

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2  
<https://doi.org/10.5194/hess-2021-503-RC2>, 2021  
© Author(s) 2021. This work is distributed under  
the Creative Commons Attribution 4.0 License.

## Comment on hess-2021-503

Anonymous Referee #2

---

Referee comment on "The role of morphology in the spatial distribution of short-duration rainfall extremes in Italy" by Paola Mazzoglio et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-503-RC2>, 2021

---

The authors here investigate short-duration rainfall extremes in Italy focusing on improving simple relationships with elevation. The form national multiple regression equations exploiting several geomorphological covariates and one climatic. At the national level this did not really led to significantly improvements and thus the authors proceed to several localized spatial clustering approaches identifying this need given the clear spatial pattern in local bias. The paper was joy to read, clearly written, easy to follow and offers an addition to the literature. Therefore, my comments are only minor and optional since the paper fulfills its goal as is.

In general, there are different definition on what is considered extremes. There so many references on extremes, and sub daily extremes, mean extremes, etc. in the introduction but it is not crystal clear what these extremes are. Are POT values, annual/seasonal maxima, etc? Please clarify.

Section 2.2. Can you show the fitting the Equations 3-6? Especially the nonlinear 5-6.

Fig 2 please try to use the minus symbol for minus and not the dash as the "--" is not clear and it should be "- -".

Out of curiosity, have the authors tried to see if there's potential in using the temperature as a climatological variable?

The authors might be interested in the Moccia et al. 2021 (10.1016/j.ejrh.2021.100906) study (though at daily scale) analyzing a fine resolution gridded product over Italy and investigating extremes. The bivariate choropleth in Fig13 also shows elevation-rainfall

depth relationship.

Is  $\beta_i$  a vector in Eq7?

Was there some preliminary examination in leading to select a multiple linear model? Maybe pair-wise scatter plots would give valuable information and might actually lead in selecting nonlinear relationships at least for some of the covariates. It might worth creating these scatter plots. Also, yes the test showed no collinearity, but let's see this also in scatter plots.

- So in essence MAR acts as a proxy of elevation, right? What is the correlation between MAR and elevation?

Maybe creating subnational regions would be improved by using generic spatial clustering algorithms. I mean based on some statistical properties and not necessarily based on the geomorphological classifications. There are many of them in the literature and could offer an alternative detailed assessment on the optimal number of subregions and on their extend. I hope I have not missed this, but have the authors considered creating such region by applying spatial clustering algorithms to the bias maps?

Summarizing this is a nice paper, adding to the literature and deserves publication.