A mathematical model for soil moisture

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The experimental measurements for the soil moisture are not an easy work. We will determine the water diffusion coefficient for soil moisture using a mathematical model on the loess hill slope based on limited measured data. Then we can determine and predict the soil moisture of an entire area. The model involves the following factors: the slope, vegetation cover, and surface water diffusion together with the field measurements of soil moisture.

The soil moisture is important for the productivity because the delivery of the plant intake nutrient requires moisture. The most important factors that influence the soil moisture are: rainfall, soil characteristics, slope and land cover [1]. The area that we consider is the hills slope of Chinteni, Cluj County.

The physical concept of the mathematical model is based on the diffusion of surface water balanced with gravitation along the slope [2].

We denote by *u(s)* the surface water flux rate, *k(s)* the obstruction of different type of vegetations to water flow. The model that we consider is given by the following equation [3]:

$$\frac{d}{ds}\left(k(s)\frac{du}{ds}\right)+g\sin\theta=0$$

Under the assumption of constant precipitation if the surface runoff increases then the soil moisture decreases and vice versa. The factors that influence the surface runoff are: the water flow rate and obstruction of water flow by vegetation.

Based on the mathematical model described above as well as the experimental data we will estimate the parameter involved and then we predict the soil moisture.

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