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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Climate change increases the probability of heavy rains like those of storm Desmond in the UK – an event attribution study in near-real time" *by* van Oldenborgh et al.

Anonymous Referee #5

Received and published: 12 January 2016

General Comments:

The motivation for this paper is the widespread flood impacts following Storm Desmond in the UK in December 2015, which led to questions as to whether climate change played a role. The point of the paper is to provide a methodology that can be used to answer such a question in the days following the event.

While I can understand the motivation for a methodology that can provide robust answers rather than just speculation when an event is still in the public eye, it is extremely important that this methodology is well justified in the peer-reviewed literature prior to those robust answers being publicised.

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Unfortunately I cannot recommend it for publication in its current state. A clearer explanation of the three methodologies is required, as well as a better placing of these methodologies and the case study within the existing literature, and a discussion of the limitations of these methodologies. I have provided guidance for this within my specific comments.

Specific Comments:

- This paper focusses on the precipitation amounts during Storm Desmond, rather than the flooding itself. Given that the media attention is on the flooding, it is extremely important to declare the difference between the results of a precipitation attribution to an attribution the flood impact. Given the importance of antecedent conditions for [most] flood events, an analysis of river flows would have been appropriate, and could easily have been carried out using the 'observational analysis' methodology, but of river flow rather than rainfall gauges.

- The methodology is difficult to follow, with some things appearing in the Figure captions that are not referred to directly (e.g. Fig 3 a,b,c,d), and methods such as the scaling of the block maxima with the low-pass filtered global mean temperature needing to be clearly explained, and where possible, referenced.

- On p13200 the authors mention that 'low-frequency variations play a minor role here'. This is clearly wrong, as the NAO is well known to influence precipitation in NW UK, e.g.

Burt T P and Howden N J K 2013 North Atlantic Oscillation amplifies orographic precipitation and river flow in upland Britain Water Resour. Res. 49 3504–15

Svensson, C., Brookshaw, A., Scaife, A. A., Bell, V. A., Mackay, J. D., Jackson, C. R., ... & Stanley, S. (2015). Long-range forecasts of UK winter hydrology. Environmental Research Letters, 10(6), 064006.

The authors should comment on how the NAO signal has been accounted for in their

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analysis and influenced the results they have found.

- In terms of the area averages, I think there needs to be more discussion (based on the literature) of how area averages can reflect localised extremes, and on Figure 1 the areas used for North West England and Southern Scotland areas should be outlined.

- There is no discussion of why a GEV fit has been used, or whether it provides a good fit to the data. For Figure 5 the GEV fit doesn't look good, with the residuals not normally distributed at the extreme end of the distribution. In addition, the y-axis could be on a log scale to make the plot easier to decipher.

- In p13202 line 25, the authors state that the 1 in 100 year event is used, which is roughly the return time of the event in the observations (presumably the Eskdalemuir series, though this is not stated) and from ERAInterim (though again, the reference for this hasn't been provided).

The choice of this return period is critical. In Figure 5, no lines are drawn to guide the reader to the 1 in 100 year event, and clearly if the observed 2015 value (for which there is a line) was used then the uncertainties are so large at this extreme end of the distribution that it is possible (though not the most likely explanation) that climate change actually reduces the likelihood of such an event occurring.

I would suggest using the return period for the South Scotland and North West England precipitation totals when it becomes available, if it hasn't already.

- I'm concerned about the use of the Eskdalemuir time series because it is the 'only one publicly available'. Is this the use of only this due to the motivation of producing this analysis in real-time? Have the authors attempted to obtain data from some of the gauges in Cumbria? Is the lack of suitable data now the main limiting factor in performing attribution in near real-time?

- For sections 4 and 5, I would like to see some discussion of to what extent models that don't include orographic effects can provide meaningful results when comparing

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return periods for this kind of orographic rainfall event, especially where NAO has been shown to double the orographic enhancement (Burt and Howden, 2013).

Technical Comments:

- The labelling of the Figures, especially in section 3 is wrong.

- P13205, L7: I think this is written the wrong way round?

- P13206, L17-19: Also need to mention the antecedent conditions, which also contributed to the flooding.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 13197, 2015.