Geophysical Research Abstracts
Vol. 14, EGU2012-4893, 2012
EGU General Assembly 2012

Biochemical resistance of pyrogenic organic matter in fire-affected mineral soils of Southern Europe

H. Knicker, F.J. González Vila, and L. Clemente Salas
IRNAS-CSIC, Spain (knicker@irnase.csic.es, +34 954624002)

Incorporated into the soil, naturally formed pyrogenic organic matter (PyOM) is considered as highly recalcitrant, but direct estimation of PyOM decomposition rates are scarce. With this aim in mind, we subjected organic matter (OM) of fire-affected and unaffected soils to biochemical degradation under laboratory conditions and monitored CO_2 production over a period of seven months. The soils derived from fire affected and unaffected areas of the Sierra de Aznalcóllar and the Doñana National Park, Southern Spain. Virtual fractionation of the solid-state 13C nuclear magnetic resonance (NMR) spectra of the fire affected soils into fire-unaffected soil organic matter (SOM) and PyOM yielded charcoal C contributions of 30 to 50% to the total organic C (Corg) of the sample derived from the Aznalcóllar region. Fitting the respiration data with a double exponential decay model revealed a fast carbon flush during the first three weeks of the experiment. Solid-state 13C NMR spectroscopy evidenced the contribution of aromatic moieties of the PyOM to this initial carbon release and to the biosynthesis of new microbial biomass. The input of PyOM resulted in an increase of the mean residence time (MRT) of the slow OM pool of the soil by a factor of 3 to 4 to approximately 40 years which rises doubts rises doubts about the presumed big influence of PyOM as an additional C-sink in soils. On the other hand, although being small the difference in turnover rates is evident and has some major implication with respect to long-term alteration of the chemical composition of OM in fire-affected soils. Based on the obtained results and the analysis of PyOM in other soil systems, a conceptual model is presented which can explain the different behavior of PyOM under different soil conditions.