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Exploring the impact of scale and enhanced soil parameterization on surface energy fluxes in land surface models (LSM) in a semi-arid region

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Soil moisture conditions are crucial in the forecast of weather and studying the anomalies in climate such as the causes of drought, floods in addition to surface temperature variations. These anomalies are more pronounced in semi-arid regions where the variability in climatic conditions is having a devastating effect on ecosystems and the human communities. Land surface models (LSM) provide a simple numerical representation of the complex biophysical processes involved and are used in studying such anomalies. But much attention is been focussed on the accuracy of LSMs results. In order to reduce the uncertainties associated with modelling recent research into LSMs has been in the area of improving validity of model output involving various methods which include integrating field observations into models or model evaluation by comparing model results with observations. It is also argued that increasing the heterogeneity of surface parameters such as soil data is known to have improved soil model output at the regional level. This study therefore, uses the Joint UK Land Environment Simulator (JULES) a LSM and part of the UK met office Unified Model in simulating energy exchange in the semi-arid area of North-eastern Nigeria within a period of two decades (1981-2001) using two different data sets with the aim of improving soil moisture representation at the regional level by increasing the heterogeneity of soil hydraulic parameters necessary in estimating soil moisture concentration and the resolution of the forcing data. The two data sets include a one degree and a new half degree data set of boundary conditions and meteorological forcing. Soil conditions of the new half degree data set were generated from the Soil Survey Map of Nigeria. Differences between the results of soil moisture, latent and sensible heat flux driving JULES with the new half degree and one degree data sets will be determined using analysis of variance. Finally, a half degree satellite derived soil moisture data set developed by the Institute of Photogrammetry and Remote Sensing (IPF) from the European Remote sensing satellites (ERS-1 and ERS-2) Vienna University of Technology will be used for evaluating modelled results of the half degree data set.