Hydrology and Earth System Sciences

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Discussions

Interactive comment on "Characterizing the space–time structure of rainfall in the Sahel with a view to estimating IDAF curves" *by* G. Panthou et al.

Anonymous Referee #1

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The Authors investigate a not-easy issue represented by the space-time variability of rainfall, through the calculation of the Intensity-Duration-Area-Frequency (IDAF) curves. The area of interest is the Sahel region. The difficulty of this issue is also testified by the small number of contributions available in literature. Thus, this contribution is welcome.

The Authors use a simple scaling approach of annual maxima of rainfall in area and duration, and a GEV distribution for the description of annual maxima. The Authors apply the methodology to Sahel region verifying the hypotheses made. The manuscript sounds well from the technical point of view, however I found some issues to be fixed

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before its acceptance. Thus, I suggest a minor revision of the manuscript according to the comments reported in the next.

Detailed comments

Line 25 at page 8412, the reference De Michele et al (2002) is pertinent to this manuscript, similarly line 20 at page 8413. De Michele, C., Kottegoda, N.T., Rosso, R. 2002. IDAF(intensity-duration-area frequency) curves of extreme storm rainfall: a scaling approach. Water science and technology, 83-90.

In eq.(3), please change "z" with "i"

Lines 2-3 at page 8416, the sentence "the Areal Reduction Factor is the ratio between point rainfall and areal rainfall, either for a given observed rain event or in a statistical sense" is wrong. The Areal Reduction Factor is the ratio between areal rainfall and point rainfall for a given observed rain event. What do you mean for "in a statistical sense"? Similar consideration is applied to the sentence "this ARF thus denotes the ratio between the point distribution and the areal distribution of the annual rainfall maxima."

In Eq.(15), please define "μref"

In Eq.(16), please define "σref"

In Eq.(17), please define "ξref"

According to Eq.(13), in Eq.s(15-17), I think that the subscript "ref" must be substituted with "1". Some clarifications are necessary here.

Page 8418, line 6, I suggest to delete "initial"

Page 8418, lines 22-23, the definition of r(x,y,t) can be ambiguous. 1)The Authors write "we denote by r(x,y,t) the actual 5-min rainfall accumulation recorded at a given time t and at a given rain gauge of coordinates (x,y)." It is not clear if the instant "t" is the starting point or the ending instant of the 5-min interval. 2) r(x,y,t) should be the

instantaneous rainfall recorded at a given time t. Presently $r(x,y,t) = rD=5(x,y,t)$, but this is not clear in the manuscript.

Page 8423, line 26, for large areas (900, 1600 and 2500 km2) you have also the problem that increasing the area, you could include more than one single center of storm, and consequently also the definition of ARF is difficult. Similar problems, for large areas, are found also in De Michele et al. 2001, 2002.

Page 8423, please provide some comments about the value of the parameters obtained, and in particular the dynamic scaling exponent.

Page 8424, line 18. Question: how you have calculated the critical values of the KS and AD tests? The issue is not trivial because the authors have estimated the parameters from the data. Please provide details on this issue.

Page 8427 line 8. Please provide some references for "copulas".

Page 8436, Figure 4, change "E[i(d)q]" with "E[Iq(D)]". Same comment to page 8437, Figure 5.

Page 8439, Figure 7, indicate the random variable with the capital letter "I".

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 8409, 2014.