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Hydrology and Earth System Sciences Discussions

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

Anonymous Referee #2

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1 General comments

The paper "Which spatial discretization for which distributed hydrological model?" by J. Dehotin and I. Braud presents a methodology for subdividing a catchment into modelling units based on the principles of landscape classification, which is not quite what I thought the paper would be about when I read the title. I must say that partly because the authors did not go all the way to showing how their approach leads to improved predictions, but also partly I'm afraid because they do not sufficiently master the english language, I had difficulties following the paper.

2 Specific comments

I do not think that the proposed methodology is applicable to a wide range of distributed hydrological models and datasets, but rather to a limited number of hydrological models and datasets. In particular, the fact that the authors opt for a raster-based approach to represent fine scale landscape elements is quite surprising, as it means that they must typically resort to a fairly high spatial resolution for the common grid (on the order of a few meters I would think), in order to resolve some of the most important hydrological controls, such as small streams, riparian zones, ditches, ... Also, the fact that the final modelling units have no chance of being convex makes it difficult to use anything but a 1D hydrological model, i.e. a model in which there are no explicitly represented fluxes exchanges between modelling units, except through the river network itself.

Land-surface models used in atmospheric sciences typically fall within this category of model, because they focus on vertical exchanges of mass, energy and momentum. Even if they are typically run at the spatial resolution of the atmospheric model they are coupled with (which can be quite low), land-surface models will generally represent sub-grid variability is some way, for example using the so-called tile approach in which the grid box is subdivided into a number of landscape elements which all receive the same forcings, but behave differently.

The idea behind the tile approach is to take into account the heterogeneity of the landscape, while running at a resolution dictated by the data available. This leads to a discretization such that the frequency with which major landscape types occur on the basin is conserved (provided enough tiles are used) independently of the horizontal resolution of the land-surface model. When similar landscape types are parameterized in the same way independently of their location on the basin, this discretization approach is known in hydrology as the grouped response-unit (GRU) approach. Given that the authors are familiar with the vocabulary used in the atmospheric community to distinguish between resolution and conceptualisation, I was surprised to see that they

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did not present the tile and GRU approach to sub-grid heterogeneity.

3 Recommendation

For this paper to be acceptable for publication, I would suggest that the authors rewrite their paper with a focus on the specific class of hydrological models for which their method is applicable, and show with such a model that their technique leads to better predictions of some hydrological variable of interest, compared to other techniques such as a tile or GRU approach. Even then, given the large amount of vector-based datasets typically available, limiting oneself to raster-based datasets seems a major constraint.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 4, 777, 2007.