Hydrol. Earth Syst. Sci. Discuss., 10, C344–C346, 2013
www.hydrol-earth-syst-sci-discuss.net/10/C344/2013/

Hydrology and Earth System Sciences Discussions

Interactive comment on "The influence of decadal-scale variability on trends in long European streamflow records" *by* J. Hannaford et al.

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Received and published: 14 March 2013

We thank the reviewer for their very positive review, and are very encouraged by the supportive comments they have made. We are glad the reviewer supports our decision not to use statistical significance for the purposes of this kind of study, an approach followed by numerous other recent studies which have similar aims.

The reviewer has two primary suggestions for revisions, which we address below:

1) Examining the coherence between mean, maximum and minimum flows. We thank the reviewer for this insightful suggestion, and completely agree that this is an important area in the debate on hydroclimatic change that our work can contribute to, which

we neglected in the paper. We plan to add more discussion on this topic, with reference to other work which illustrates the conventional thinking that in many parts of the world, both extremes will get worse, i.e. increased wet extremes with an increase in dry spells too (e.g. work which suggests this is a “characteristic signature” of global warming, Girorgi et al. 2012). Whilst we may indeed expect that to happen in a warming world in some places, in reality the responses will be far more complex. We note that in some of our regions, there is a good degree of coherence between the extremes, whereas in others less so – this may reflect the role of snow storage – e.g. contrasting Central West (good coherence) with Northern Coastal (less coherence). We will investigate this further by correlating the smoothed interdecadal variability lines for mean, AMAX7, AMIN7 for each cluster. We will carry out this analysis and feature in the results section, and add some commentary in the discussion, also making reference to other work which has examined coherence of high, medium and low flows in Europe (Gudmundsson et al. 2011).

2) A question on the formation of the regions. We thank the reviewer for raising this concern and we agree we can improve the clarity in our discussion of the clustering. The regions were formed objectively using a cluster analysis, rather than geographically – although the northern and central domains were clustered separately (as mentioned at present, p1868, L20) due to the geographical separation of Scandinavia and central Europe. The geographical coherence along with cluster size were criteria in deciding which clustering method to use (although the results were generally very similar). This is discussed in section 3.2 but, taking the reviewers comments on board, we will make sure this is explained more clearly when revising. By giving the regions names we have perhaps implied they were defined geographically. They were defined statistically but happen to be fairly geographically separated, but note that there is actually some overlap between the regions (especially in central Europe). The naming was felt to make reference easier, and as this overlap is generally fairly limited, we think it is defensible as a way of referring to the general locality of the regions. We will add some more discussion on this in the methodology and the results section.

HESSD

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Gudmundsson, L., Tallaksen, L.M., Stahl, K., 2011. Spatial cross-correlation patterns of European low, mean and high flows. Hydrological Processes, 25(7): 1034-1045.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 1859, 2013.