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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Spatial Dependency in Nonstationary GEV Modelling of Extreme Precipitation over Great Britain" *by* Han Wang and Yunqing Xuan

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Wang - hess-2020-44

Review:

This paper is about estimating extreme annual maximum rainfall throughout the United Kingdom, by comparing stationary and non-stationary extreme value distributions. The paper is interesting, if not ground-breaking, but is a possible contribution to the hydrometeorological armoury after major revision.

Regrettably, there are many irritating grammatical errors, which need correction. The

explanations are sometimes so poor that I had to re-read the paper 3 times before I could get the gist. The text introducing the mathematics is sparse and needs better explanation - you could have asked for help with the language from an English colleague to make it more readable. In particular, please be more informative in your figure captions, which are very terse and need textual expansion to help the reader follow what you have done, which is to present a puzzle difficult to solve. I nearly aborted at one stage. The paper is relatively short and some extra passages of explanation and referral to the text will aid the reader. For example, in the introduction and conclusion, it would help the readers who scan the paper before deciding to read it, if you tell them what S-GEV, NS-GEV, LM, ML & B-MCMC stand for. The captions in the figures are difficult to interpret and follow, and are as important as is the abstract to the potential reader. Also, throughout the paper, please include a space between paragraphs.

Nevertheless, I have been at pains to sanitise the errors I found and made suggestions as to layout, as in 'first aid'. My detailed remarks are itemised in an edited copy of the pdf, which I am returning with this review. I will append the major points from that version below my signature.

I recommend major revision.

Geoff Pegram

27 April 2020

Extended remarks follow – short ones can be found as captions in the attached pdf:

Line 77: 'For a given sampled area, the annual maxima series of the areal daily rainfall' . . . how do you determine the daily rainfall amounts from the 500 squares - arithmetic average? Also I suggest 'For a given sampled area of 500 km square, ..'

Line 109: 'The ML method (Myung, 2003) . . .' In my opinion, this is a trivial reference to the method of maximum likelihood, with which any reader of this article should be very familiar. If you do want a reference, go back to the originator Wilks - see be-

low. If you are serious about referencing, the idea originated from Gauss and Laplace! From Wikipedia: "Early users of maximum likelihood were Carl Friedrich Gauss, Pierre-Simon Laplace, Thorvald N. Thiele, and Francis Ysidro Edgeworth.[34][35] However, its widespread use rose between 1912 and 1922 when Ronald Fisher recommended, widely popularized, and carefully analyzed maximum-likelihood estimation (with fruitless attempts at proofs). Maximum-likelihood estimation finally transcended heuristic justification in a proof published by Samuel S. Wilks in 1938, now called Wilks' theorem." In the list of references, please substitute for Myung: Wilks, S. S. (1938). "The Large-Sample Distribution of the Likelihood Ratio for Testing Composite Hypotheses". Annals of Mathematical Statistics. 9: 60–62. doi:10.1214/aoms/1177732360

Line 155: ' boxplot is employed to indicate the under/overestimate the risk of extremes' Where is it?

Line 160: 'The Natural Neighbor interpolation method' please quote: Sibson, R. (1981). "A brief description of natural neighbor interpolation (Chapter 2)". In V. Barnett (ed.). Interpreting Multivariate Data. Chichester: John Wiley. pp. 21–36.

Line 163: please explain why Fig. 1a is a strange shape and discuss it in the text.

Lines 199 to 203: this passage is trivial and should be seriously pruned.

Line 216: 'About 56% samples are detected to have an increasing mu' I do not understand this statement - please enlarge - which figure?

Line 233: ' rainfall become rarer after 100 years, especially when sigma drops significantly' I do not see the reduction in sigma in figures 4, 5 & 6 - see my remarks on the figures

Line 370: In the revised version of this paper, please site the tables near the figures they refer to and also appropriately in the text.

In Table 1, you have the following headings: Nothing in column 1; Figure 6a – b – c in the rest In the row labelled sigma, you have '+2/100 yr; Unchanged; -2/100 yr'; what

does that mean? Sigma changes by +/- over 100 years? From what? As a ratio? The treatment of the parameters is very difficult to follow.

I have other remarks on Tables 1 & 2, not listed here – please see pdf.

Line 380: what are we to take away from Table 4?

Figure 1: 'Figure 1. The sampling area as shown in (a) the base data grids of a single sample; (b) the spatial distribution of the 88 samples.' I suggest: 'Figure 1. The sampling area as shown in (a) the base data grids of a single sample each containing 500 1 km squares of rainfall data; (b) the spatial distribution of the 88 sampling areas.'

Figure 3: Please explain here and to the reader of the text that mu1 and sigma1 should be defined as scaled parameters, relative to the central value of mu and sigma. This is VERY confusing and needs to be sorted out.

Please see my comments on Figure 4 – they need attention and I cannot reproduce them here usefully.

'Figure 8. Spatial distribution of the best fitting method for simulating AMDR's at different return levels: (a) L1; (b) L2; (c) L3 and (d) L4.' What are L1 to L4? The captions are all very terse and need to be expanded. Please explain in the caption as well as the text in Section 4.3. It seems that B_MCMC is far superior in fitting the rare events, as indicated in Fig. 7a, so make a comment.

Please also note the supplement to this comment:
https://www.hydrol-earth-syst-sci-discuss.net/hess-2020-44/hess-2020-44-RC3-supplement.pdf

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