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Hydrology and Earth System Sciences Discussions

Interactive comment on "Evaluation of the transferability of hydrological model parameters for simulations under changed climatic conditions" *by* S. Bastola et al.

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Response to reviewer 2

Response to interactive comment on Evaluation of the transferability of hydrological model parameters for simulations under changed climatic condition

Thank you for the comments and suggestions. In the text below we try to answer all the questions formulated. We believe the comments and suggestions from the anonymous reviewer were very helpful in improving the manuscript. If you consider that it is still not enough, please do not hesitate in contacting us. We want to express our apologies if

some of the explanation in some cases is too scant and/or unclear.

Continuous rainfall-runoff simulations at a daily time step are adopted to model the streamflow regime of a catchment. In this study, four different models are employed and it is assumed that the conceptual basis of the models enable the hydrological processes to realistically respond to changes in climatic input. Average conditions are used as a splitting criterion to define climatic condition. It is true that such threshold values, derived from present climatic conditions, may not be fully representative of expected future climate change. However, the threshold values that differentiate different climatic periods, are in fact derived from the future projections, using the HADCM3 A2 climate scenario. We express our apology for the lack of clarity of the methodology and results. We have included additional detail on methodology and added additional discussion in the results section. Moreover, the definition of evaluation criteria and assessment measures are corrected to improve consistency and clarity.

1. 5894, 10-11: I don't think this is correct

Response: Sentence is rewritten to improve clarity. We agree with both reviewers that most studies have assessed the temporal transferability of model parameters via split-sample testing.

2. 5895 26-27: How is the downscaling performed?

Response: Downscaled climate scenario data were taken from Fealy and Sweeney (2008). The authors used a statistical downscaling method to downscale the precipitation data. First, precipitation occurrences were modelled: then a model is fitted to precipitation quantities which describe the rainfall distribution for days on which precipitation occurs.

3. Page 5897 25-26: Not clear why this is important

Response: Models are usually calibrated and applied on chronological data. However, in order to define parameters for different climatic conditions, behavioural simula-

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tors are estimated from intermittent data and not from chronological data. Therefore, inorder for the behavioural paramter set to be realistic, they should be able to work satisfactorly on the chrolological data.

4. Page 5898 5-9: performance measure should be defined

Response: The definition of performance measures (equation 1-4) is included in the revised manuscript.

5. Why are PWW and PDD shown? The results are not used. They are shown as they characterise the climatic period.

Response: Both PWW (probability of wet day following wet day) and PDD (probability of dry day following dry day) were only shown to characterise the climatic period used in this study.

6. page 5898 16-19: Describe how the GLUE methodology is applied for defining behavioural models.

Response: In this study, the threshold value of 0.6 (NSE) was selected as a threshold value to differentiate between behavioural and non behavioural parameter set. The selection of the above threshold values were made based on a sensitivity analysis where the width of the prediction interval (ΔQ), count efficiency (CE) and the number of behavioural simulation (NB), were estimated for different threshold values, namely NSE of 0.3, 0.5, and 0.7. For all models the ΔQ, CE and NB increased with a decrease in value of the threshold and vice versa. However, the rate of decrease of ΔQ, CE, and NB are (5

7. Page 5899-5900: Not clear why a study on reparameterisatons of the NAM and HYMOD is included in the paper.

Response: They were initially included to explain the model bias associated with the original model. However, we only included the result from the original models. In hindsight we agree with both reviewers and have removed the paragraph from the

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revised manuscript.

8. page 5900 16-17: not clear

Response: As the periods used for the calibration of the model are not continuous in time, the estimated basin simulators were also used for simulation with the chronological data. (comment 3).

9. Table 2: The symbols are defined in the revised manuscript to improve clarity

10. The Fewer parameter points shown for TANK and TOPMODEL. Response: All four models employ the same threshold value and the same number of model evaluations. Apart from these subjective criteria used to derive behavioural simulators, the number of behavioural parameters sets depends upon the models structure, complexity and degree of interaction among model parameters. In the present application, the number of simulation runs retained for analysis for TANK and TOPMODEL was small as compared to HYMOD and NAM. This information will be included in the revised manuscript.

11. Figure 8 what is shown in (a)-(d)

Response: Figure caption is revised to improve clarity.

Fealy, R., Sweeney, J.: Climate scenarios for Ireland, in Sweeney, J. (ed.) Climate Change: Refining the Impacts. Environmental Protection Agency, Johnstown Castle, Wexford, Government Publications, 5-38, 2008.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 5891, 2011.