

Multi-scale temporal variability of soil moisture over Europe: A synthesis of observational data, palaeoclimatic reconstructions and simulation results

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Soil moisture is a major variable of the climate system. Thus, properly presenting its variability in the temporal scale continuum is of key importance for (a) determining its link with the variability of the global water cycle and (b) investigating its relationship with drought persistence. A simple, yet robust, method to explore temporal variability is by aggregating and plotting its variance across each time scale. A certain advantage of this approach is that different data sets of varying temporal resolution can be combined to provide an overview of the overall variability. Here, we use the GRACE satellite products, the Old World Drought Atlas tree-ring reconstruction and the mHM model 250-year simulation results, to describe soil moisture variability from daily to decadal scale. In addition, this approach is used to identify possible discrepancies across temporal scales among the datasets and also to assess the dependence structure of the soil moisture time series. The latter can be useful in the development of stochastic models that reproduce soil moisture multi-scale variability.