Geophysical Research Abstracts
Vol. 14, EGU2012-14086, 2012
EGU General Assembly 2012

Wildfire effects on C stocks in mountain soils

R. Menéndez-Duarte (1), S. Fernández (1), C. Santin (2,1), L. Gaspar (), and A. Navas ()

(1) Institute of Natural Resources and Spatial Planning (Indurot), University of Oviedo, Spain., (2) College of Science, University of Swansea, UK., (3) Estación Experimental de Aula Dei, Consejo Superior de Investigaciones Científicas, Zaragoza, Spain

Wildfire is the main perturbation agent in mountain soils of the Cantabrian Range (NW of Spain). Fire affects soil organic carbon (SOC) quality and quantity, both directly (e.g. combustion of organic matter and pyrogenic carbon production) and indirectly (e.g. increase of soil erosion and change of the vegetation cover).

After fire, the organic fraction of the soil is expected to be enriched with charred compounds (black carbon, biochar or pyrogenic carbon-PyC). PyC mainly contributes to the recalcitrant C pool and therefore to the medium- and long-term C sequestration in soils. Moreover, recurrent fires in these Atlantic mountain ecosystems cause the conversion of the vegetation cover from forest to heathland, altering C transfer from biomass to soil. On the other hand, in this steep terrain, fire enhances soil erosion by creeping and therefore soil loss and the consequent loss of SOC.

Thus, a basic but fundamental question arises: which is the net variation of SOC stocks in these mountain soils due to wildfires? To answer this, soils were sampled in a typical quartzite steep mountain in the Somiedo Natural Park (NW of Spain): i) a transect in the South hillside, prone to fires and with an intense fire history, where the vegetation cover is mostly heather and gorse; and ii) a transect in the North hillside, less affected by fire and with a well preserved vegetation cover (beech and oak forest). Samples of the surface soil (0-5 cm) and the whole soil profile were taken and, bulk density and SOC content were determined.

On average fire-affected soils in the South transect have a lower soil depth (12.0 cm) and lower bulk density (0.5 g/cm3) than the North transect soils (17.6 cm depth and 1.0 g/cm3 bulk density) but they have also SOC concentrations six times higher than their unburned counterparts (147.5 and 22.8 mg C/g soil, respectively). When considering SOC stocks, differences are not as pronounced but, even so, fire affected soils content twice as much SOC (7.4 kg /m2) than the unburned soils (3.2 kg SOC/m2).

Characterisation of SOC is being carried out by thermogravimetry-differential scanning calorimetry to identify the qualitative differences of SOC in burned and unburned soils and to quantify the proportion of PyC, which may play a main role in the potential of these mountain soils as long-term C reservoirs.