

Landsat satellite programme potential for soil erosion assessment and monitoring in arid environments: A review of applications and challenges

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Abstract

This review article presents a comprehensive overview of the current status of the Landsat program and its applications in soil erosion modelling and assessment within arid environments. Literature for the period between 1972 and 2022 was retrieved using directed search strategies and keywords. A total of 170 journal articles were gathered and analyzed. The literature analysis reveals that 27 (16%) of the publications fall within the period from 2007 to 2011, marking the highest occurrence within a five-year interval. The scrutinized literature was classified into ten distinct periods, or “pentades,” to accommodate the evolving applications of the Landsat program in response to advancements in remotely sensed data quality. This review article underscores the substantial contribution of Landsat data to the monitoring and assessment of soil erosion attributed to the action of water. Numerous studies have been conducted to model soil erosion using the Revised Universal Soil Loss Equation (RUSLE) model, facilitated by Geographic Information Systems (GIS) and remote sensing technologies. Nonetheless, the integration of Landsat data does present some challenges. Notably, the limitations of coarse resolution and data loss, particularly the scan line issues affecting Landsat 7, have hindered the full potential of the affected satellite datasets. As a solution, a multi-source approach that amalgamates diverse datasets is advocated to bridge data gaps and address disparities in spatial and temporal resolutions. To conclude, the Landsat mission has indisputably emerged as an indispensable instrument for facilitating the assessment and monitoring of soil erosion in resource-constrained communities. To advance this field, there is need to bolster storage infrastructure to manage large datasets, ensuring continuity for these sensor outputs, presenting a promising path for future research.

Keywords: Arid environments, Landsat series, Remote sensing, Soil erosion, Spatial data fusion