visual analysis” because any figure is referred in the text.

Pag 3074, lines 26-29: Suddenly, you start to compare with the meteorological model

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LAMBO, but, there is no information about which scheme, selected variables, number of analogues and domain area you are using to do this comparison.

Pag 3075, lines 4-7: looking at Figure 4 it is not clear why you propose to work with the fifty-member analogue subset (30-member looks better).

Pag 3076, line 12: Explain the criteria applied to propose 23 classes.

Pag 3076, line 20: it would be useful to introduce a figure to clarify the sentence “by consensus of both schemes and analogy criteria, the solution of geopotential at 500 hPa combined with vertical velocity at 700 hPa provides a better estimation of future flows”. Looking at figure 4, methods S1 and EP point out to different selected variables, and scheme B provides considerable better values of RPS than scheme A

Pag 3077, line 25: the three selected case studies, did they exceed the warning threshold?

Pag 3081, lines 1-5: there is no conclusion about the application of scheme A or scheme B.

Technical Comments

Pag 3065, line 20: Baur, 1951 is not included in the list of references

Pag 3076, line 12: table 3 is not included.

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