

***Interactive comment on “Weather model performance on extreme rainfall events simulation’s over Western Iberian Peninsula” by S. C. Pereira et al.***

**Anonymous Referee #2**

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The manuscript presents an evaluation of three model runs with different nudging configurations to "assess possible improvements in [the] model performance". It is difficult to determine whether the original idea of the study is interesting because the authors failed to explain clearly the methodology and the results. Also the conclusions are only a summary of the results and is limited to a description of the statistical measures. The manuscript has not been prepared carefully and there are several errors that should be corrected before submitting. The language makes the manuscript difficult to follow and the reader might get lost easily. Therefore, in my opinion the paper is not adequate for publication and should be rejected.

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The reasons of this opinion are detailed below.

**Major comments**

1. Title is incorrect. How the authors justify the term "extreme" in the title considering the relatively low return-values and the absence of particularly heavy daily events during December 2009. Also in P9164, L6, what are extremely heavy rainfall periods?. Indeed in P9164 L8-10 It is said that the climatological mean is exceeded in +89mm in average, but it makes a difference considering the range of regimes (190-1175mm).
2. Despite the fact that the authors suggest that short-term extremes (30mins) are critical for surface runoff generation in Mediterranean scales, they do not address this issue in this paper (DO THEY?). Therefore, the authors should consider changing this sentence to emphasize the relevancy of their work or investigate short-term extremes. (P9165 L6-9).
3. The introduction in general could be much clearer and more related to the topic itself (maybe more focused on modelling). I personally think that it could be reviewed and reorganised, setting up an appropriate scene for the study.
4. Several parts of the manuscript are presented carelessly. The manuscript contains several grammatical and orthographic errors, a large number of references are missing, the figure's labels and references do not match and many of the figures lack information (e.g., units, scales). Some of those errors are detailed below, although not all of them.
5. Several statistics were computed to evaluate the model performance. The question that arises is whether all those statistics provide independent measure or additional information of the model performance. The respective results indeed suggest that they do not.
6. Section 3.2 is in general confusing. It can be much improved. Several parts of this section are difficult to follow and the authors do not express themselves with clarity.
7. The conclusions are a mere description of the results. They should not be only

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a summary of the previous sections. Different features that could be improved are described below.

Minor comments

1. P9165 L15. Change northt by north.
2. P9165 L 22. What is the frequency of the model outputs? Temporal resolution of NWP models is much higher than 15-30 min. In particular, WRF requires a temporal resolution (in seconds) of about 6 times the spatial resolution (in km). That is, for a 1-km run, the time step should be 6 s. This is the timescale that the model is able to capture, although the modeller might have set up a lower frequency to write the outputs.
3. P9165 L26-29. Parenthesis and full stops to be revised.
4. P9166 L2-3. This is probably unnecessary. "due to battery failure as a result. . ."
5. P9166 L12. "Sparsely" is an adverb.
6. P9166 L10-18. I would rephrase the entire paragraph, but particularly the last sentence, which is too long and confusing. This is a key paragraph of the manuscript and should be neat and clear.
7. P9166 L 24-25 Please, rephrase. ("Within the study. . .Águeda").
8. P9167 L 15. This reference is for version 3, not 2.2. (Skamarock, W. C., J. B. Klemp, J. Dudhia, D. O. Gill, D. M. Barker, W. Wang and J. G. Powers, 2005: A Description of the Advanced Research WRF Version 2).
9. PG9167 L16. Replace "terrain following" by "terrain-following".
10. P9167. L 22. All except two references regarding WRF are missing in the bibliography. Despite not being wrong, the reference regarding the use of WRF in Portugal is a conference contribution, which is not accessible to readers (only the abstract). A quick

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search in any of the internet databases will return studies using WRF in Portugal or the Iberian Peninsula that could be cited and are probably easier to find by the reader. Also, some of the studies for the Iberian Peninsula (with WRF and other LAMs) could serve as comparison for the author's results and could also give clues on the source of some of the errors.

11. P9168 L3-6 In the model setup, the authors should specify how the domains are nested (i.e., one-way or two-way).
12. P9168 L10-12. The location of the east border has not been selected according to this criteria. Indeed, according to figure 1, the east border of D03 crosses "Penhas Douradas", a point that is particularly complex in terms of regional modelling (see Fernández et al. 2007, JGR)
13. P9168 L13-15. The eta levels can be omitted if they are the model default ones.
14. P9168 L15-22. The selection of the parameterization schemes is of paramount importance in a regional model. The author's should explain why this configuration was selected or provide references of previous studies if necessary. Also, the authors do not specify whether the convective scheme was switched off for the inner domain. At high spatial resolution (typically higher than 10km), the cumulus scheme should be switched off because the model becomes able to dynamically capture the convective processes.
15. P9168 L36-28. This sentence is unclear ("They were. . .experiments"). I think that the explanation of the experimental design could be much more simple, although still containing the same information.
16. P9169 L14. As a general rule, humidity should not be nudged to avoid competition with convective schemes. However, it is not clear from the text whether the convective scheme is switched off (see comment 14) in the innermost domain. It is not clear either if the nudging is applied to all domains.

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17. P9169 L19. I am not very familiar with the term "buddy". How are they determined?

18. P9170 L9. Remove "the" before "December".

18. P9170 L13. The reader might think from the experiment design that the authors did not adopt a spin-up. It is specified later, but it is such an important feature of the simulations that it should be mentioned in the experiment design section. Did the authors consider longer spin-up periods?

19. P9170 L10. Is this figure missing? I cannot see any timeseries in figure 2.

20. P9170 L 16-18. I am not sure of having understood the procedure correctly. Does it mean that we are probably taking hours that are completely dry in the model and discarding wet hours just to maintain not only the same number of hours, but also the timing of those hours.

21. P9170 L27. I do not understand what the records evidence.

22. P9171 L17. Why three times the IQR? Maybe reference or a justification.

23. P9171 L22-23. Do you mean among stations?

24. P9172 L 6-8. Please rephrase these two sentences. "strength among data pairs" (?). Revise the tenses.

25 P9172 L13-14. What is the sensitivity of the instruments? ME (and the other statistics) cannot have higher precision than the measurements themselves.

26 P9172 L17-18. The sentence "Individually...control run" is unclear and should be rephrased.

27 P9172 L18-20. I do not understand what the authors mean here.

28 P9172 L23-26. I do not understand the evidence the authors try to show. These sentences should be clearer.

29 P9172 L27-28. Reorder the sentence "In Fig 5c...absolute error".

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30 P9173 L3-5. The authors included sentences like "Still...remaining stations" that are unclear to me. What do the authors want to express by "a few stations show an average magnitude error smaller than the reference run and that of the remaining stations"? If I have understood correctly, it is obvious that the model errors are smaller in some stations than in others.

31. P9173 L8-10. The fact that the authors use different statistical parameters to examine the errors do not necessarily characterize different aspect of the errors. They might be characterizing similar features and thus will agree.

32. P9173 L13-15. If I have understood correctly (here and in many other places along the manuscript), the authors are asserting that some of the stations are more accurate than the aggregated statistic value. I do not consider this particularly interesting since it is in the very nature of an average.

33. P9173 L17. "aggregated", please revise tense.

34. P9173 L21. Remove "only" since one of the simulations necessarily outperforms the others. Also change "outer perform" by "outperforms".

35. P9173 The authors should define terms like "aggregated", "reference system", "reference run" and other, and use them in a systematic way to ease the reading and understanding of the manuscript. In different occasions, I was unable to know what the authors were referring to with these terms.

36 P9174 and P9175. These sections are particularly difficult to follow because the respective figures are barely visible. The figures also lack information.

37. P9175 L22. "The quality of the model...used as a measure of the quality of the model" (?).

38. P9175 L24-25. There is no forecasting in the study. The authors should also tone down their statement "reliable and consistent" bearing in mind the results of their limited evaluation.

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39. P9175 L26. What do the authors mean by "the model system has resolution"?

40. P9176 L 5-6. Why not choosing other measurements that take this into account?

41 P9176 L7. The authors have not examined the suitability of the domain.

42 P9176 L9-12. I do not see the relevance of this citation.

43 P9176 14-15. Do the authors mean that some of the stations provide better results than the average of stations? As stated before, this is in the very nature of averaging.

44 P9176 L20-22. The authors have not tested any additional configuration with respect to the initialization. Also the reference cited actually proposed an alternative method to single initialization and concluded that frequent reinitializations might be beneficial. Also, please keep consistency in the format of the citations (see previous citation of Lo et al. 2008)

45 P9176. "However, proceeding with caution is necessary". Is it not a too broad statement to finish the manuscript?

46. All figures are barely visible and in many cases impossible to interpret because of their size and resolution. They also lack units and information. In figure 1, the location of the profile is not specified. Figure 4 includes markers that are not described and I am not able to see any boxes. Also rephrase the caption. It would be helpful to have a slope 1 line in figure 5 (as well as the units). The authors should make an effort to present the information of figure 6 in a way easy to interpret by readers.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 9163, 2012.

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