Geophysical Research Abstracts,
Vol. 10, EGU2008-A-01248, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-01248
EGU General Assembly 2008

Monitoring a burned soil with the use of soil quality indices

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Soils from stable forest ecosystems have specific physical, chemical and biological properties based on the conditions in which they have developed. Here we use two soil quality indices (models) to evaluate and monitor the effect of a wildfire on the soil. The models were developed studying different soil properties in undisturbed forest soils in SE Spain, and establishing the relationships between the soil parameters using multiple linear regressions. Model 1, that explained 92% of the variance in soil organic carbon (SOC), showed that SOC can be calculated by linear combination of 6 physical, chemical and biochemical properties (acid phosphatase, water holding capacity (WHC), electrical conductivity (EC), available phosphorus (P), cation exchange capacity (CEC) and aggregate stability (AS)). Model 2 explains 89% of the variance in SOC, which can be calculated by means of 7 chemical and biochemical properties (urease, phosphase and β-glucosidase activities, pH, EC, P and CEC). Any perturbation, such as wildfires, must lead to modifications in this natural balance.

These two models were applied to monitor an area affected by a wildfire in 2005 in the Alicante Province (SE Spain). Samplings were carried out immediately after fire and at 12, 15 and 24 months after fire. Our results confirm that wildfires, either directly or indirectly, provoke an imbalance among organic carbon content and physical, chemical and biochemical properties. The two models reflect that immediately after fire a great deviation in the natural equilibrium of the soil was produced, indicating a high perturbation. The following sampling and analyses show the natural equilibrium re-

covering, and 2 years after fire the affected soil is near natural equilibrium. Model 2 reflects more sensitivity to the perturbation than model 1, probably because it includes more biochemical parameters, which have been demonstrated to be very sensitive parameters to soil perturbations.

The models which represent the natural balance among soil properties in stable ecosystems have been checked to be sensitive to changes provoked by fire. Therefore, we suggest their potential use to evaluate wildfire effects on soil and its recovery, since with them we are integrating more information than the classic comparison of some soil parameters between burned and adjacent unburned soils

Acknowledgements: This research was supported by the CICYT co-financed FEDER project CGL2006-11107-C02-01/BOS and the “Caja de Ahorros del Mediterráneo”. Authors thank to Valerie and John (owners of the study site) for their collaboration in this research.