



Soil moisture characteristics and implications for vegetation regeneration in Sudan during the period 1965-2005.

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This study aims at better understanding the soil moisture (SM) characteristics as fundamental factors for vegetation regeneration in Sudan during the period 1965-2005. The Mann Kendall (MK) analysis was used to test the trend in the average monthly soil moisture (SM), rainfall and temperature data. Geographically weighted regression (GWR) was selected to study the SM, rainfall and temperature relations because it accounts for the local spatial variability and non-stationarity of these variables. To further understand dry and wet variations in terms of regeneration demand, the aridity index (AI) was used. The results of (MK) test showed that there were decreasing trends of SM on an annual and seasonal level and that the trend was less dramatic or softer in the dry season (November-April) than the wet season (May- October). That soil moisture variability followed closely that of rainfall and temperature, although there was a hint that SM variability followed temperature changes more closely than rainfall. The (GWR) model gave optimal results in semi-arid central Sudan. In the north due to lack of rainfall and in the south due to plant heterogeneity, the model did not perform so well. The spatio-temporal variability of the (AI) showed that the long-term average of (AI) was affected by the reported decline in rainfall during 1965-1985. The decadal (AI) average of 1995-2005 gave evidence of increases in rainfall that are reported since the mid-nineties. (AI) performed well in reflecting the wet conditions in Sudan. Very rare are the studies of soil moisture in Sudan, especially in the through way that is presented here.