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Spatial patterns of soil moisture from distributed modelling

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The characterization of the spatial dynamics of soil moisture is a key issue in hydrology to improve understanding of land surface-atmosphere interactions. Its statistical structure was examined by using soil moisture maps obtained from distributed modelling at 1/8 degree of resolution (about 10-12 kilometres). Simulations were performed by the VIC model within the NLDAS multi-institution partnership [Mitchell et al., J. Geophys. Res., 109, D07S90, 2004]. VIC partitions the soil into three layers, with a top layer of 10 cm and the other two layers with varying depths over different regions. The study was carried out to analyze both the top 10 cm and the root zone soil moisture. Dynamics of soil moisture averaged over two different depths were found to be significantly different in terms of scaling properties and temporal behaviour. The first layer usually shows higher variability, lower degree of organization and rapid change in time of the slope of the scaling function of the variance. The root zone soil moisture has lower variability in time and larger correlation, and is clearly affected by regional patterns. Nevertheless, the two variables show a strong dependence that increases with the water content of the top layer.