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# Incorporating flood event analyses and catchment structures into model development

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The space-time variability in catchment response results from several hydrological processes which differ in their relevance in an event-specific way. An approach to characterise this variance consists in comparisons between flood events in a catchment and between flood responses of several sub-basins in such an event. In analytical frameworks the impact of space and time variability of rainfall on runoff generation due to rainfall excess can be characterised. Moreover the effect of hillslope and channel network routing on runoff timing can be specified. Hence, a modelling approach is needed to specify the runoff generation and formation. Knowing the space-time variability of rainfall and the (spatial averaged) response of a catchment it seems worthwhile to develop new models based on event and catchment analyses. The consideration of spatial order and the distribution of catchment characteristics in their spatial variability and interaction with the space-time variability of rainfall provides additional knowledge about hydrological processes at the basin scale. For this purpose a new procedure to characterise the spatial heterogeneity of catchments characteristics in their succession along the flow distance (differentiated between river network and hillslopes) was developed. It was applied to study of flood responses at a set of nested catchments in a river basin in eastern Germany. In this study the highest observed rainfall-runoff events were analysed, beginning at the catchment outlet and moving upstream. With regard to the spatial heterogeneities of catchment characteristics, sub-basins were separated by new algorithms to attribute runoff-generation, hillslope and river network processes. With this procedure the cumulative runoff response at the outlet can be decomposed and individual runoff features can be assigned to individual aspects of the catchment. Through comparative analysis between the sub-catchments and the assigned effects on runoff dynamics new insights to the validity of assumptions about hydrological processes and dependencies to specific catchment values can be obtained.