

Interactive comment on “Which spatial discretization for which distributed hydrological model?” by J. Dehotin and I. Braud

Anonymous Referee #1

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The title of the paper raises an important question. The first part of the paper provides thoughts on the use of spatial data in hydrological modelling, these are not really new, but this is a good review. When it comes to the technique the authors want to propose and its application for a French catchment (parts 3 and 4) I have to say that I had difficulties following the work. There are several points which remained unclear to me and at this stage I'd like to use the HESS-D platform for clarification and discussion rather than to provide a traditional review.

While I like the idea to use distributions for landscape classifications I am not really convinced about the roadmap taken by the authors. A central step seems to be the computation of the frequencies based on a neighbourhood window which can be of different shapes. Regardless of shape, however, hydrological connectivity is not taken

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into account. Landscape variables can, for instance, be summarized over water divides. Please clarify why this should make sense.

The example does not include any model. Please comment on how the question raised in the title can be answered using an analysis as suggested in the paper.

Please comment on two important issues which do not seem to be addressed: (1) The use of raster-based information, for instance, is convenient, but also implies the risk that small landscape elements are missed totally. Riparian zones in headwater catchments, for instance, might not show up raster maps if cells of 200m are used. (2) Distributed models might need a higher spatial resolution for numerical reasons, even if there is no detailed maps for all spatial information. The question on necessary spatial discretization also depends on the way lateral flow between landscape elements is computed.

Questions with regard to the illustration example: There is a long list of available data (p. 798). Please clarify how data on meteorology, streamflow, soils and groundwater has been used.

A DEM of 200 is rather coarse, why did you not use the available 100 m DEM. Even the 100m DEM would be still too coarse to really represent the topographic controls on hydrology.

Please clarify what you mean by 'predefined digital river network' (p800,3)? How was this network obtained? An average of 35 km² for first order catchments sounds large too me (we usually have 3rd order catchments at this size), but this of course depends on the details in the stream network.

As I can understand the classification presented in the example is not really based on distributions but more a traditional overlay of different GIS layers (see tab 1&2, fig 6&7 (I have to say that I could not read the legend of fig 7). Please clarify how the histogram ideas were used in the example. As I understand the power of the histogram

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approach would be that it allows for non-homogenous reference zones, but it remains to be shown how this could be implemented in practice.

Could you please clarify how a REW is different from a subcatchment. One might argue that REW is just a fancy name for what hydrologists always have used for dividing the landscape.

How did you evaluate the landscape classification? Ultimately this would be done by evaluating modelling performance; could you comment on how to assess the quality of a hydrological landscape classification in the absence of a distributed model.

Could you please clarify how confidence maps and uncertainties can be computed using your approach (p. 805, 5).?

Figures and tables: The quality of figures and table needs to be improved. The legends of some of the figures are difficult to read or not readable at all (e.g. fig 7), or it is missing totally (fig 9 & 10). There is also some text in French (e.g. Table 2)

Minor comments: P 792, l. 5-7: this sentence is unclear to me and Fig. 1 does not seem to provide any help P 792, 21-22: please explain how you define/calculate accuracy and consistency and how acceptable values are specified P 796, 4-5: what is meant by second image and how is the confidence map computed? P 800, 5: Please clarify what flow algorithm you were using, D8 or Dinf as suggested by the reference to Tarboton (1997). P 801, 1: why were slopes not computed from the 100 m DEM, what represent slopes at the 200 m scale? How were the class boundaries specified? P 802, 21: here it says 1.4 km in figure 8 it says 1.6 km, what is correct? P 802/803: a mean of 16 km² with a std of 99 km² indicate a distribution which is far from normal, which makes the std a less suitable measure.

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