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Influence of forest fires on labile, recalcitrant and refractory carbon soil pools: Evidence from Thermal analysis- Quadrupole mass spectrometry- Isotope Ratio mass spectrometry

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Forest fires involve the transformation of vegetation and litter, leaving charred residues and so influencing the carbon cycle by changing (a) the amounts of soil organic matter and (b) the proportions within it of pools with differing stability.

Such transformations have implications on the soil's capacity to sequester carbon, soil recovery, and in terms of the long-term atmospheric CO_2 budget.

To understand the chemical character and turnover rate of old and new soil organic matter (SOM), and hence interactions between soil carbon pools and atmospheric CO_2levels, it is essential to be able to quantify and characterise soil organic matter and mineral hosts for C.

This paper reports our latest findings on the use of thermal analysis-differential scanning calorimetry (TG-DSC) coupled to on-line evolved gas and carbon isotope analysis [1,] to characterize changes in labile, recalcitrant and refractory carbon in soils affected by forest fires. TG-DSC-QMS-IRMS was used to (a) quantify proportions of different organic matter components (b) determine the origin of the carbon source, and (c) to describe the chemical environment of carbon, nitrogen and water within control and fire affected soils.

Studies in recent forest fires in the South of Spain showed an increase in the pro-

portion of refractory SOM and carbon stability, as compared with non-fire affected soils[2,3]. Characterisation of their SOM also showed an increase in labile SOM over time after the fire event which could be associated with soil and vegetation recovery. Studies on long term carbon storage in soils affected by forest fires[4] and in soils where charcoal has been incorporated into the soil [5] showed that refractory carbon persists for hundreds of years, that recalcitrant SOM becomes more stable with time, and that, in some cases, their stability may have been prolonged by protection by the mineral matrix. Information obtained from this study could be applied to studies in carbon incorporation and the use of soils as C sinks.

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[2] De la Rosa, J.M. *et al* (2007) SSSAJ (in press)

[3] De la Rosa J.M. *et al* (2007) CATENA (accepted November 2007)

[4]Lopez-Capel E *et al* (2007) RCM (Accepted December 2007)

[5] Lopez-Capel E & D.A.C. Manning (2007) http://www.biochar-international.org/images/Elisa_Lopez_Capel.pdf