

Earth Syst. Sci. Data Discuss., referee comment RC1  
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## Comment on **essd-2022-40**

Anonymous Referee #1

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Referee comment on "The enhanced future Flows and Groundwater dataset: development and evaluation of nationally consistent hydrological projections based on UKCP18" by Jamie Hannaford et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2022-40-RC1>, 2022

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The title of the paper is misleading, it had me expecting to read about projected changes in flows and groundwater in the UK, when in fact the paper presents an evaluation of hydrological models prior to being forced with future runs. Indeed the opening sentence of the abstract doubles down on this - the paper presents a dataset of nationally consistent hydrological projections for the UK based on the latest UK Climate Projections. The paper doesn't do this and thus needs to be reframed as a paper evaluating hydrological models and RCM ensemble members in capturing observed regime - PRIOR to providing climate change projections for the sector.

Apart from this major oversight, the paper is well written and presented. There are a number of questions I was left with after reading that should be addressed in a revision. First, why the differential sampling of models for flows and groundwater? 3 different hydro models but only one GL model and one recharge model. In addition, why was uncertainty in model parameters not investigated.

Second, was any testing done on the transferability of models to future conditions? In particular the lumped conceptual models (GR and PDM) are held to perform better for modified catchments because the calibration picks this up. However, for future runs for later in the century are these modifications likely to be stationary and therefore how representative are these models for these catchments likely to be? On a related note, it would be useful to describe the range of disturbances affecting catchments - is it predominantly abstractions?

IF the purpose of the dataset is to inform adaptation planning why was RCP8.5 selected and why not more scenarios. There is debate in scientific literature presently about the realism of RCP8.5 - its selection here needs to be justified further. I understand the need for crystallising the uncertainty as stated, but this needs to be done based on the objectives or intended uses of the dataset.

Am I correct to conclude that there is no evaluation of model performances for an independent verification period, ie. that all metrics presented are for calibration period? How then can we be sure that calibrated models perform outside of the period used to train them, even during the baseline period, never mind under changed future climates. Please justify NOT using a verification period and what this may mean for your results.

Minor comments

Some aspects of the uncertainties explored seem to be missing from Table 1 - eg. The first sentence of section 3 mentions 2 regional climate models, groundwater models are also not included.

Line 196 can you say how this was done for clarity

Line 216 - it would be useful to provide a brief overview of this downscaling method here. It is an important part of the methods and this is the go to paper describing the dataset.

Line 236 - what does copied down mean here - lacks clarity.

Figure 2 - there are 12 PPE members from text but 15 columns. Not sure I follow, is there an ensemble mean presented?

I like how there is tracability between FFWGL and this dataset in terms of models, catchments etc. This is sensible and useful. I also like how research and industry needs fed into catchment selection. I also like the description of stage 2 assessment and its expectations. Dont often see this as nicely explained.

Line 604 - this concerns me and needs teasing out a bit more, especially given the objective of informing adaptation in the sector. What does to a degree mean? I can understand the need to assess future changes relative to the 'real' present (ie disturbed) for planning but what are the implications and cautions that should be borne in mind?

Figure 4 caption needs to state #catchments and refer to table detailing the skill scores.

Line 644 missing word.

Line 680 full stop missing.

Line 840 - should really discuss the transferability of models and parameter sets from current to future conditions as a key source of uncertainty here, along with the stationarity of disturbances in relative catchments.