

Areal Reduction Factors from High-Resolution Rain Gauges in Austria

- Author's response -

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We thank editor Henning Rust for his comments. Please find here out detailed [point-to-point response \(blue\)](#) to his comments (black) The [modification within the manuscript \(green\)](#) is added as well.

Editor Henning Rust (HR)

I have two points which I think are crucial for transparent and reproducible research:

1 I made a comment to your statement: "The exponential distribution is a special case of the Weibull distribution function with $\lambda=1$." My comment was that a) if you refer to parameters of a distribution by name (which you do using λ), then you need to introduce these parameters first. b) if you are referring to a parameter of the WEIBULL distribution, you need to introduce also the WEIBULL distribution, not just the exponential. In your answer you do not introduce the Weibull distribution and -- probably by mistake -- set $\lambda=1$ but use λ then in the next line as the parameter for the exponential. Please rewrite this paragraph and use a consistent notation. From my point of view there is actually no need to introduce the Weibull; I consider it to be sufficient to say that the Exponential is a special case of the Weibull and give a reference. However, if you refer to a specific parameter of the Weibull, then you need to introduce it as it is otherwise not clear what parameter you refer to.

[We thank Henning Rust for spotting the misleading parameter in the equation. To avoid any confusion, we have removed the information that the exponential distribution is a special case of the Weibull distribution in the paragraph that introduces the exponential distribution. The information is not essential for the manuscript content there at all, and leads more to confusion rather than simplification.](#)

2 You introduce and use the Exponential distribution. In your response you refer to x as precipitation (amount?) and define a rate parameter λ . However, your interpretation of λ is "expected events per interval". It is not clear to me how this goes along with x being precipitation (amount?) as the unit of λ should be the inverse of the unit of x . I think the interpretation of λ is different in your case; you might also prefer the following parameterisation of the exponential: $F(x)=1-\exp(-x/k)$, with k being the scale.

[We thank Henning Rust and have adopted the equation as suggested. The variable " \$x\$ " refers to precipitation rate, which was clarified in the manuscript as well.](#)

Referee#1 commented: "What are the u and w parameters of the exponential distribution? I think the equation should be given since the usual case is a one-parameter distribution". In my decision letter, I highlighted this point and asked you to address it. Please do so and relate now u and w from your log-linear straight line to the rate parameter λ (or the scale k) in your definition of the exponential distribution. Furthermore, T should be related to the probability F(x).

We thank Henning Rust for the clear suggestion. Since u and w are parameters of the graphical solution, they are not linked to k, but to T and x. We have added the following parts to the manuscript: For design values, extreme precipitation values of certain return periods T are of interest, which can be expressed in general as:

$$P(X \leq x) = F(x) = 1 - \frac{1}{T}$$

and

Both, u and w, can be estimated as graphical parameters of the exponential distribution via regression functions and are linked as (Lengfeld, 2021):

$$T = e^{\frac{x-u}{w}}$$