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Fire vegetative ash and erosion in the Mediterranean areas. State of the art and future perspectives

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Fire is a global phenomenon with important ecological impacts. Among all ecosystems, the Mediterranean is frequently visited by severe wildfires with serious impacts on soil properties and increase soil vulnerability to erosion due vegetation removal. After the fire the ash distributed in soil surface can mitigate soil exposition to erosion and rain splash (Cerda and Doerr, 2008), however, this depends on the fire severity that have implications on the type of ash produced (Pereira et al., 2010). High fire severities produced thinner ash that it is easily transported by wind, contrary to low severity wildfires where combustion is not so intense and the mass loss is less, providing a better soil protection in the immediate period after the fire. Soil protection after the fire highly depends on fire severity (Pereira et al. 2013a; Pereira et al. 2013b). Ash it is a highly mobile material, thus this protection can change in space and time, providing a better cover in some areas and worst in others. In the period immediate after the fire, ash can change soil hydrological properties, increasing water retention and reducing sediment transport in relation to bare soil areas (Cerda and Doerr, 2008), but also clog soil pores, seal the soil and increase erosion (Onda et al., 2008). In fact results are controversial and the impacts of vegetative ash in soil erosion may rely on the proprieties of ash produced, that can be extremely variable, even in small distances (Pereira and Úbeda, 2010), due the different conditions of combustions. Ash produced at low severity temperatures can be highly hydrophilic (Bodi et al., 2011) and induce soil hydrophobicity (Bodi et al., 2012). Other mechanisms as the direct impact of fire in soil, can induce soil water repellency, and do not have any interference of vegetative ash. This fire can induce direct (e.g temperature) and indirect (e.g. ash properties) on soil wettability, with obvious implications on spatio-temporal pattern of soil erosion. At this point we are dealing with a complex interaction since interactions, since low severity fires due ash, and high severity fires, due temperature induce soil hydrophobicity. After the fire, other ash properties may interact with soil erosion, as particulate size, and chemical composition, that can induce soil particulates flocculation or dispersion. Ash chemistry is strongly related with fire severity (Pereira et al., 2012). Further studies may be directed in the complex interaction between ash physico-chemical properties interaction with the degree of fire impacts on soil. These and other ideas will be discussed during the session.

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References

Bodi, M., Doerr, S., Cerdà, A., Mataix-Solera, J. (2012) Hydrological effects of a layer of vegetation ash on underlying wettable and water repellent soil. Geoderma 191: 14-13.

Bodi, M., Mataix-Solera, J., Doerr, S., Cerdà, A. (2011) The wettability of ash from burned vegetation and its relationship to Mediterranean plant species type, burn severity and total organic matter content. Geoderma, 160, 599-607.

Cerdà, A., Doerr, S.H. (2008). The effect of ash and needle cover on surface runoff and erosion in the immediate post-fire period. Catena, 74, 256-263.

Onda Y, Dietrich WE, Booker F. 2008. Evolution of overland flow after a severe forest fire, Point Reyes, California. Catena. 72, 13-20.

Pereira, P., Bodi. M., Úbeda, X., Cerdà, A., Mataix-Solera, J., Balfour, V, Woods, S. (2010) Las cenizas y el ecosistema suelo, In: Cerdà, A. Jordan, A. (eds) Actualización en métodos y técnicas para el estudio de los suelos afectados por incendios forestales, 345-398. Càtedra de Divulgació de la Ciència. Universitat de Valencia. ISBN: 978-84-370-7887-8. Deposito Legal: V-3541-2010.

Pereira, P., Cerdà, A., Úbeda, X., Mataix-Solera, J. Arcenegui, V., Zavala, L. (2013a) Modelling the impacts of wildfire on ash thickness in a short-term period, Land Degradation and Development, (In Press), DOI: 10.1002/ldr.2195

Pereira, P., Cerdà, A., Úbeda, X., Mataix-Solera, J., Jordan, A. Burguet, M. (2013b) Effects of fire on ash thickness in a Lithuanian grassland and short-term spatio-temporal changes, Solid Earth Discussions,4, 1545-1584.

Pereira, P., Úbeda, X. (2010) Spatial variation of heavy metals released from ashes after a wildfire, Journal of Environmental Engineering and Landscape Management 18(1), 13-22.

Pereira, P., Úbeda, X., Martin, D. (2012) Fire severity effects on ash chemical composition and water-extractable elements, Geoderma, 191, 105-114.