My thanks to Referee #2 for comment and constructive suggestions.

Apparent EV3 forms are not necessarily so rare in hydrology and might arise, for example, for annual stage height maxima when river floods extend over a wide flood plain. This is presumably the origin of the EV3 form in the plot of stage height maxima shown in Fig. 3b of Jenkinson (1955).

As an example of an apparent EV3 form for discharge maxima, Fig. 1 shows a Gumbel plot of annual flow maxima recorded in the upper Whanganui River, New Zealand. The fitted EV3 curve gives a discharge upper bound estimate of 73 m^3s^{-1}. The maxima X were transformed as $Y = \exp(-\exp(X/a))$, where a is a scale parameter – in this case the mean of the maxima. The transformation results in the distribution of Y being approximated by a 2-parameter Weibull distribution, as indicated by the linearity of the corresponding Weibull plot (Fig. 2).

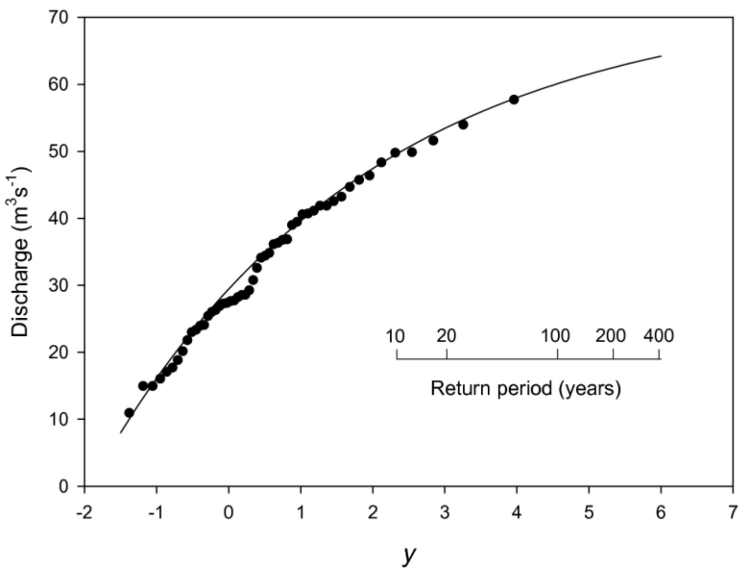

Figure 1. Gumbel plot of annual flow maxima for the Whanganui River at Te Porere, New Zealand (1966-2017). *y* is the Gumbel variate.

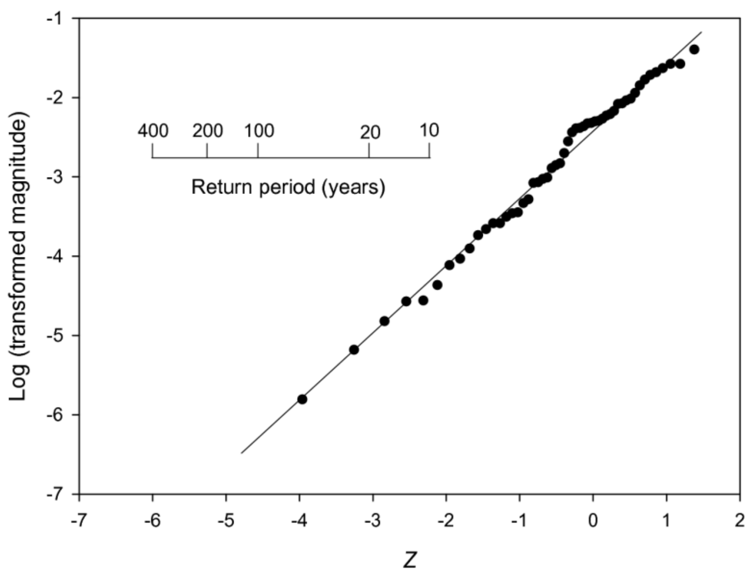

Figure 2. Weibull plot of the transformed annual flow maxima of Fig. 1. *z* is the Weibull variate (corresponding to - y).

As described in the paper with reference to the half-normal distribution, an alternative extreme value interpretation for the Whanganui maxima is that the sample size (number of independent flood events per year) is not large enough for the distribution of annual maxima to be approximated by the true unbounded extreme value limit distribution. However, the same sample size is sufficiently large for the distribution of the transformed maxima Y to be approximated by a 2-parameter Weibull distribution of smallest extremes, which is consistent with no upper bound for the original data. That is, the apparent EV3 form of the annual maxima distribution is seen as an artefact caused by the annual maxima distribution being subasymptotic with respect to the true limit extreme value distribution. This does not represent proof of the absence of an upper bound for the data. However, the point is made that an equally valid alternative extreme value analysis does not require an upper bound parameter.

There is no suggestion that the double exponential transformation used here has general applicability for apparent Type 3 forms of annual maxima, but it is an obvious starting point. As noted in the paper, different data sets may require different transformations to achieve a Weibull approximation.

There is actually no “author claim” in the paper about applicability of extreme value theory. Classical asymptotic extreme value theory was developed with respect to maxima or minima of large samples of independent random variables drawn from the same distribution. Whether a sampled distribution is derived as a transformation of some other distribution is of no consequence, unless the transformation was deliberately contrived in such a way as to make the asymptotic theory inapplicable. Thus, the paper makes no claim to new theory and its value is solely with respect to its potential for practical hydrological application. My thanks for the requested hydrological example, which should give some encouragement in this regard.

The suggestion that the paper is concerned with small samples is not quite correct. For example, reference is made to a distribution mentioned by Koutsoyiannis (2004), where even a sample size of 1000 would result in a false EV2 form for maxima in a Gumbel plot.

Yes – a “rainfall” label for the half-normal distribution example was unfortunate. It would probably be best to leave it undefined as something along the lines of “Hydrological variable”.

References

Jenkinson, A.F.: The frequency distribution of the annual maximum (or minimum) values of meteorological elements. Quarterly Journal of the Royal Meteorological Society, 81, 158–171, 1955.

Koutsoyiannis, D.: Statistics of extremes and estimation of extreme rainfall: I. Theoretical investigation. Hydrol. Sci. J. 49, 575–590, 2004.