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Hydrogeological Mapping and Hydrological Process Modelling for understanding the interaction of surface runoff and infiltration in a karstic catchment

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This paper presents a study at the interface hydrogeology – hydrology, concerning mapping of surface runoff generation areas in a karstic catchment. The governing processes range from surface runoff with subsequent infiltration to direct infiltration and further deep percolation into different karst conduits. The aim is to identify areas with a potential of surface erosion and thus, identify the hazard of solute/contaminant input into the karst system during aestival thundershowers, which can affect water quality at springs draining the karst massif. According to hydrogeological methods the emphasis of the study are field investigations based on hydrogeological mapping and field measurements in order to gain extensive knowledge about processes and their spatial distribution in the catchment to establish a site specific Dominant Process Concept (DPC). Based on the hydrogeological map, which describes the lithological units relating to their hydrogeological classification, mapping focuses on the following attributes of the overlaying loose material/debris and soils: (i) infiltration capability, (ii) soil depth (as a measure for storage capacity), and (iii) potential surface flow length. Detailed mapping is performed in the reference area, where a variety of data are acquired, such as soil grain size distribution, soil moisture through TDR measurements at characteristic points, etc. The reference area borders both end-members of the dominant surface runoff processes as described above. Geomorphologic analyses based on a 1m resolution Laserscan assist in allocating sinks and flow accumulation paths in the catchment. By a regionalisation model, developed and calibrated based on the results in the reference areas, the process disposition is transposed onto the whole study area. In a further step, a hydrological model will be set up, where model structure and parameters are identified based on above described working steps and following the DPC. The model will be validated to surface runoff data in parts of the reference area and in a second phase, to data of the main spring of the karst massif. Therefore a conceptual karst module will be implemented and tested. Water quality data (like SAC 254 and microbial indicators) are used amendatory to obtain a better understanding of the karst system and its drainage characteristics and to estimate particle travel.