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The relative effect of heterogeneities in rainfall and soil properties on soil moisture on a regional scale

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Accurate knowledge of spatial soil moisture fields is vital to correct modelling of land atmosphere interactions at different scales. It has been argued that soil moisture variability, when going to regional scales, increases to the extent that soil moisture-flux relationships are effecively linearized. This increase in variability should be due to variability in rainfall, since all sources of variability act on much smaller (soils, vegetation, topography, etc.) or much larger (radiation, climate, etc.) spatial scales. We investigate the effect of spatial heterogeneities in forcing and in model parameters on modelled soil moisture on scales ranging from ~ 1 km to $\sim 10^3$ km.

We use a point-scale soil moisture model (see contribution by Teuling and Troch, Page 81) with daily rainfall products as input. The 240 km $\times$ 240 km rainfall field is given on a 4 km $\times$ 4 km grid around the Little Washita SCAN site, and is a composite of several WSR-88D radars and with a raingauge network. This rainfall data, and soil moisture measured at Little Washita were collected as part of the SMEX03 campaign that took place between 20 May 2003 and 31 July 2003.

The effect of spatially aggregating rainfall and soil/vegetation properties on modelled soil moisture are investigated by means of a Monte Carlo simulation using soil and vegetation properties (saturated hydraulic conductivity and leaf area index) drawn from distributions that are representative of the area around Litte Washita. The model is compared to the measured soil moisture at the Little Washita SCAN site. The results of this study could be useful in determining the relative effect of heterogeneities in rainfall and soil/vegetation properties on soil moisture on a regional scale.