147

Soil Erosion and Sediment Transport in Agricultural Watersheds: Modeling, Impacts, and Management Strategies

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Abstract

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Soil erosion and sediment transport are critical environmental challenges in agricultural regions, where they threaten soil fertility, agricultural productivity, and water quality. In agricultural watersheds, soil erosion is primarily driven by water runoff, which detaches and transports soil particles, leading to sedimentation in rivers, lakes, and reservoirs. Sediment, in turn, carries nutrients, pesticides, and other contaminants that degrade aquatic ecosystems. These processes not only harm ecosystems but also have significant economic impacts due to the reduction in agricultural productivity, increased infrastructure maintenance costs, and impaired water quality.

Soil erosion is influenced by various factors such as rainfall intensity, land use practices, vegetation cover, and topography. The complexity of these factors requires integrated models to simulate erosion and sediment transport at the watershed scale. However, many existing models have limitations, including inadequate representation of local-scale variations and uncertainties in predicting the effectiveness of land management practices. This thesis aims to assess soil erosion and sediment transport in a specific agricultural watershed, evaluate the impact of land use practices, and develop management strategies to mitigate these issues.

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