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Spatial and temporal patterns of spontaneous grass cover as a control measure of soil loss: a study case in an olive orchard microcatchment

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Spatial and temporal patterns of vegetal communities control local biogeophysical processes.. The use of cover crops and spontaneous grass cover as a soil erosion control measure is quite common, particularly in hilly agricultural areas. Spontaneous covers show usually irregular spatial and temporal patterns, resulting in a questionable efficiency and and unresolved management requirements. However, due to its zero cost, it is a helpful alternative for soil erosion control in marginal farms (Taguas et al., 2015). The main aim of this work was to characterize the spatial and temporal patterns of spontaneous grass cover in an olive orchard microcatchment to interpret its dependences on other physical features as well as its influence on soil loss control. The specific objectives were: i) to evaluate the relationships between the mean cover and the variables: accumulated precipitation, accumulated evapotranspiration and average minimum temperature for the preceding 5, 15, 30 and 60 days to the sampling date; ii) study the spatial aggregation degree of the cover, its temporal stability and its correlation with different topographical properties, the richness of species and the apparent electrical conductivity as a measure of soil variability; and iii) describe the influence of the cover on runoff and soil loss in the catchments.

Cover percentage corresponding to spontaneous grass was evaluated on a seaonsal basis during 3 years (2011–2013), resulting in 12 surveys. A permanent and regular grid of 36 points covering the entire catchment (5-6 samples/ha) was used in each survey. At each location cover percentage was determined through image analyses. In order to explore the relations between cover percentage and meteorological variables, multiple linear regression was applied whereas the SADIE approach (Spatial analysis by distance indices; Perry, 1998) was used to describe possible spatial aggregation patterns and the correlation with features such as aspect, slope, drainage area, height, richness and apparent electrical conductivity.

The mean annual cover percentage varied from 23% to 36% with a coefficient of variation of 57% and 6%, respectively. On the seasonal scale, the cover varied between 0.2% and 50% . Significant effects of accumulated precipitation during the precedubg 15 days on the cover percentage were detected. In addition, a permanent aggregated pattern of spontaneous grass was observed for different seasonal surveys with abundant preceding rainfall. No clear correlations were found with physical attributes with the exception of electrical conductivity (50 cm-depth). Finally, the differences found in the hydrological responses for similar events with different degrees of soil cover highlighted the role that spontaneous vegetation plays in the sediment discharge control during humid periods.

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