

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

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### **Response to reviewer comments**

#### ***C. Laize***

General comment 1: Increase the background information on the case study catchments

More information has been provided, and the data sources identified.

General comment 2: Do the six catchments represent fully diversity in the UK?

The catchment set is not designed to represent the full range of diversity in UK hy-

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drological conditions, merely to represent six different types of hydrological regime. A sentence has been added to emphasise this.

Specific comments:

Nash & Sutcliffe (1970) has been added to the reference list

The sources of information have been added to Table 1.

Figure 1 has been upgraded.

Figures 2a and 2b have been redrawn, and should be clearer now

Technical corrections:

The axis labels have been increased in size in the new figures

Grids are now all defined as  $0.5 \times 0.5^\circ$

18 climate models has been changed to 21 climate models

### ***Anonymous referee 1***

Specific comments:

The term “scenario” has been used now to refer only to scenarios of climate information being fed into the hydrological model

The parameter uncertainty part of the study has been expanded. First, the exercise has been repeated for all six catchments. Second, the method for defining parameter sets has been revised, so that 100 “good” fits (bias < 5%) are used. Parameter sets that produce “poor” fits have been excluded. It would have been possible to use a different definition of “good”, but the simplest approach was adopted here – partly because the original parameter sets for each catchment are based on a combination of objective and subjective calibration.

The conclusion on the role of hydrological parameter uncertainty is now better sup-

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ported in the text, through the refinement of the methodology for defining parameter sets, and the use of all catchments. The figures now show the parameter uncertainty range for HadCM3 together with the other 20 climate model patterns, and the relative size of the two uncertainties is clear. Similar results were produced using other climate model patterns, as now mentioned in the paper (but the results are not shown).

The natural multi-decadal variability is described in section 2.4

The discussion of the “clusters” in response has been rephrased to emphasise that these are clusters in projected change, due to clusters in the behaviour of the ensemble of models used. The fact that the models are not independent is mentioned explicitly in 2.4. The lack of independence between models is also mentioned in Section 3.4 as one of the reasons why models cannot sensibly be combined.

The results have mostly been presented for a 2°C change. This is partly to reduce the number of figures, and partly for consistency with the other papers in the Special Issue. The paper is not intended to be used by decision-makers directly, so the focus on 2°C as an illustration is not a limitation; one of the aims of the paper is to illustrate the nature of uncertainty in impacts, and what that implies for how results can be summarised.

Technical corrections:

- These have all been addressed in the revised text

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

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