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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Climate change alters low flows in Europe under a 1.5, 2, and 3 degree global warming" *by* Andreas Marx et al.

Anonymous Referee #1

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The authors present a comprehensive study of change in low flows for Europe using downscaled GCM output fed into three different hydrologic models. I am happy to recommend publishing of the manuscript subject to maybe some clarifications.

This paper is looking at changes in the percentile (as the abstract says) – but the introduction is focuses on droughts. As it is currently phrased I am not sure I feel comfortable with research Question 1. I think this should be changed to say it is looking at changes in low flows. The introduction needs some text to relate drought to low flows. I understand that at the bottom of page 4 it is stated that Q90 is the drought metric but this comes too late in the piece.

I think there are a few papers that could be cited in the introduction, for example, Hall et al. (2014); 10.5194/hess-17-325-2013; and a recent article that looks at the

sensitivity of flows to temperature 10.1038/s41598-017-08481-1.

I did find it odd that a lot of material was introduced in the discussion on Page 10 and Page 17/18. Given it is relevant I think the introduction needs to (at least briefly) incorporate these references to put this works novelty in context.

Could the bias correction be elaborated in a sentence or two because the choice of bias correction can make a huge difference to the results? Especially if the focus is drought, authors need to correct for low-frequency variability biases - see 10.1016/j.jhydrol.2016.04.018.

Worth noting we are tracking for higher increases than 3 degrees probably: 10.1038/nclimate1783

Can the results in Table 1 be verbally contrasted with land predictions for Europe (i.e. will Europe heat up more or less than the global average). The IPCC reports will have this.

I am pretty sure that the low flow statistics in Table 2 are based on average of all the grid cells in a region but I am not sure. This could be mentioned in the text.

Figure 4 – not really clear to me what the blue dashed line indicates. I think the lines need to be described in the legend.

It is a bit hard to assess Table 3 because the step changes aren't linear. You could compare the following: Table1 Row 1 (0-1.5K) increase equivalent to 22, -7, -4, 8, -12 % changes and comparing to Row 3 in Table 2 (again a 1.5 K increase but now from 1.5 to 3K) of 24, -13, -12, 23, -23.

It was not clear to me how the GCM and HM signal-to-noise ratio was split.

Abstract Line 5: Unprecedented is a strong word and I would remove it.

Page 8 Line 4: Typo. ". . .by first fixing a HM and then calculating the range of Q90 (max-min) corresponding to give GCM outputs and repeating the previous step . . ."

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