

Ocean Sci. Discuss., referee comment RC2  
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## Comment on os-2022-14

Anonymous Referee #2

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Referee comment on "Technical note: Tail behaviour of the statistical distribution of extreme storm surges" by Tom Howard, Ocean Sci. Discuss.,  
<https://doi.org/10.5194/os-2022-14-RC2>, 2022

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Thank-you for this technical note, which I believe will be helpful in analysing return periods of UK gauges and is worth publishing in OS. A little work is required to make it easier to understand, especially for readers considering how it applies to sites outside of the UK network. Some suggestions:

The paper could be made easier to follow independently. It currently relies on too much cross-referencing to other papers particularly H&W21.

Please provide equations for GEV/Gumbel, and GPD that is mentioned later.

Fig 1 only makes sense to someone very familiar with the names and locations of the UK TG network, and even then it is hard to determine whether there is a spatial relationship or whether the relationship is due for example to tidal range. Perhaps using the colouring to group neighbouring gauges in clusters would be useful? And certainly a map.

But I would also like to see some evidence of the spatial correlation of  $\mu$  and  $\lambda$ , perhaps some maps indicating all three parameters, as fitted to the data as it stands, and then under the experimental conditions? Or plotted with the coastal position as an axis - I see from panel 1c that you have already ordered the sites clockwise around the coast.

line 73: artefact since we're in British spelling

line 113: You show that the fitted scale parameter  $\lambda$ , assuming a Gumbel distribution, is slightly higher than a Gumbel should allow? What does this imply, physically? How does assuming a Gumbel therefore bias the extrapolation? Perhaps work through an example? ... ah this comes in figure 6, thanks. It might be easier to understand the general argument if you brought fig 6 forward.

Figure 3: I'm afraid I don't really follow what is going on here, this plot is not well explained.

Fig 6: It is quite concerning that Hinkley shows such a large uncertainty at very long return periods depending on the method, considering the reason for the gauge! If this is very atypical, a more typical example would be illustrative. Probably not Bournemouth, which has its own unusual challenges.

line 202: Can you give any guidance on **what** constraints should be applied to the GEV shape parameter in practice? Is it the same at any site? If not, what varies?

Conclusions: I agree with the other reviewer that it is refreshing to see such succinct conclusions!

References: There are several missing DOIs.

Data: data should be open and links provided.