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Soil Water Assessment Tool (SWAT) to Model Sediment Transport in Peddavagu River, A Tributary of Godavari River Basin in India

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ABSTRACT

The current research entails a practical examination of sediment hydraulic processes to assess and predict the fluvial conditions in Peddavagu, a tributary within the Pranhita Sub-basin of the Godavari river basin in India. The unique aspect of this drainage basin is its location in a region with substantial annual rainfall, averaging around 1040 mm. Notably, over 90% of this rainfall occurs during the South-West Monsoon from June to October, resulting in all inflow being received during this period. The region typically experiences high floods between August and September, followed by a considerable reduction in river flow. This study compares and evaluates the performance of two applied methodologies - Artificial Neural Networks (ANNs) and conventional Sediment Rating Curves (SRC) - to precisely estimate sediment transportation initially. Subsequently, the Soil Water Assessment Tool (SWAT) methodology is employed to simulate and model the sediment transport response of the drainage basin, considering a wide range of hydrologic parameters. The primary focus of the study is on accurately estimating the event and understanding the broader influence of other hydrological components. To achieve this, SWAT is adapted to incorporate additional hydrological parameters, despite resulting in lower performance indices, aiming for a better comprehension of system behavior. The research assesses the performance of the selected models for predicting average monthly runoff values during both monsoon and non-monsoon seasons. For the SWAT model, a comprehensive set of databases (Digital Elevation Model, land use/land cover, soil, precipitation, temperature, etc.) is essential for optimal performance, particularly in terms of Nash-Sutcliffe Efficiency (NSE). On the other hand, ANN, being a linear model, typically requires both dependent

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and independent parameters. Given the objective of the study, an attempt is made to evaluate the performance of both models under conditions of limited and scarce input data.

Keywords: rainfall, runoff, drainage basin

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