



Using Hydropedology Surveys to Guide Process Based Hydrological Modelling in South Africa

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Hydropedology surveys include linking soil profile information in hillslope transects in order to define dominant subsurface flow mechanisms and pathways. This information is useful for deriving hillslope response functions, which aid storage and travel time estimates of water and solute movement in the sub-surface. In this way, the “soft” data of the hydropedological survey can be included in simple hydrological models, where detailed modelling of processes and pathways is prohibitive. Hydropedology surveys were conducted in two catchments and the information used to improve the prediction of water and solute responses. Typical hillslope response functions are then derived using a 2-D finite element model of the hydropedological features. Similar response types are mapped. These mapped response units are invoked in a simple SCS based, hydrological and solute transport model to yield water and solute fluxes at the catchment outlets. The first catchment (1.6 km²) comprises commercial forestry in a sedimentary geology of sandstone and mudstone formation while the second catchment (6.1 km²) includes mine waste impoundments in a granitic geology.

In this paper, we demonstrate the method of combining hydropedological interpretation with catchment hydrology and solute transport simulation. The forested catchment, with three dominant hillslope response types, have response times in excess of 90 days, whereas the granitic responses occur within 10 days. The use of the hydropedological data improves the distribution of hydrological responses and storage simulation, compared to simulations without the hydropedology interpretation. The catchment runoff responses are similar, with and without the use of the hydropedology data, but the simulated distribution of water in the catchment is improved using the techniques demonstrated.