Geophysical Research Abstracts
Vol. 14, EGU2012-2948, 2012
EGU General Assembly 2012

Composition and dynamics of pyrogenic C depend on its physical form

C. Rumpel
CNRS, BIOEMCO, Thiverval-Grignon, France (cornelia.rumpel@grignon.inra.fr)

Pyrogenic carbon (PC) is a continuum ranging from partly burned plant litter to completely graphitized elemental carbon. During combustion, PC of different physical appearance is produced depending on combustion characteristics as well as feedstocks. During natural fire, we expect a higher diversity of the produced PC compared to biochar production under controlled conditions in industrial plants.

The aim of this presentation is to show that different physical fractions of PC have a contrasting chemical composition and chemical reactivity. PC including particle size fractions of charcoal was sampled in the ash layer after agricultural fire as well as wildfire. The chemical composition of these fractions was characterised using elemental analysis, analytical pyrolysis as well as 13C CPMAS spectroscopy. Their reactivity was tested by exposure to harsh chemical treatments (acid hydrolysis and chemical oxidation). The results showed that small and light pyrogenic particles generally have a lower condensation degree and a higher content of nitrogen and labile compounds such as polysaccharides, lipids and proteins. They additionally show a higher reactivity towards chemical oxidation than coarse particles. Pyrogenic nitrogen is more reactive than pyrogenic carbon. Therefore, I suggest, that small pyrogenic particles are more reactive towards microbial activity once added to soil.

Because of their physical and chemical properties small PC particles are susceptible to be eroded or degraded by the soil microbial biomass at higher rates than coarse PC particles, which in turn might remain on site and could be incorporated into the mineral soil. When incorporated into the mineral soil, the PC contained within these coarse particles may have the potential to be preserved for longer timespans. This could be one of the reasons, why temperate agricultural soils are low in PC even after decades of residue burning and why PC isolated from forest soil can be several thousand years old.