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Upscaling of soil hydraulic parameters by combining large scale inverse modeling of unsaturated flow with remote sensing based algorithms

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Soil hydraulic properties regulate the movement of water in the soil. This in turn plays an important role in the water and energy cycles at the land surface. The hydraulic properties are commonly defined by a simple pedotransfer function from soil texture classes. Through inverse modeling based upon remotely sensed data the model performance of regional climate models might be improved, especially since the point scale soil hydraulic properties have to be upscaled to obtain effective parameters for the regional climate modeling

We assess the possibility for this upscaling for a part of Hungary. We use the remote sensing based Surface Energy Balance Algorithm for Land (SEBAL) to derive time series of evapotranspiration values for 2005. Effective parameters are derived by backward simulation of soil water flow using the numerical simulation model SWAP as well as the land surface atmosphere scheme of the Royal Netherlands Meteorological Institute (KNMI). The inverse problem is then to find an optimum for the hydraulic parameters b that minimizes the objective function. The effectiveness of the inverse modeling approach is assessed by measuring the reduction of the RMS error between the measured and the modeled evapotranspiration for a separately derived dataset.