



Vulnerability Assessment by combined 3D-geological and mathematical Modelling

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An important aspect of groundwater protection in karst areas is the assessment of vulnerability. In Europe, multicriteria methods are the primary tool for vulnerability mapping. However, these methods often don't sufficiently account for the manifold interactions when water is passing through the soil, the unsaturated zone and the complex karst system. We present an integrative approach for groundwater vulnerability assessment, which includes geologic structures and the different interacting flow systems. This approach combines reservoir geometry and the modelling of the dynamic character of recharge, flow and transport of dissolved compounds and particles to different springs. The principle data and tools are (1) 3D-geological modelling of the tectonic and structural framework using GOCAD, (2) recording of principle hydrological and meteorological data, (3) discharge, flow and transport simulation and parameter estimation, performed with the modelling tool Aquasim (Reichert 1994) and (4) tracer experiments with fluorescent dyes used for model calibration. The approach was tested at a field-site in the Tabular Jura, Northwest Switzerland. Our results show that we were able to derive and quantify the complex geometry of the karst subsurface as well as the interaction of the different flow systems.