Geophysical Research Abstracts,
Vol. 11, EGU2009-9134, 2009
EGU General Assembly 2009

The influence of synoptic airflow on UK daily precipitation extremes: observed spatio-temporal relationships

D Maraun (1), TJ Osborn (1), and HW Rust (2)

(1) University of East Anglia, Climatic Research Unit, Norwich, United Kingdom (d.maraun@uea.ac.uk, +44 1603 507784),
(2) Laboratoire des Sciences du Climat et de l'Environnement, Gif-sur-Yvette, France

Extreme precipitation is one of the major natural hazards in the United Kingdom, and knowledge about its present and future occurrence is needed with a high resolution to assess its impact on local scales and to implement adaptation measures accordingly. Climate projections of regional climate models (RCMs) provide resonable accuracy on scales well above their typical resolution (25km-50km length scales). On grid scales their output might be considerably biased, and they do not provide information about subgrid processes. Thus it is important to identify and understand stable relationships between processes on large scales and extremes on local scales to downscale climate model output to the desired resolution.

Against this background, we investigated the relationship between the large scale atmospheric circulation and local extremes of daily precipitation. We developed a vector generalised additive model that uses synoptic scale airflow indices on extreme days to predict the extreme value distribution of monthly precipitation maxima at 689 rain gauges covering the UK. We found distinct spatial patterns of relationships between the predictors airflow strength, direction and vorticity on the one hand, and extreme precipitation on the other hand. We also found that depending on region and season, the relative importance of these predictors changes. For instance in winter, extreme precipitation in north Scotland is dominated by airflow strength, whereas in summer, East Anglian extreme precipitation is dominated by the airflow direction. Furthermore, we investigated the temporal variability of extreme precipitation for ten different UK regions, and studied its predictability by air flow indices from monthly to decadal time scales.