

What made the June 2013 flood in Germany an exceptional event? A hydro-meteorological evaluation

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Principal Criteria	Excellent (1)	Good (2)	Fair (3)	Poor (4)
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Scientific Significance:

Does the manuscript represent a substantial contribution to scientific progress within the scope of Hydrology and Earth System Sciences (substantial new concepts, ideas, methods, or data)?

X

Scientific Quality:

Are the scientific approach and applied methods valid? Are the results discussed in an appropriate and balanced way (consideration of related work, including appropriate references)?

X

Presentation Quality:

Are the scientific results and conclusions presented in a clear, concise, and well-structured way (number and quality of figures/tables, appropriate use of English language)?

X

1. Does the paper address relevant scientific questions within the scope of HESS?

The paper presents a hydro-meteorological comparison of three major flood events that occurred in Germany these last decades: July 1954, August 2002 and June 2013. It addresses several components that can explain the severity of these events: meteorological conditions, initial wetness conditions and rainfall intensity. This is a valuable contribution to the analysis of past flood events and the improvement of the understanding of the physical mechanisms of extreme floods.

2. Does the paper present novel concepts, ideas, tools, or data?

The paper provides very clear maps on the spatial variability of different indexes : 3days maximum rainfall - cumulated amount and return period; antecedent precipitation index - cumulated amount and return period; initial flow condition - normalized ratio and return period; peak discharge - return period. It gives also interesting information on the weather conditions, the repartition of the areal rainfall

during the rainy period, the date of the maximum of the rainfall, the position of the three flood events within a 2D graph (wetness index and precipitation index).

All these information provide a very valuable insight of the characteristics of flood events.

3. Are substantial conclusions reached?

Yes, the paper shows clearly the importance of antecedent soil moisture conditions for the high return period of the June 2013 flood.

4. Are the scientific methods and assumptions valid and clearly outlined?

Yes

5. Are the results sufficient to support the interpretations and conclusions?

There is one possible improvement related to the role of snowmelt contributions. This point is addressed (end of section 3.5) in one sentence. I wonder if some index could be added (analysis of snow cover plus air temperature).

6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)?

One point could be highlighted : I didn't understand how the event start dates were selected (see section 2.4.1). Is it related to the date when the flow does significantly increase ? The sentence is easy to write, but we need some mathematical criteria to define what is a significant increase (we can have some secondary peaks).

7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution?

Yes

8. Does the title clearly reflect the contents of the paper?

Yes

9. Does the abstract provide a concise and complete summary?

Yes

10. Is the overall presentation well structured and clear?

Yes

11. Is the language fluent and precise?

Yes

12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used?

Please give comment of the value of 0.9 in equation (1). Is it a well known planetary invariant coefficient (??) or something specific to the time-autocorrelation of rainfall in Germany ? Add some references on this point.

13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated?

Section 1 : The sentence “This hypothesis is contrary to the notion that the influence of catchment wetness is greater ...” is somewhat overstated. The main idea of flood frequency analysis based on rainfall information is that the extreme tail of distribution is driven by the extreme tail of the rainfall distribution. It is characterized by an asymptotic parallelism between the two distributions (see for example the Schadex method, Paquet *et al.*, 2013). But these methods clearly account that flood hazard is a combination of antecedent moisture conditions and rainfall intensities. That is to say that all possible combinations are possible for specific flood events.

Page 8128, line 22 : “Section 4”

Page 8138, line 26 : “(pw)”

Page 8139; line 10: The sentence is not clear. I understand that the authors do not want to extrapolate beyond the 200 year return period. It means that the estimated values of return period have been upper-bounded to 200 years (and not neglected).

Page 8144, line 6 : “(see Fig. 11, middle and right panels)”

Page 8148, line 30 : paper of Bloschl *et al.* (2013) has been published in HESS (no more in HESSD).

Paquet E., Garavaglia F., Garçon R., Gailhard J. (2013) - The SCHADEX method: a semi-continuous rainfall-runoff simulation for extreme flood estimation. *J. Hydrol.* 495 : 23-27

14. Are the number and quality of references appropriate?

Yes

15. Is the amount and quality of supplementary material appropriate?

No relevant