Heavier summer downpours with climate change

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Extreme summer rainfall may become more frequent in the UK due to climate change, according to new research led by the Met Office as part of the CONVEX project.

This study uses a very spatially detailed model to examine changes in hourly rainfall over the southern UK. This model, unlike typical climate models, is able to realistically represent hourly rainfall, allowing us to make future projections with more confidence (Figure 1).

The highly detailed model experiments provide the first evidence that summer downpours could become heavier with climate change (Figure 2). These results, published in Nature Climate Change[4], are a first step towards building a more complete picture of how UK rainfall may change as our climate warms.

While summers are expected to become drier overall, intense rainfall indicative of serious flash flooding could become several times more frequent. In particular, the model suggests intense rainfall associated with flash flooding (more than 30mm in an hour) could become almost five times more frequent by 2100.

Improved projections are needed so that we can make informed decisions on managing the risks associated with heavier rainfall due to climate change.

This study is based on one model, so we need to wait for other research institutes to run similarly detailed simulations to see whether their results support these findings. However, the results are consistent with the theory of an intensification of convective events in a warmer, moister environment and with the limited observational studies of hourly rainfall to date.

The UK has experienced several major summer flood events in recent years, representing a considerable loss to the UK economy. A significant proportion of these have been associated with short-duration intense events, important in small catchments and urban areas.

Annual damages from flooding are expected to rise substantially with climate change, in the absence of appropriate mitigation and adaptation measures. This work will lead to better estimates of potential future flood losses, and therefore better targeted use of resources to reduce those losses and increase resilience.

Pedestrians on Dean Street. The 28th June 2012 "Toon Monsoon" event in Newcastle upon Tyne, UK, where almost 50mm rainfall fell in 90 mins. ncjMedia Ltd - Paul Norris.

Boscastle flood, 16 August 2014. Due to several hours of torrential rain which was well forecast by the 1km forecast model. Several helicopter evacuations were required and it was remarkable no lives were lost.

Cyclist on Chillingham Road in Heaton, Newcastle upon Tyne. Photo from the 28th June 2012 "Toon Monsoon". ncjMedia Ltd - Lewis Arnold.

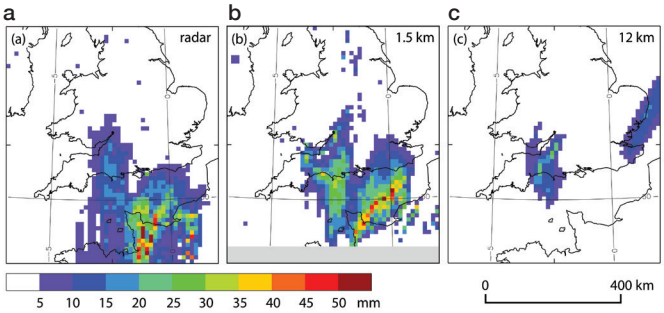

Figure 1. Heavy rainfall on 27 July 2013 from (a) radar observations, (b) 1.5km forecast model and (c) 12km forecast model. The improvement seen in the 1.5km model is typical for convective storms.

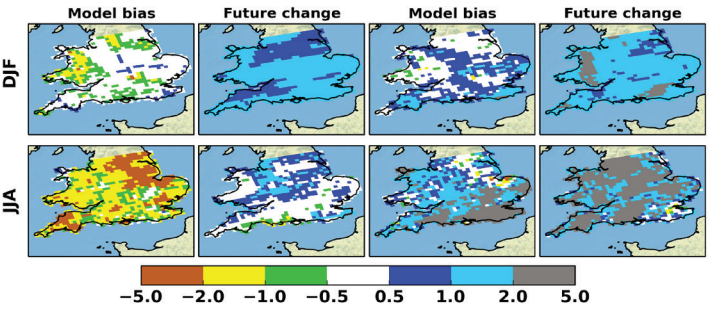

Figure 2. Model biases and future changes in heavy hourly rainfall (mm/h) in the (left) 12km and (right) 1.5km climate models, for winter (DJF) and summer (JJA). Both models show increased hourly rainfall intensity in winter, but the 1.5km model also reveals significant increases in short-duration rain intensity during summer. Changes are for 2100 under high emissions scenario RCP8.5.

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4 Kendon, E. J., N. M. Roberts, H. J. Fowler, M. J. Roberts, S. C. Chan and C. A. Senior (2014) Heavier summer downpours with climate change revealed by weather forecast resolution model, Nature Climate Change 4, 570–576, doi:10.1038/nclimate2258