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Hydrology and Earth System Sciences Discussions

Interactive comment on "Low-frequency variability of European runoff" *by* L. Gudmundsson et al.

Anonymous Referee #1

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I enjoyed reading this paper. Space time variability of monthly streamflow is at the heart of regional hydrology and I think this paper makes an important contribution. However, I had some difficulties with understanding what has been done as well as the reasoning. The paper would profit from clarifying a number of issues.

Some jargon is used throughout the paper and I am not sure how useful it is for the readership. "Fraction of low frequency component of variability" could perhaps be replaced by "between-year variability". I realise the variability does not exactly refer to years, but the wording is certainly clearer than "low frequency". Similarly, high frequency should be replaced by within-year.

Most of the reasoning is in terms of the between-year variability while I think the patterns that emerge have a lot to do with the within-year variability. While the two are complementary, so technically the reasoning can be made for either low or high fre-

quency components, I believe reasoning in terms of within-year variability is clearer from a hydrological perspective as I believe the runoff regime (within-year variability of streamflow) is the main reason for the patterns. For example, in the cold regions the within-year variability of streamflow is larger than in other parts of Europe and this is simply because of snow processes. This implies that the relative contribution of the between-year variability is smaller, but this is not a helpful explanation, I think.

Below are my detailed comments.

p. 1708, l. 9: "Accordingly" is not clear to me.

p. 1710, l. 23: The description of the LOESS kernel is needed but at the end of reading the paragraph the time scale of the kernel was still unclear to me. It would be important to give the units in terms of months and explain the concept in a way the reader can relate to.

p. 1712, l. 2 and Fig. 3: Fig. 3 was perfectly unintelligible to me. What are the scales? Where is the "distance measured along the curved earth surface" mentioned in the text in Fig. 3? Besides, it is unclear why this distance metric should play an important role in Europe relative to Euclidian distances.

p. 1712: A description of the isomap method is necessary, but the authors make no attempt to relate it to the present case. I strongly recommend to add an intuitive explanation of what the method does to assist the reader in the interpretation of the results. How can it be interpreted hydrologically?

p. 1713, l. 10: I would put it the other way round: "the fraction of high-frequency variance of runoff increases under wetter and colder conditions" and this is because of snow processes within the year (snow storage, snow melt).

p. 1713, l. 25: Why is it that low frequency runoff and rainfall are not correlated? I am not sure whether I can follow the interpretation in the manuscript on the following pages about catchment storage. Catchment storage would be clearly much more important

within a year than between years, i.e. the exact opposite of what the authors are claiming.

p. 1717, l. 19: I would put it the other way round: “Catchment processes reduce high-frequency fluctuations” which is obvious because they are filters.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 1705, 2011.