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Hydrology and Earth System Sciences Discussions



# *Interactive comment on* "Modelling dominant runoff production processes at the micro-scale – a GIS-based and a statistical approach" *by* C. Müller et al.

**C. Müller et al.**

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We would like to thank the referees for their suggestions. Due to the fact that several major issues were included in all five comments, the authors would like to address these issues in general first.

1. Concerning the use of the word modelling: This study was not about developing and using hydrological digital computer models to model runoff, but about developing spatial approaches. The results of the developed approaches in this study are maps, which identify dominant runoff processes. These maps represent a spatial distribution of the hydrological behaviour of the soil during prolonged rainfall events. With such



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maps, areas relevant for the formation of floods can be identified (Schmocker-Fackel et al. 2007). However, in order to avoid misunderstandings concerning the word modelling the authors will delete it from the title and use it throughout the manuscript with the utmost care.

2. Use of hydrological data (hydrographs): The results of the original method of Scherrer and Naef (2003) (i.e. maps with dominant runoff processes or DRP-maps) have no direct relation with quantitative aspect of hydrographs. Therefore, the use of hydrographs is not suited yet to validate either the results of the original method of Scherrer and Naef (2003) or the results of both developed approaches, since hydrographs depict the integrated response of a basin. The authors refrained therefore from using hydrographs. Concerning the usefulness of the DRP-maps, Schmocker-Fackel et al. (2007) argued that such maps could be used to predict areas at risk of damage, for example pesticide loss or soil erosion.

3. The original method of Scherrer and Naef (2003) and the developed approaches: The aim of the study was to develop two different approaches based on the original method of Scherrer and Naef (2003). The objective was to simplify this original complex method. For the application of the original method, numerous data sources and complex field observations are required, in combination with a final appreciation of the soil via decision trees, which depend on the land use to determine the dominant runoff process. The data sources required comprise 16 datasets: soil profiles; soil maps; topographical maps; geo-morphological maps; vegetation maps; geological maps; hydrological maps; geo-technical maps; geo-ecological maps; drilling points with soil description; infiltration tests; digital maps (ATKIS); forestry maps; agricultural land evaluation; remote sensing data and drainage plans (Scherrer 2006). The field observations comprise measurements of 15 soil profile properties: vegetation cover; hydrophobic cover; slope; surface roughness; soil matrix; macro-porosity; bulk density; soil sealing by rainfall; plough pan; thickness of the soil column; lateral flow paths and drainage; influence of groundwater/aquifer; depth of waterlogging; rate of gleying;



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5, S1073–S1075, 2008

Interactive Comment



permeability of the substratum (Scherrer 2006). All this makes the original method time consuming and predominantly applicable at the lower micro-scale. The presented approaches require less data sources (3 basic datasets are required: simplified geological map in terms of permeability, land use and a digital elevation model), require less field observations and have a simpler procedure for predicting the dominant runoff processes compared to the original method, which makes them not only applicable for larger areas, but also less time consuming.

4. Validation, regionalization and application of the results of the two approaches: The authors see the need for an application of both approaches in a new basin. In the opinion of the authors an application in a new basin with similar climate and physiographic properties would be very useful because this offers the opportunity for validation and clarification of methodology. In the revised manuscript an additional (meso-scale) basin is introduced in which the two approaches will be applied and afterwards compared with the results of the original method of Scherrer and Naef (2003) and Scherrer (2006).

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