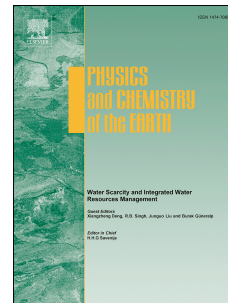


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Assessing and mapping the severity of soil erosion using the 30-m Landsat multispectral satellite data in the former South African homelands of Transkei

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Abstract

Soil erosion is increasingly recognised as the principal cause of land degradation, loss of agricultural land area and siltation of surrounding water waterbodies. Accurate and up-to-date soil erosion mapping is key in understanding its severity if these negative impacts are to be minimised and affected areas rehabilitated. The aim of this work was to investigate map the severity of soil erosion, based on the 30-m Landsat series multispectral satellite data in the former South African homelands of Transkei between the year 1994 and 2010. Further, the study assessed if the observed soil erosion trends and morphology that existed in this area could be explained by biophysical factors (i.e. slope, stream erosivity, topographic wetness index) retrieved from the 30-m ASTER Digital Elevation Model (DEM). The results of this study indicate that the Transkei region experience varying erosion levels from moderate to very `severe. The large portion of the land area under the former homelands was largely affected by rill erosion with approximately 74% occurring in the year 1984 and 54% in 2010. The results also revealed specific thresholds of soil erosion drivers. These include steeper areas ($\geq 30^\circ$), high stream power index greater than 2.0 (stream erosivity), relatively lower vegetation cover ($\leq 15\%$) and low topographic wetness index ($\leq 5\%$). The results of this work demonstrate the severity of soil erosion in the Southern African former homelands of Transkei for the year 1984 and 2010. Additionally, this work has demonstrated the significance of the 30-m Landsat multispectral sensor in examining soil erosion occurrence at a regional scale where in depth field work still remain a challenging task.

Keywords: Former homelands; land degradation; terrain; soil moisture proxy; stream erosivity; remote sensing; fractional vegetation cover.

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