



From the study of fire effects on individual soil properties to the development of soil quality indices. 1. The pioneer research

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Although forest fires must be considered as a natural factor in Mediterranean ecosystems, the modification of its natural regime during last five decades has transformed them in an environmental problem. In the Valencia region (E Spain) 1994 was the worst year in the history affecting more than 120,000 hectares. I started my Ph.D that year by studying the effects of fires in soil properties. The availability to be able to analyse a great set of different types of soil properties in the laboratories of University of Alicante allowed me to explore how fires could affect physical, chemical and microbiological soil properties. After years studying different soil properties, finding that several factors are involved, including: fire intensity and severity, vegetation, soil type, climate conditions, etc. (Mataix-Solera and Doerr, 2004; Mataix-Solera et al., 2008, 2011) my research as Ph-D supervisor has been focussed to investigate more in depth some selected properties, such as aggregate stability and water repellency (Arcenegui et al., 2007, 2008). But one of the main problems in the studies conducted with samples affected by wildfires is that for the evaluation of the fire impact in the soil it is necessary to have control (unburned) soil samples from a similar non-affected near area. The existing spatial variability under field conditions does not allow having comparable samples in some cases to develop a correct assessment. With this idea in mind one of my Ph.D researcher (R. Zornoza) dedicated his thesis to develop soil quality indices capable to assess the impact of soil perturbations without comparing groups of samples, but evaluating the equilibrium among different soil properties within each soil sample (Zornoza et al., 2007, 2008).

Key words: wildfire, Mediterranean soils, soil degradation, water repellency, aggregate stability

References:

- Arcenegui, V., Mataix-Solera, J., Guerrero, C., Zornoza, R., Mayoral, A.M., Morales, J., 2007. Factors controlling the water repellency induced by fire in calcareous Mediterranean forest soils. *Eur. J. Soil Sci.* 58, 1254-1259.
- Arcenegui, V., Mataix-Solera, J., Guerrero, C., Zornoza, R., Mataix-Beneyto, J., García-Orenes, F., 2008. Immediate effects of wildfires on water repellency and aggregate stability in Mediterranean calcareous soils. *Catena* 74, 219-226.
- Mataix-Solera, J., Doerr, S.H., 2004. Hydrophobicity and aggregate stability in calcareous topsoil from fire affected pine forests in southeastern Spain. *Geoderma* 118, 77-88.
- Mataix-Solera, J., Arcenegui, V., Guerrero, C., Jordán, M., Dlapa, P., Tessler, N., Wittenberg, L. 2008. Can terra rossa become water repellent by burning? A laboratory approach. *Geoderma*, 147, 178-184.
- Mataix-Solera, J., Cerdà, A., Arcenegui, V., Jordán, A., Zavala, L.M., 2011. Fire effects on soil aggregation: a review. *Earth-Science Reviews* 109, 44-60
- Zornoza, R., Mataix-Solera, J., Guerrero, C., Arcenegui, V., Mayoral, A.M., Morales, J. Mataix-Beneyto, J., 2007b. Soil properties under natural forest in the Alicante Province of Spain. *Geoderma*. 142, 334-341.
- Zornoza, R., Mataix-Solera, J., Guerrero, C., Arcenegui, V., Mataix-Beneyto, J., Gómez, I., 2008. Validating the effectiveness and sensitivity of two soil quality indices based on natural forest soils under Mediterranean conditions. *Soil Biology & Biochemistry*. 40, 2079-2087.