

# Applying transfer function-noise modelling to characterize soil moisture dynamics - a data-driven approach using remote sensing data

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## Abstract

The increasing availability of remotely sensed soil moisture data offers new opportunities for data-driven modelling approaches as alternatives for process-based modelling. This study presents the applicability of transfer function-noise (TFN) modelling for predicting unsaturated zone conditions. The TFN models are calibrated using SMAP L3 Enhanced surface soil moisture data. We found that soil moisture conditions are accurately represented by TFN models when exponential functions are used to define impulse-response functions. A sensitivity analysis showed the importance of using a calibrated period which is representative of the hydrological conditions for which the TFN model will be applied. The IR function parameters provide valuable information on water system characteristics, such as the total response and the response times of soil moisture to precipitation and evapotranspiration. Finally, we encourage exploring the possibilities of TFN soil moisture modelling, as predicting soil moisture conditions is promising for operational settings.

## Keywords:

Data-driven modelling, Pastas, Impulse-response function, SMAP, Unsaturated zone.

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