



Incidence of soil surface components as regulators of hydrological processes along a Mediterranean transect (Southern Spain)

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The incidence of the soil surface components (SSC) as regulators of the topsoil hydrological processes is a subject particularly relevant in Mediterranean environments, due to the spatial heterogeneity of the soil surface characteristics and the existence of patches of vegetation which control the distribution of tussocks or shrubs and bare soil.

Various studies carried out in different types of lithology have shown that SSC have very varied effects, both spatial and temporal, on the hydrological behavior of soil depending on i) the existing relationship between vegetated and non vegetated areas or bare soil, ii) the type of SSC, iii) their position along the gradient, iv) the hydrological state of the soil after rainfall, and v) the intensity of the antecedent rain (Poesen, 1986; Poesen et al., 1990; Poesen and Ingelmo, 1990, 1992; Lavee and Poesen, 1991; Poesen and Lavee, 1994; Brakensiek et al., 1994; Bunte and Poesen, 1994; Ingelmo et al., 1994; Valentin, 1994; Danatalos et al., 1995; Moustakas et al., 1995; Sarah, 2002; Katra et al., 2007; Arnau-Rosalén et al., 2008).

Ruiz Sinoga and Martinez Murillo (2009) have shown that, on a hillslope in Mediterranean dry climate, the method based on grouping explanatory variables through factorial analysis of the main components, is suitable for determining the regulatory effect of soil surface components on hydrological behaviour.

The hydrological behavior of SSC was analyzed in three field sites situated along a wet to semiarid Mediterranean pluviometric gradient, with the aim of confirming (1) whether the pluviometric gradient factor affects the hydrological behavior of surface fragments (2) and if, in each field site, surface components play the same role as regulators of infiltration processes.

Final results show:

i) SSC act as regulators of soil hydrological processes both along the gradient as in each of the climatic conditions considered whether wet dry or semiarid Mediterranean. In accordance with their role overall within the pluviometric gradient, it is the health of the soil which is most important when it comes to explaining its behavior and hydrological state (27.7% of variation), while the role of SSC in the aforementioned behavior is linked to 23.9% of variation. However, this does not happen when we consider the specific role of SSC in each of the environments considered, because they are the most relevant components in the soil hydrological processes.

ii) The importance of SSC in the behavior and hydrological state of the soil is greater in the intermediate field site, linked to dry Mediterranean conditions, where 39.2% of the variation is explained, than in wet Mediterranean conditions or semiarid where only 35% and 29.2% respectively are explained, which means that it is the semiarid conditions which act as the threshold.

iii) The variables used, as well as the method based on grouping explanatory variables by means of factor analysis by PCA, is suitable to determine the effect of the SSC on its hydrodynamic behavior and hydrological state in different climatic conditions.