Geophysical Research Abstracts
Vol. 13, EGU2011-1193-2, 2011
EGU General Assembly 2011

Post-fire evolution of soil properties in a Mediterranean heathland after experimental burning

Arturo JP Granged (1,2), Lorena M Zavala (2), Antonio Jordán (2), and Gema Bárcenas-Moreno (2)

(1) Dpto. de Física Aplicada I. Escuela Técnica Superior de Ingeniería Agronómica (Universidad de Sevilla), Carretera de Utrera, km 1, 41013, Sevilla, Spain., (2) MED_Soil Research Group. Departamento de Cristalografía, Mineralogía y Química Agrícola, Facultad de Química (Universidad de Sevilla). C/Profesor García González, 1, 41012, Sevilla, Spain.

Forest fires are recurrent phenomena in the Mediterranean area and are one of the main causes of changes in Mediterranean ecosystems, increasing the risk of soil erosion and desertification. Fire is an important agent which can induce important changes in the chemical and physical characteristics of soils. Burning severity can modulate the recovery of plant communities and the quantity and intensity of changes in fire-affected soil system. Mediterranean soils under heathland often shallow with low capacity for water storage, and high erosion risks. In this context, recurrent wildfires can negatively affect their chemical and physical properties. Very little research has been carried out concerning the long-term variations on the ground surface after burning. In this study, the impact of burning on several physical and chemical soil properties have been investigated during 3 years after experimental burning in a Mediterranean heathland.

On average, the soil organic matter content after fire decreased strongly, and one year after fire it did not vary substantially, although it increased slightly during the following two years until the end of experiments. Burning led to coarser texture immediately after fire, but clay content decreased strongly during the following 3 years due to post-fire erosion processes and selective detachment of fine particles. Therefore, textural changes cannot be totally attributed to burning. Most likely post-fire soil erosion processes contributed to selective removal of clay, leading to exhaustion of fine detachable mineral particles. Combustion of soil organic matter strongly affected chemical properties of soil, increasing pH and electrical conductivity by release of cations. These early changes were ephemeral and pre-fire values were re-established after just 1-year period.

Soil water repellency was partly destroyed immediately after intense burning, but pre-fire proportion of water-repellent soil samples was observed just 1-year after. Water-repellent aggregates may have been removed by post-fire erosion, but this result is in agreement with previous research by the authors and confirms that water repellency is a natural attribute of these soils. In addition, after removal of vegetation, post-fire soil erosion processes led to exposition of subsurface hydrophobic soil material not affected by burning temperatures.

High fire severity led to a reduction in organic matter content and, subsequently, to decreased stability of aggregates and increased bulk density. These findings are in agreement with results from other authors, who have related high organic matter contents in Mediterranean soils with high aggregate stability. Probably a lower aggregate stability, immediately after experimental burning could be explained in part as a result of partly destroyed water repellency.