Geophysical Research Abstracts
Vol. 14, EGU2012-13531, 2012
EGU General Assembly 2012
© Author(s) 2012

Modelling climate impact on floods under future emission scenarios using an ensemble of climate model projections

F Wetterhall (1,2), H. L. Cloke (1,2), Y He (3), J Freer (4), and F Pappenberger (1)

(1) European Centre for Medium Range Weather Forecasting, Reading, United Kingdom (fredrik.wetterhall@ecmwf.int, +44-118-9869 450), (2) Department of Geography, King's College London, London, UK, (3) Tyndall Centre for Climate Change Research, School of Environmental Sciences, University of East Anglia, Norwich, UK, (4) School of Geographical Sciences, University of Bristol, Bristol, UK

Evidence provided by modelled assessments of climate change impact on flooding is fundamental to water resource and flood risk decision making. Impact models usually rely on climate projections from Global and Regional Climate Models, and there is no doubt that these provide a useful assessment of future climate change. However, cascading ensembles of climate projections into impact models is not straightforward because of problems of coarse resolution in Global and Regional Climate Models (GCM/RCM) and the deficiencies in modelling high-intensity precipitation events. Thus decisions must be made on how to appropriately pre-process the meteorological variables from GCM/RCMs, such as selection of downscaling methods and application of Model Output Statistics (MOS).

In this paper a grand ensemble of projections from several GCM/RCM are used to drive a hydrological model and analyse the resulting future flood projections for the Upper Severn, UK. The impact and implications of applying MOS techniques to precipitation as well as hydrological model parameter uncertainty is taken into account. The resultant grand ensemble of future river discharge projections from the RCM/GCM-hydrological model chain is evaluated against a response surface technique combined with a perturbed physics experiment creating a probabilisic ensemble climate model outputs. The ensemble distribution of results show that future risk of flooding in the Upper Severn increases compared to present conditions, however, the study highlights that the uncertainties are large and that strong assumptions were made in using Model Output Statistics to produce the estimates of future discharge. The importance of analysing on a seasonal basis rather than just annual is highlighted. The inability of the RCMs (and GCMs) to produce realistic precipitation patterns, even in present conditions, is a major caveat of local climate impact studies on flooding, and this should be a focus for future development.