The CONVEX project:
Using Observational Evidence and Process Understanding to Improve Predictions of Extreme Rainfall Change

http://research.ncl.ac.uk/convex/

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CONVEX progress

CONVEX has continued to make considerable progress in recent months:

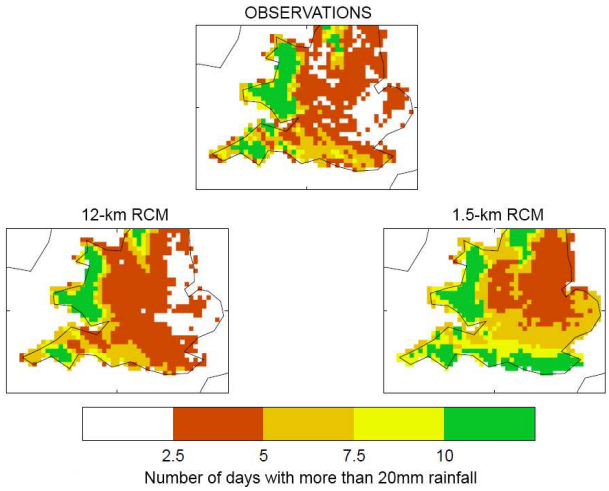
- CONVEX has added new sources of hourly rainfall gauge measurements for analysis as part of our examination of the observed characteristics and variation in short-duration rainfall events. We are hoping to incorporate additional datasets into our analyses and so if you have access to, or know of, hourly rainfall data that is available to researchers please contact us. Recent work on this dataset has examined the (multi-) hourly rainfall climatology of the UK, focussing on extreme events. On-going work is examining longer-term variability where the data permits.

- The CONVEX high-resolution climate model simulations are continuing to run at the Met Office and will hopefully be complete by summer 2013. Analysis of the new Met Office climate model simulations for the historical period has continued and some of the latest published results are summarised below.

- As part of the CONVEX PhD studentship we have started to develop statistical methods for assessing different sources of uncertainty in groups of climate models, including the atmospheric processes relating to extreme rainfall. These will be used to assess how the formulation of climate models (e.g. resolution) affects the precipitation that they output.

- A methodology which has previously been developed to distinguish between areas that have convective or non-convective rain is being tested on the high-resolution numerical weather prediction data. If successful this will lead to a better diagnosis of high-intensity summer storms in the climate model output.

- Additional work is building upon a methodology that allows the frequency of low pressure areas at different locations to be determined in regional climate model forecasts. This is important because it will allow us to see if there is any connection with extreme rainfall, and if there is, to identify any changes in extreme rainfall in the context of any differences in the larger-scale pressure patterns.



CONVEX results have shown that the more detailed 1.5-km model is better at simulating the spatial extent and duration of extreme rainfall events but, as shown here, may not lead to improvements in modelling how often they occur. Figure adapted from Chan et al. (2013).

New CONVEX results published

Further results from CONVEX have been published. In a paper published in *Climate Dynamics* we present results of climate simulations from Met Office models with different levels of spatial detail (grid boxes of 1.5-, 12-, and 50-km) over the southern United Kingdom. This indicated that the more detailed models decrease the errors in the simulation of the amount of precipitation over elevated terrain (e.g. Wales). For extreme events that may cause flooding (>50 mm a day) there are also differences between the models depending upon their level of detail. However, the finest resolution (1.5-km) model has the worst mean precipitation biases overall when compared to coarser models.

This research sheds some light on whether we need to use highly detailed climate models to assess future climate change and if so which information is most useful. The results yield mixed results for the value of high-resolution simulations. However, other ways to examine the same models (such as how long precipitation lasts, and when precipitation occurs during the day; see Kendon et al. (2012)) clearly favour the same high-resolution model.

For more information see: Chan S.C., Kendon E.J., Fowler H.J., Blenkinsop S., Ferro C.A.T., Stephenson D.B., 2013. Does increasing the spatial resolution of a regional climate model improve the simulated daily precipitation? *Climate Dynamics*, in press. Subscribers to the journal can view the paper online at http://link.springer.com/article/10.1007%2Fs00382-012-1568-9#.

Science collaborations

CONVEX researcher, Dr. Steven Chan, recently completed a three-week visit to the Swedish Meteorological and Hydrological Institute (SMHI) in Norrköping, approximately 150 km from Stockholm. Steven presented results from CONVEX but also examined the simulation of extreme events by the European HARMONIE modelling suite. The main science objectives included investigation of the differences in extremes between the HARMONIE and Met Office models, as well as the exchange of modelling and data analysis expertise. This will help to improve our understanding of extreme rainfall processes in different climate models. Steven worked closely with Dr. Erik Kjellström and two graduate students and met with researchers from the atmospheric and hydrological sciences. Steven also got to experience Swedish Christmas events and exotic Swedish tastes! The visit was funded by the European Cooperation in Science and Technology.

Coming up in CONVEX

- New hourly gauge data has been obtained for use in the project and this will be added to our existing datasets to provide a more spatially comprehensive assessment of observed UK extreme rainfall.
- We will be starting to examine the atmospheric drivers of extreme rainfall with the aim of understanding the underlying causes of some of the identified deficiencies in the climate models, and also which processes the different models perform well. Once complete we will also begin analysis of the future (climate change) run of the 1.5 km climate model.
- The methodology for examining extreme rainfall in relation to low pressure systems will be applied to the CONVEX climate model simulations.
- CONVEX researchers will be attending the European Geosciences Union (EGU) General Assembly in Vienna this April to present work from the project on both observations and climate models. Follow our twitter feed for session details.

The Toon*Flood* Project

Last summer Newcastle was affected by the type of rainfall event that is of interest to CONVEX researchers and planners and responders in our major cities. A series of intense thunderstorms crossed England during 28th June 2012. Between 14.30 and 17.00 several rain gauges in the city recorded rainfall totals of 45-50mm. This caused widespread flooding with consequent disruption to transport systems, businesses and homes.

The Toon*Flood* project is being carried out by research groups in flood risk and urban drainage and transport operations at Newcastle University, together with engineers at Newcastle City Council. It aims to gather as much information as possible from photos, eye witness reports and measurements. It is hoped that this will help us to understand the extent of the flooding around the region, its impacts and how to improve the resilience of the city and its infrastructure to similar events in future. Researchers have also been working recently on detailed computer models of flooding in the city which could predict which areas are vulnerable to flooding from extreme rainfall. The photographs and comments provided through Toon*Flood* will therefore not only help to understand the extent of the flooding around the region and but also to validate computer modelling of the event.

For access to information about the project and to view mapped comments and photographs relating to the event visit the ToonFlood website at http://ceg-morpethflood.ncl.ac.uk/toonflood/.

Newcastle Central Motorway, 28 June 2012. Source: Toon*Flood* Project.

How to keep in touch with what's happening in CONVEX

CONVEX continues to welcome comments and feedback, including views on how we can better provide you with the sort of information you need. You can find out more from our project website: http://research.ncl.ac.uk/convex/.

You can contact Prof. Hayley Fowler (hayley.fowler@ncl.ac.uk) or Dr. Stephen Blenkinsop (stephen.blenkinsop@ncl.ac.uk) for more information.

You can also keep up to date with CONVEX on twitter:

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