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Hydrology and Earth System Sciences Discussions

Interactive comment on "The relationship between climate forcing and hydrological response in UK catchments" *by* N. W. Arnell

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General comments

This study addresses relevant scientific questions within the scope of HESS. The author revisits some of his previous work (Arnell, 2003a, 2004) by taking a same set of UK catchments on which he performs analyses of climate-flow associations using the most up-to-date GCM outputs. By doing so, the reader gets useful insight of climate-flow relationships for a set of catchments in the present time, and also can readily compared these results to those from the previous studies, which were using GCM outputs of the time. It uses known and proven approaches and techniques, which are clearly presented. Of note is the way the author presents results from a series of model

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outputs using graphs rather than summary statistics like mean and standard deviation thus avoiding the shortcomings related with summary statistics.

The paper would benefit from minor corrections addressing the following points:

- Given the manuscript partly follows on from some of the author's previous papers (Arnell, 2003a, 2004), it seems at times that some background information have not been included and it is left to the reader to check out the original papers, not always easily available. For example, the same six catchments as used before are presented in Paragraph 2.2, which sums up their most remarkable characteristics, but it could be useful to cite data and information sources in the manuscript, and it would be necessary to give more background on the selection process of these six catchments (Why and how were they selected in the first instance? What makes them of particular interest? Etc).

- Selection of six catchments only; UK rivers and catchments are far more diverse than in many countries, as noted in many papers, for example in Marsh (1998)*, and its c. 1500-strong gauging station network (only counting the ones with records held in the UK National River Flow Archive (NRFA) hardly manages to capture this diversity. Consequently, using only six gauged catchments limits how much general the author's conclusions can be (in particular, re influence of catchment characteristics). It would be useful to acknowledge this more clearly especially for the benefit of those less familiar with the UK, who may be under the impression that six catchments are well representative of the country. Alternatively, the author could demonstrate more clearly in what extent these six catchments are indeed well representative of the UK.

Specific comments

- Nash-Sutcliffe; cite the original paper** or give equation and explain.

- Catchment characteristics (Table 1); indicate sources of information and data.

- Figure 1 could benefit from being upgraded from the original version (eg adding major

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rivers, moving runoff plots so that they do not overlap on coastline).

- Figure 2a and 2b would be easier to read if replaced by tables featuring the actual values rather than using the bar plots; if figures are kept, consider alternative colour schemes for both, and, for Fig. 2b specifically, amend so that it is clearer than there are three groups of bars (the gaps are too narrow and it looks as a single plot at first glance).

Technical corrections

- On the current PDF, none of the legends or labels in Figures 2-8 are easily readable at 100% display (same problem on two different computers) or when printed on A4.

- Grids are referred to as '0.5 x 0.50' whilst it is usually '0.50 x 0.50' including one of the author's own citation (Arnell, 2003b; in HESS) in the present submission.

- Page 7635, line 18; the text mentions '18' climate models instead of 21; if it is indeed '18', then it would need clarification.

References:

*MARSH T. J. (HERSCHY R. W. (ed.)) Maximising the utility of hydrometric data. In Hydrometry; Principles and Practices. Wiley, Chichester, 1998, pp. 291–316

**Nash, J.E. and Sutcliffe, J.V. 1970. River Flow Forecasting Through Conceptual Models - Part I - a Disscussion of Principles. J. Hydrol., 10 (3))

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 7633, 2010.