Assessment of linear and nonlinear Techniques in soil moisture time series rescaling

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Soil moisture has been selected as an essential climate variable owing to its critical role in many hydrological and hydro-meteorological fields through its impact in water and energy balances. This essential variable is retrieved using many different platforms like remote sensing-, hydrological model-, station-based. However systematic differences exist between the signal components of these variables that prevent direct comparison of time series obtained from different platforms. Many different rescaling techniques have been implemented to alleviate this problem. Some linear (variance, regression, and triple collocation-based) and nonlinear (cdf- and copula-based) methods have been implemented so far to obtain consistent time series in some statistical sense. In this study several different rescaling techniques are investigated to analyze the added utility of nonlinear rescaling methods compared to linear methods. In addition to above listed techniques, artificial neural network based methods are also considered for the first time as another non-linear rescaling method. Methods are compared using station-based soil moisture observations obtained over 4 USDA ARS watersheds and remote sensing-based LPRM and API datasets, and NOAH hydrological model datasets. Results showed copula-based rescaling methods has the smallest errors and nonlinear methods to have smaller errors than linear methods.