

Interactive comment on “Future hot-spots for hydro-hazards in Great Britain: a probabilistic assessment” by Lila Collet et al.

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Thank you for your interest in our work and your feedbacks. Find below the answer to each of your comments:

Comment 1: Introduction: An interpretation on existing approach for projecting future hydrohazards, not only for UK, but also for other places worldwide, should be included. It will help readers to identify clearly the improvements from the existing knowledge and the innovation of the study.

Answer to comment 1: We agree the introduction is quite UK-centric. We thus added another reference to a European analysis of the impact of climate change on future hydro-hazards by Roudier et al. (2016) who used the euro-CORDEX database.

C1

Comment 2: Line 11 Page 4: What is exactly the methodology or indexes of drought characteristics? It is not sufficient to just tell where can find the R package.

Answer to comment 2: The methodology we used to extract drought characteristics is described throughout section 2.2, particularly Page 4 lines 11-25. To be clearer on which characteristics we assessed, the text was modified line 11 page 4, as well as line 3 page 4 (to detail flood characteristics).

Comment 3: Result: It would be much better to show how the climate will change in the scenarios? And for each Figures shown, how the reasons for such changes? Please just be more clear on how these hydro-hazards respond to what kind of changes in which climate parameters??

Answer to comment 3: We are unclear what you mean by climate parameters: do you mean climatic variables (precipitation, temperature...), or the climatic model parameters? For the later, this can be access through the literature related to HadRM3-PPE [give reference here]. Regarding climate variables, whilst it would be informative to investigate the relationship between the changes in precipitation / temperature/... and changes in river flow, it is not the scope of the paper, which aims to identify hydro-hazard hot-spots as a result of climate change (see end of the introduction, we also modified the abstract to clarify the goal). Here, our paper focuses on developing new tools and approaches for water managers to understand potential impact of climate change on water resources, resulting in a relatively dense paper. We believe that the discussion on UKCP09 climatic projections (see section 4.1, page 15 lines 3-13) provides sufficient context in the climate-hydrological modelling chain, and that additional analysis of the climatic variables alone is not necessary.

Comment 4: Line 1 Page 17: Using climate change projections of only one GCM model is only can be acceptable if you show how these characteristics of floods and droughts quantitatively to each unit change in key climate characters. Such information can be also valid for other GCM model outputs.

C2

Answer to comment 4: As mentioned earlier, the aim of this paper to develop a methodology enabling to define probabilistic climate change hydrological impacts. Here it was applied to an ensemble forced by a single GCM, with a perturbed physics parameterization ensemble to encompass some climate modelling uncertainty. The methodology could be easily be applied to a larger ensemble. However, the Future Flows Hydrology ensemble had been analysed in previous work (Prudhomme et al., 2012; section IV) showing that the range and distribution of hydrological changes was generally consistent with the fuller uncertainty described by UKCP09-derived hydrological changes for the 2050s horizon. This was clarified in the discussion (section 4.3). As discussed in this paper, we think a wider range of GCM database would allow a better uncertainty assessment, but the FFH already provides a decent range of possible futures to develop statistical tools.

References: Christel Prudhomme, Sue Crooks, Christopher Jackson, Jon Kelvin, Andy Young (2012) Future flows and Groundwater Levels. Final Technical Report Science Report/Project Note – SC090016/PN9. CEH Wallingford, 118 p.

http://webarchive.nationalarchives.gov.uk/20130301204241/http://www.ceh.ac.uk/sci_progra

Roudier, P., Andersson, J.C.M., Donnelly, C., Feyen, L. Greuell, W., Ludwig, F., 2016. Projections of future floods and hydrological droughts in Europe under a +2°C global warming. *Climatic Change*, 135: 341. <https://doi.org/10.1007/s10584-015-1570-4>.

Please also note the supplement to this comment:

<https://www.hydrol-earth-syst-sci-discuss.net/hess-2018-274/hess-2018-274-AC3-supplement.pdf>

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2018-274>, 2018.