

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 #1

Received and published: 21 December 2015

General comments

This paper concerns the possible relationship between the heavy precipitation in NW England and S Scotland associated with Storm Desmond, and anthropogenic climate change. It consists of an observational analysis, and two model studies that give very similar results. My main issue is with the alleged connection between the analysis presented here and that particular extreme event (and, especially, with the flooding in Cumbria, which is what generated the most media attention). It seems to me that the different analysis components really say nothing more than that we can expect heavy wintertime precipitation in high northern latitudes to increase under climate change,

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which of course is well established in general. In particular I fail to see how this analysis differs from general (non-event-specific) analysis of what we can expect from climate change, and how much of that change is already affecting extreme-event risk.

Much more extensive scientific analysis (see comments below) would be needed to connect these results to Storm Desmond. Thus I am unable to recommend this paper for publication in its present form.

Specific comments

p.13199, line 8: You say that Clausius-Clapeyron may not be the only factor affecting heavy precipitation, but it seems to me that the C-C-based estimate would fall safely within your estimates. Is there really any evidence that your results are reflecting anything other than C-C? This really ought to be discussed.

In the observational analysis, what should we make of the fact that the observations show no trend in NW England, but a big trend in nearby S Scotland? Are there plausible physical reasons for this? Do the models suggest anything like this? Otherwise it seems that you are just averaging over the two regions to obtain a larger signal-to-noise ratio (since the wintertime precipitation gets much stronger at higher latitudes), which completely removes any association with the recent heavy precipitation event in NW England (where there seems to be no evidence of a long-term trend).

p.13201, lines 16-17: The horizontal line in Fig. 3 shows the ERA-Interim precipitation, which would correspond to about a 1-in-4 year event in NW England, and practically an annual event in S Scotland (in present climate). Are these values believable?

More generally, why should we trust ERA-Interim for heavy precipitation? What sort of validation can you provide in this region?

p.13201, line 24: What do you mean by “The trends in the two regions are compatible with each other”? Since the trends in NW England are basically zero, this would seem to suggest that the trends in S Scotland are compatible with zero; is that really what

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you mean? If that really is the case, then the conclusion of the study seems vastly over-stated.

In the modelling analysis, the use of the large area (54–57N, 6W-2E), especially one extending so far north, must greatly increase the anthropogenic signal, but to be relevant to the flooding in Cumbria, some connection must be established between heavy precipitation in that larger region, and heavy precipitation in mountainous areas in Cumbria. Moreover such a connection has to be established not only for year-to-year variability, but for the effects of climate change. Is there any evidence for such a connection?

p.13202, line 25: Picking the 1-in-100 year event for the large region as the “Desmond storm” in the coupled model simulations seems to be purely a result from model world. Have you analysed that event (for either model) to see whether the synoptic situation looked anything like Desmond?

p.13205, line 27: It says “1.05 to 1.4” on line 10, so this value of “1.05 to 1.8” seems to be incorrect. How does that affect your overall confidence intervals?

A small point, but why do you say 6W–2E rather than 6-0W as there seems to be no land over 0-2E anyway (for 54–57N)?

Technical corrections

p.13201, line 15: “Fig. 2” -> “Fig. 3”

p.13202, line 13: “Fig. 2” -> “Fig. 1”

p.13203, line 2: I do not understand what is meant by “a shift in intensity . . . of such an event in intensity”

p.13204, line 20: “Fig. 5” -> “Fig. 6”

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

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