Hydrol. Earth Syst. Sci. Discuss., 7, C4255–C4258, 2010
www.hydrol-earth-syst-sci-discuss.net/7/C4255/2010/

Hydrology and Earth System Sciences Discussions

Interactive comment on "

Geostatistical regionalization of low-flow indices: PSBI and Top-Kriging" *by* S. Castiglioni et al.

S. Castiglioni et al.

attilio.castellarin@unibo.it

Received and published: 17 December 2010

We thankfully acknowledge Referee#2 for providing helpful suggestions and comments, which enable us to improve the overall quality of the presentation of our work.

Our reply is structured as follows, we report all referee's comments (indicated by RC) together with our reply (denoted by AR, Authors' Reply).

RC:

This is very interesting and well written paper. I have a range of comments mainly to improve the discussion of the paper.

- It would be good to mention in the abstract why Q355 is relevant (as is discussed later in the text).

AC:

The abstract will be modified as suggested by concisely indicating why Q355 is relevant.

RC:

- Both methods (depending on the scle of application and whether the network is controling or not) seem to offer a lot of potential in model calibration. They would offer a strategy to derive estimates of hydrologically relevant flow characteristics either at ungauged or at internal catchment sites to which lumped or distributed models could be calibrated (see regionalization of flow characteristics and subsequent calibration approaches by Bardossy (2007, HESS) or Yadav et al. (2007, Adv. Water Resources)).

Hence providing a very interesting alternative to the direct regionalization of parameters.

AC:

Refeere#2 is right. As indicated in the original manuscript (p. 7234, l. 13), the literature reports a successful application of PSBI in the context of regionalization of rainfall-runoff parameters (Hundecha et al., WRR, 2008). Applications of Topkriging are, in principle, also possible in this context. A more detailed comment will be reported in the introduction and the relevant references indicated by Referee#2 will be included.

RC:

- While the authors mention that catchment classification requires the additional step of grouping catchments, the basis for such groupings are nonetheless often continuous indices (e.g. Wagener et al., 2007, Geography Compass; and work by Ross Woods), which means the authors approach could provide an interesting basis for classification

HESSD

7, C4255–C4258, 2010

across gauged nd ungauged basins.

AC:

This is also a good point that will be incorporated in the introduction (within the paragraph on p. 7234 from l. 14 to l. 26 of the original manuscript), together with the relevant references.

RC:

- What is the variability of Q355 along the network? What density of estimates would be needed for a continuous prediction? at what scale is the variabiluity known and hence what are limits of predictability?

AC:

Table 1 will be modified by reporting the variability of empirical q355=Q355/A values. This will also be functional to the discussion of the limits of predictability in the discussion section. Subsection 4.2 actually presents a continuous prediction of Q355 performed by applying the two methodologies. The subsection will be enriched by explicitly mentioning the density of estimates that was needed to produce such a continuous prediction for this particular case study, even though it has to be acknowledged that these information are case-study specific: other geographical contexts are probably associated with different limits of predictability and different needs for a continuous prediction.

RC:

- There are some smaller textual errors, which the authors will find when reding through carefully one more time. E.g. 'closer look to Table' should be 'closer look at Table'.

AC:

The manuscript will be carefully checked from grammatical viewpoint one more time.

HESSD

7, C4255–C4258, 2010

RC:

- I have another question about the limits of predictability of the two methods: PSBI cannot predict behavior of locations outside the range of observed catchment characteristics.

Does top-kriging enable further extrapolation as long as a network connectivity exists?

AC:

This is a good point. The uncertainty associated with PSBI predictions evidently increases dramatically as we move outside the portion of physiographic space containing the empirical values. Top-kriging should provide a more accurate means to perform downstream extrapolations (i.e. predictions for catchments that are larger than all gauged catchment considered in the study area), provided that a network connectivity with upstream gauged catchments exists and physiographical parameters do not change radically as we go downstream (hydrological homogeneity of the study region).

Nevertheless, for both techniques a general comment holds. Like all geostatistical methods (without drifts) extrapolation will make Topkriging and PSBI converge to the expectation.

A comment on this aspect will be included in the discussion section.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 7231, 2010.