Geophysical Research Abstracts,
Vol. 11, EGU2009-8766, 2009
EGU General Assembly 2009

Spatial and temporal variations of soil moisture under Rosmarinus officinalis and Quercus coccifera in a burned soil

E. Gimeno-García (1), J.A. Pascual-Aguilar (1), and J. Llovet (2)

(1) Centro de Investigaciones sobre Desertificación-CIDE (CSIC, UVEG, GV), Camí de la Marjal, s/n, 46470, Valencia, Spain (eugenia.gimeno@uv.es/ Fax:+34 961270967), (2) Fundación Centro de Estudios Ambientales del Mediterráneo (CEAM). Universittat d'Alacant. Departament d'Ecologia. Campus de Sant Vicent del Raspeig - Ap.99. 03080, Alacant, Spain (juan.llovet@ua.es/ Fax: +34 965909825)

When studying surface runoff processes, measurement of the soil moisture content (SMC) at the surface could be used to identify sinks and sources areas of runoff. Surface soil moisture patterns variability have been studied in a burned Mediterranean semi-arid area. Since surface SMC and soil water repellency (SWR) are influenced by fire and vegetation (see previous abstract), and soil water dynamics and vegetation dynamics are functionally related, it could be expected to find some changes during the following months after fire when vegetation starts to recover. The identification of these changes is the main goal of this research.

The study area is located at the municipality of Les Useres, 40 km from Castellón city (E Spain), where a wildfire occured in August 2007. We selected a burned SSE facing hillslope, located at 570 m a.s.l., with 12º slope angle, in which it was possible to identify the presence of two unique shrub species: Quercus coccifera L. and Rosmarinus officinalis L., which were distributed in a patchy mosaic. Twenty microsites with burned R. officinalis and eight microsites with burned Q. coccifera were selected in an area of 7 m wide by 14 m long. At the burned microsites, it was possible to distinguish three concentric zones (I, II and III) around the stumps showing differences on their soil surface appearance, which indicate a gradient of fire severity. Those differences were considered for field soil moisture measurements. Five measurements of SMC separated approximately 10 cm per zone at each microsite (n= 420) were carried out after different rainfall events. Volumetric soil moisture was measured by means of the moisture meter HH2 with ThetaProbe sensor type ML2x, 6 cm long.

SMC was monitored on three occasions, always one day after the following rainfall events: (1) the first rainfall event after fire, when 11 mm were registered (Oct-07); (2) four months later than fire (Dec-07), after six consecutive raining days with a total rain volume of 172 mm; and (3) ten months after fire (Jun-08), when 50 mm were registered in the previous ten days. The spatial pattern of SMC was determined trough geostatistical analysis using GS+ software, calculating the semivariograms, to analyse the spatial correlation scale, interpolating data to estimate values of SMC at unsampled locations by means of kriging and finally, the results of kriging were displayed as different contour maps.

Results showed that spatial pattern of SMC was highly variable, with important differences recorded within short distances. In fact, the range of spatial correlation (a0), which is the distance at that spatial correlation exists, varied between 0.5 to 1.4 m. A0 also varied according to the time from fire, with values of 0.5 m in the first rainfall after fire, 0.9 m four months later and 1.4 m ten months after fire occurs. This result suggests that the extent of the wettest areas increase as the vegetation recover. After the first rainfall, the SMC spatial pattern seems to be related to the soil microsite characteristics, mainly organic matter content, presence of hydrophobicity and soil clay content. Generally, the highest SMC (26-31%) appears at the burned bare soil areas. Four months later, as the same time as Q. coccifera resprouts, and in the R. officinalis microsites an important regrowth of Brachypodium resutum is observed, the spatial pattern of SMC changed according this plant cover distribution. This pattern is more clearly observed ten months after fire, when the highest SMC values were located at Q. coccifera and B. resutum areas (28-33%). At this time, no evidence of germination of R. officinalis (obligate seeder specie) was found. The lowest SMC (19-22%) appeared at the half lower part of the plot, where there was a central strip

dominated by bare soil, with scarce presence of resprouter species.

These results showed that at detailed working scale, the soil moisture pattern in this burned area was highly heterogeneous and the microsite characteristics (mainly soil properties and vegetation regrowth) seem to control the SMC spatial pattern. The interaction of soil-plant-water is more complex that the few environmental factors analysed here, and future research is needed to consider other site factors, such as microtopography, surface stoniness and outcrops, root density, between others. However, the obtained results reflect the capacity of vegetated patches to act as moisture holding areas ten months after fire occurs.