Geophysical Research Abstracts
Vol. 17, EGU2015-15844-1, 2015
EGU General Assembly 2015

Soil wetting patterns of vegetation and inter-patches following single and repeated wildfires

Óscar González (1,2), Maruxa Malvar (2), Erik van den Elsen (3), mohammadreza Hosseini (3), Celeste Coelho (2), Coen Ritsema (3), Susana Bautista (4), Jan Jacob Keizer (2), and Artemi Cerdà (1)

(1) Soil Erosion and Degradation Research Group, Department of Geography, University of Valencia, Valencia, Spain. artemio.cerda@uv.es, Oscar.Gonzalez-Pelayo@uv.es/ www.soilerosion.eu,, (2) CESAM, University of Aveiro, Environment & Planning Department, Aveiro, Portugal, (3) Wageningen University, Wageningen, The Netherlands., (4) University of Alicante, Dept. Ecology. Alicante, Spain.

Although wildfires spread in Mediterranean areas are considered a natural processes, the expected increase in fire frequency has raised concerns about the systems' future resilience (Pausas, 2004). Besides more frequent, future wildfires can become more severe and produce more pronounced changes in topsoil properties, vegetation and litter (Cerdá and Mataix-Solera, 2009). To deal with challenges, the EU funded CASCADE and RECARE projects, which are currently assessing soil threats and tipping-points for land degradation in a climatic gradient across Europe.

The present research was developed in Portugal and aims to find relationships between fire frequency and soil wetting patterns following single versus repeated wildfires. In September 2012, a wildfire burnt 3000 ha. of Pine stands and shrub vegetation in the vicinity of Viseu district, North-Central Portugal. Analyses according to the available burnt-area maps (1975-2012), discriminated areas that has been burned 1x (called SD) and 4x (called D) times. In order to evaluate the post-fire soil surface moisture patterns, 6 slopes (3 in SD and 3 in D) were selected and a balanced experimental design with 72 soil moisture sensors (EC5 and GS3, from Decagon devices) was implemented under shrubs (n=18) and on bare (n=18) soil environments, at 2.5 cm and 7.5 cm soil depth each. The spatio-temporal occurrence of soil water repellence (SWR) (Keizer et al., 2008; Prats et al., 2013; Santos et al., 2014) was monthly assessed through the MED test at 2.5 cm and 7.5 cm soil depth into 5 sampling points located at regular distances along a transect running from the top to bottom of a selected slope in SD and D. Automatic and totalize rainfall gauges were also installed across the study area.

Preliminary results showed that soil wetting patterns and SWR occurrence differs between SD, D sites and, between soil environment (under shrubs and on bare soil areas). SWR were more pronounced on the SD than in D, affecting soil wetting cycles. Soil moisture content and antecedent rainfall were both correlated with SWR, although insufficient to predict the temporal variations. Antecedent and maximum soil moisture were close related with the SWR status and data analyses showed a top-down breaking mechanism on the SWR

Acknowledgements.
The research projects CASCADE FP7 (ENV.2011.2.1.4, www.cascade-project.eu) AND RECARE FP7 (nº 603498, http://recare-project.eu/) supported this research.

References.

Cerdá, A., Mataix-Solera, J., 2009. Incendios forestales en España. Ecosistemas terrestres y suelos. En: Efectos de los incendios forestales sobre los suelos en España. Cerda and Mataix-Solera (eds). Universidad de Valencia, Valencia (España). 529 pp.

Keizer, J.J., Doerr, S.H., Malvar, M.C., Prats, S.A., Ferreira, R.S.V., Oñate, M.G., Coelho, C.O.A., Ferreira, A.J.D., 2008. Temporal variation in topsoil water repellency in two recently burnt eucalypt stands in north-central Portugal. Catena 74 (3), 192–204.

Pausas, J., 2004. Changes in fire and climate in the eastern Iberian Peninsula (Mediterranean basin). Climatic Change, 63: 330-340.

Prats, S.A., Malvar, M., Vieira, D.C.S., McDonald, L., Keizer, J.J. 2013. Effectiveness of hydromulching to reduce runoff and erosion in a recently burnt pine plantation in central Portugal. Land Degradation and Development. DOI: 10.1002/ldr.2236.

Santos J.M., Verheijen F.G.A., Wahren F.T., Wahren A., Feger K.H., Bernard-Jannin L., Rial Rivas M.E., Keizer J.J., Nunes J.P. 2014. Soil Water Repellency dynamics in Pine and Eucalypt plantations in Portugal - A high

resolution time series. Land Degradation & Development. DOI: 10.1002/ldr.2251.