

Variability of kinetic energy of rainfall and its significance in soil erosion

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■ **ABSTRACT** : The kinetic energy of rainstorm plays a paramount role in surface sealing, runoff and erosion process. Knowledge of relationship between rainfall intensity and kinetic energy and its variations in time and space is important for erosion prediction. Rainstorm kinetic energy, as a function of the mass and terminal velocity of raindrops has often been suggested as an ability of rainfall to detach soil particles. Therefore, this study was carried out to evaluate the variability of rainfall and its kinetic energy for Allahabad . Time of occurrence of rainfall , rainfall amount ,intensity and kinetic energy were evaluated. Kinetic energy was estimated with brown-foster's equation and by Wischmeier's equation of kinetic energy. Among four rainy months , maximum rainfall amount of 222.94 mm was observed for the month of August and lowest rainfall amount of 92.64 mm was observed for June. Kinetic energy by both the models was found to be maximum for July with K.E-1 as 38.71 MJ/ha, K.E-2 as 43.20 MJ/ha and for August K.E-1 as 39.33 MJ/ha and K.E-2 as 42.88 MJ/ha respectively. For rest of the months i.e. for September and June kinetic energy was in decreasing trend. Co-efficient of determination for monthly variation of kinetic energy was found to be $R^2 = 0.965$.

■ **KEY WORDS** : Kinetic energy of rainfall, Soil erosion

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Soil erosion is a natural process that can be accelerated dramatically following improper land use and management. Human activities can result in erosion rates that area many times higher than natural rates. Worldwide, erosion is considered to be the most widespread and serious form of soil degradation (Mabit and Benard,2007). With decrease of agricultural land use due to natural, social and economic factors, the amount of material lost to erosion has decreased. However, the measurements proved that erosion on agricultural land is by no means negligible and is most intensive on cultivated land (Komac and Zorn, 2005). Since this category of land use is constantly decreasing due to abandonment of agricultural practice, the existent agricultural areas and prevention measures against soil degradation are of utmost importance. Rainfall represents a distribution of differently sized drops that attain corresponding different terminal velocities in stable air. Rainfall kinetic energy and rainstorm intensity are predominant factors contributing to surface sealing , runoff and soil erosion process (Renard *et al.* ,1997). The determination of both the parameters is, therefore, of paramount important for runoff and erosion prediction purposes. Bonell (1998) observed that any change in rainfall characteristics which favours higher intensities would encourage the occurrence of overland flow and cause erosion. The study of mechanisms of water erosion brings out

two characteristics of precipitation, which makes it the dominating causative factor of the phenomenon: intensity and depth of amount (which depends on the intensity-duration combination) (WMO, 1983). Hudson (1995) defined three attributes of rain pertaining to erosion. Intensity of a rain, generally expressed as mm/h, is usually highly variable during the course of a rainstorm. The time pattern of rain intensity also differs from storm to storm, from place to place and from season to season. The second attribute is the duration of a rain, the length of time from the start of a rainstorm to its ending. As the third parameter Hudson states the energy of a rainstorm, being the summation of the kinetic energies of all raindrops falling on a unit area. Thus kinetic energy represents the total energy available for detachment and transportation of soil particles. The most widely used kinetic energy-intensity relationship is that proposed by Wischmeier and smith (1958) and that of Brown-foster's equation (1987) was used to estimate the kinetic energy in this study.

■ METHODOLOGY

Study area :

Location and extent :

The district Allahabad is located the north part of India and south-east part of State Uttar Pradesh, Which was