# An Evaluation of Downscaling Soil Moisture without Local Calibration

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**Abstract.** Fine resolution (10-30 m) soil moisture patterns are needed for various applications including vehicle trafficability, hydrologic modeling, drought monitoring, agricultural production, and wildfire prediction. Satellite remote sensing and land surface models can provide coarse resolution (10-40 km) soil moisture estimates, but soil moisture downscaling is required to produce fine resolution patterns from these estimates. The Equilibrium Moisture from Topography, Vegetation, and Soil (EMT+VS) model downscales soil moisture using fine resolution topography, vegetation, and soil data. It has been shown to reproduce temporally unstable soil moisture patterns and both hillslope and valley dependent patterns. However, it requires several parameters to characterize the local climate, soil, and vegetation characteristics. In previous applications, the model parameters were calibrated using point soil moisture data, but many regions of interest may not have such data. The purpose of this study is to evaluate EMT+VS model performance when the parameters are estimated from global climatic, vegetation, and soil datasets. The most reliable and accessible global datasets were identified and methods were developed to estimate the parameter values from the datasets. The uncalibrated model was applied to six regions (Tibet, China; Reynolds Creek, Idaho, USA; Nerrigundah, NSW, Australia; Tarrawarra, Victoria, Australia; Cache la Poudre, Colorado, USA; and Satellite Station, New Zealand) and compared to calibrated models for the same regions. Downscaling performance decreases considerably with the use of global datasets. Overall, climate-related parameters are the most reliably estimated, while vegetation-related parameters are the most poorly estimated.