

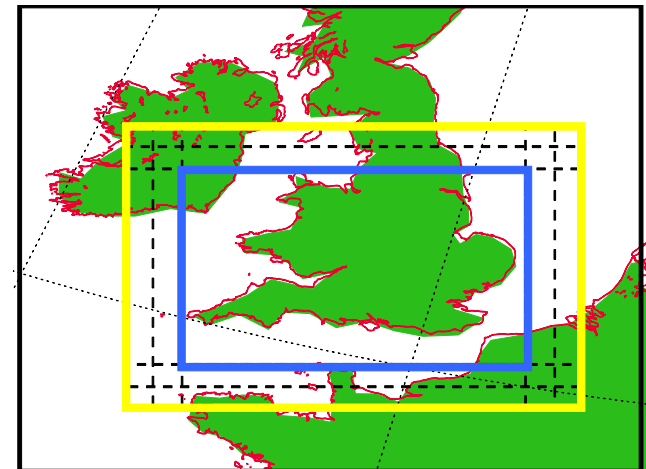
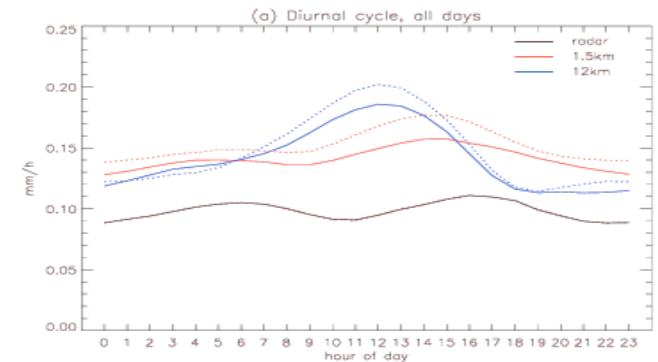
CONVEX: Headline Messages

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The Royal Society, 14th January 2015

1. Very high resolution climate models add value

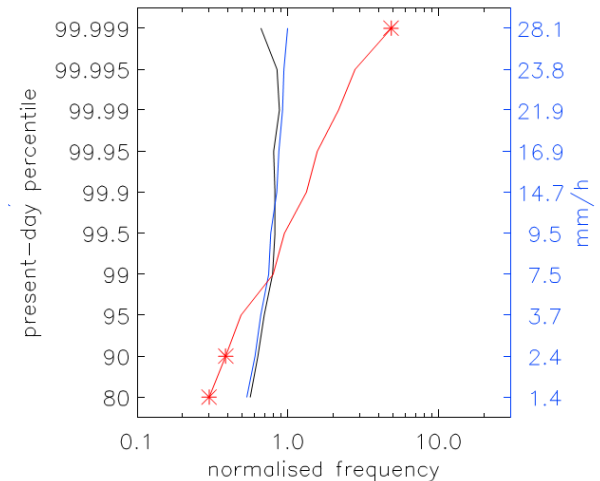
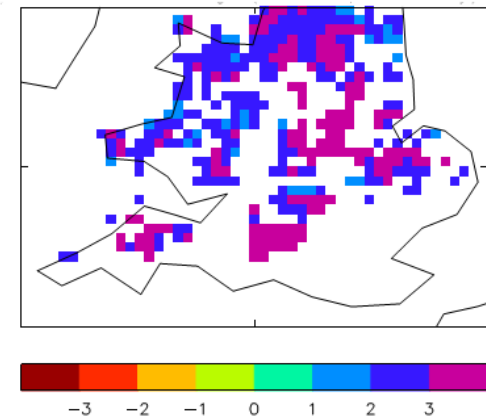
- The new 1.5km model better able to represent the diurnal cycle of rainfall and “very extreme” (multi-) hourly summer rainfall events
- Benefits are less clear for winter extremes although there is some evidence that more detailed orography at very high resolutions is beneficial for representing changes in heavy rainfall over mountains



2. We can expect heavier summer downpours with climate change

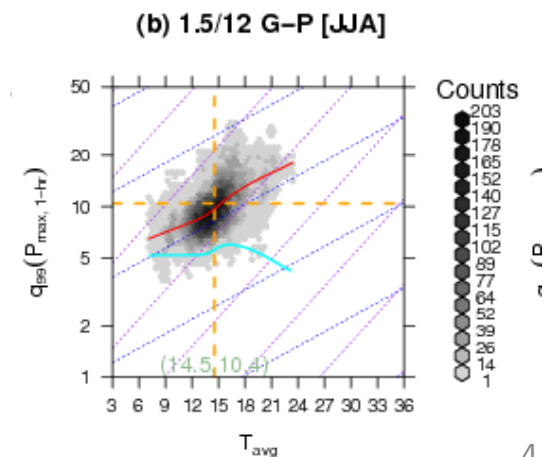
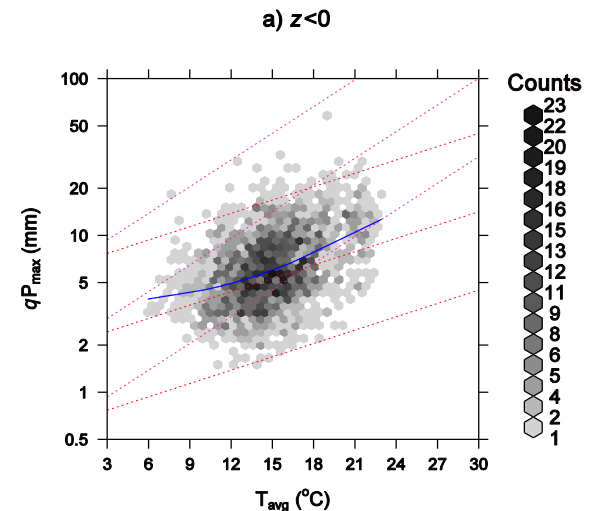
- Climate change simulations from the 1.5km model suggest more frequent summer rainfall extremes: events of $>30\text{mm/h}$ could become $\sim 5\text{x}$ more frequent by 2100 although summers are expected to become drier overall
- The intensification of summertime convective rainfall events in a warmer, moister environment is consistent with theoretical expectations and the limited observational studies of hourly rainfall to date

1.5km model future change



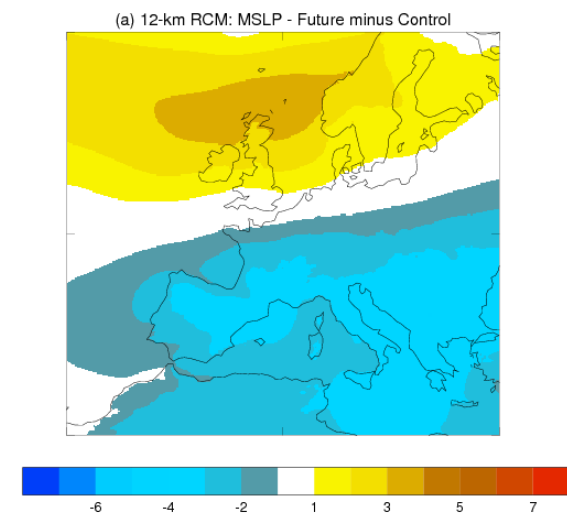
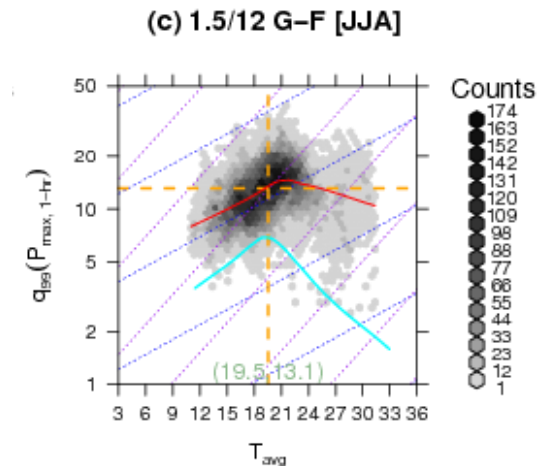
3. Summer rainfall intensities increase with temperature...

- No statistically significant trends found in observed hourly rainfall intensities.
- UK extreme summer hourly precipitation intensities are linked to temperature and increase according to Clausius-Clapeyron - at $\sim 7\%$ per $^{\circ}\text{C}$.
- The 1.5km model is able to reproduce this observed rate of increase in intense hourly rainfall with increasing temperature, providing increased confidence in future projections of intense rainfall.



3. ...but circulation changes can be important

- This relationship cannot simply be extrapolated into the future; future UK more akin to that observed in the tropics, with declines in precipitation intensities at $T > \sim 22^\circ\text{C}$.
- Caused by a shift to more anticyclonic conditions in the model, with strong daytime heating but lower humidity.
- Changes to intense precipitation are dominated by local changes in T but changes in large scale circulation can have important regional effects, and may suppress future precipitation intensities.



4. Guidance on change in hourly rainfall for the UK should be revisited

- Our results suggest significant changes to extreme summer rainfall in the future and that projections from km-scale models are very different from those from coarse resolution models.
- Since these coarse models have been used in the development of guidance, e.g. for urban drainage design, and for climate scenarios such as UKCP09, these must be revisited in the light of new understanding from CONVEX.
- We are working with UKWIR, DECC and DEFRA and other appropriate public bodies to ensure that these results are incorporated, as appropriate, into new guidance as it is developed.





Thank you

The CONVEX project website:
<http://research.ncl.ac.uk/convex/>

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