Improving soil-hydrological predictions using effective models

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Problems with process-based models at the landscape scale include substantial computational requirements, a multitude of uncertain input parameters and the limited parameter identification. Classification and Regression Trees (CART) and Artificial Neural Networks (ANN) are data-based approaches that are likely to yield advantages both over process-based models and simple empirical models. These non-linear regression techniques can be used as effective (that is, simplified yet powerful) models supported by the information content in the data. CART and ANN are applied for effectively modelling percolation in soils using weather data and the groundwater depths specific to the site. The training data was obtained by numerical experiments with Hydrus1D. Percolation is effectively predicted using CART and ANN, even through ANN provides slightly better predictions. However, the model performances depends on the available data and the boundary conditions. Despite these limitations, the methodology provides a promising approach for predictions at the landscape scale provided that sufficient data is available.