Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2018-113-RC3, 2018

Hydrology and Earth System Sciences
Discussions
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Interactive comment on "Optimal Design of Hydrometric Station Networks Based on Complex Network Analysis" *by* Ankit Agarwal et al.

Anonymous Referee #2

Received and published: 26 June 2018

This manuscript introduced the use of complex network analyses for designing optimal hydrometric networks. I find the concept interesting, but the presentation is still not ready for publication. Overall, I think a major revision is necessary.

I find the concept interesting, but the authors somewhat fail to explain what the advantage of this method is, and to make me really understand what the network analyses will mean in the case of hydrometeorological observations. It is clear how a linear network can be defined, as in Figure 1, but I find it difficult to imagine the network that is built from the event synchronization. Maybe the authors could show a small example where only a few (imaginary) stations are analysed with the network methodology. Then it can be shown how and why some stations are redundant and can be removed. The real case example from Germany is interesting, but with such a high number of

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stations, it is challenging to understand what actually happens.

I am not convinced by the use of a somewhat subjective cutoff value for the Qs to define the network, without at least a much deeper discussion around the effect. This will to a large degree ignore the level of similarity, it is just a yes/no transformation. Increasing or decreasing the threshold could drastically change the importance of the nodes in the network. Two stations with similarity just above the threshold will be treated the same way as two stations which are almost identical. On the other hand, two stations just under the threshold are treated completely different than the stations just above, even if their similarities are almost the same.

The authors do several times mention the importance of global bridge nodes, and the possibilities these give in analyses of complex networks. For example: “For instance, in climate networks and early warning signal could be generated by capturing the flow of information at such points.” This might be explained better in some of the references, but it should anyway be better explained what a global bridge node really means in hydrometeorological network, and what kind of information flow we could particularly capture from this node.

I noticed that also the other reviewers asked for some improvements regarding the relative kriging errors. In addition to what they wrote, I was not sure whether the variogram is recomputed when stations are removed. If this is done, then variogram fitting is a science in itself, whether done manually or automatically, and this can lead to changes in the kriging error, making small changes more a result of random changes. The kriging error should normally not decrease when you remove stations, so the reduction in table 4 for the mean is most likely because the variogram has been fitted differently. When kriging error is used to estimate network modifications, the variogram is therefore usually kept constant, to avoid having to also analyse the variogram fitting. The larger changes are still significant.

Some smaller issues:

P2L25 the sentence is somewhat contradictory to the previous one, try to rephrase.

P13 - Fig 6 Remove 10% from the x-label

P16 Eq. A3 explain why the numbers are 1 and $\frac{1}{2}$ in the equation.

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