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Hydrology and Earth System Sciences Discussions

Interactive comment on "Inferring the flood frequency distribution for an ungauged basin using a spatially distributed rainfall-runoff model" *by* G. Moretti and A. Montanari

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The manuscript entitled "Inferring the flood frequency distribution for an ungauged basin using a spatially distributed rainfall-runoff model" by G. Moretti and A. Montanari, is a very interesting one. The topic (prediction in ungauged basins) is of course very relevant in the hydrologic field, the adopted methods are scientifically valid and up-to-date, and the presentation is clear and concise. Synthetic generation of runoff time series, through spatial rainfall generation and rainfall-runoff transformation, is becoming the standard approach to peak discharge estimation in ungauged basins; however, the problem of changing the spatial scale from calibration to simulation (i.e., the ne-

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cessity to apply to smaller river basins the parameterisations that have been obtained by calibration on a larger basin) has been rarely considered in the literature. The main interest of the paper is, in my opinion, in the fact that it poses this problem in a very clear way. Given the intrinsic complexity of the treated topic, the paper is necessarily somewhat inconclusive, i.e. it does not lead to a definite decision on the usefulness of the simulation methods in this specific case. However, the simple fact of clearly posing the problem makes the paper well worth publication on HESS.

I have a couple of comments/suggestions for improving the paper:

1) A problem with the interpretation of the results arises, due to the fact that for the Riarbero river basin no discharge data are available. However, some data are available at the Cavola Bridge and Collagna cross sections, which are other two sub-basins of the Secchia catchment. An application of the simulation approach to these two sections (treated as ungauged basins) would give strength to the conclusion of the paper. The application at the Cavola bridge is already in the paper (Figure 3b), but, in my opinion, it is not commented in sufficient detail. In fact, the passage of scale can be already relevant at this section, because the drainage area at the Cavola bridge is less than 1/3 of the global area of the basin where the model parameters are calibrated. An application of the model to the Collagna river basin could provide some more interesting indications, even if only 6 annual maxima data are available.

2) The obtained 20-year design flood at the Riarbero cross section (102 m3/s) looks rather small when one compares it to the result obtained with the standard rational method: in fact, the drainage area is 17 km2; the concentration time is probably close to 1h, roughly estimated from the length of the main stream (7km), with a standard value for the velocity of the flood wave in steep streams (2 m/s); the corresponding 20-year rainfall intensity is around 100 mm/h (see Figure 4a). By applying the rational formula one obtains that the 20-year design discharge is 472 m3/s multiplied by C, where C is the peak runoff coefficient. The design discharge obtained with the simulation method therefore corresponds to a peak runoff coefficient C=0.22, which is a very small value,

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probably out of the range of values adopted in standard applications.

Minor point: please provide a map of the Secchia river basin with all the relevant cross-sections.

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