

Interactive comment on “A methodology to estimate flow duration curves at partially ungauged basins” by Elena Ridolfi et al.

A. Bårdossy

bardossy@iws.uni-stuttgart.de

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Dear Francesco,

thank you for your fast and interesting comments. They are certainly useful, but I have the impression that you overlooked some parts of the paper, and for sure missed the essence of the idea. To make this clear I use a slightly more formal way. We assume that discharge is somehow related to precipitation. Formally

$$Q_k(t) = h_k(P_k(t - \tau), \tau = 0, \dots, n \dots, \beta_k)$$

where k stands for the location, h_k is the transformation - usually approximated by a

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hydrological model - β are the specific parameters of the process.

Our goal is to find the distribution of $Q_k(t)$ for a time period (T_1, T_2) (FDC). We would like to have a quick approximation without hydrological modelling. (Modelling is unfortunately often introducing additional errors, and is often biased for longer subperiods. Thus it is complicated in its error structure.) Obviously we have a correlation between P_k and Q_k . Unfortunately we cannot use the distribution of P_k to assess the FDC directly as it will fail due to the lacking temporal structure and the many zeros. (Thus your statement any correlated series would do the same job is false.) Instead we use a transformation of P_k - the API:

$$A(t) = a_k(P_k(t - \tau), \tau = 0, \dots, n)$$

Both transformations can be regarded as filters acting on P_k . These filters do not necessarily produce highly correlated series, but may produce series with similar distributions. The trivial example for this is if we assume that

$$h_k = a_{k-m}$$

This is a time shift - typical for hydrological processes. The two series are not perfectly or weakly correlated, but their distributions are practically the same.

Thus the basic idea was to get rid of the complicated non-linear processes and to find a filter which relates the distributions.

Personally I am not very fond of the simple correlation type approaches

I fully disagree with your statement:

To be honest, I think that whatever variable recorded in the reference and target period can be used as a support for interpolation, if its realizations in the reference period explore the sample space in the same way as the realizations of the target variable do.

One important message of the paper is that FDCs can be very different from time period to time period. (The usual assumption that they and the related indices are characteristic for the catchment is not true.) Thus only parameters showing the same kind of signal may work. API was selected as it reflects the same generating mechanism.

You may have overlooked, but we tried the same procedure with FDCs from other sites too. Here some (most likely where h_k and h_l were similar) worked well others not.

Unfortunately I do not use, thus do not understand R-codes. Thus I cannot comment on your code. It would be interesting if you would modify or permute the precipitation series before assessing the performance of this very simple method.

Regards Andras

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