Geophysical Research Abstracts, Vol. 8, 10372, 2006
SRef-ID: 1607-7962/gra/EGU06-A-10372

Losses and redistribution of TOC in soil columns during simulated ground fires

R. J. Bryant, S.H. Doerr, P. Morgenstern

University of Wales Swansea, Singleton Park, Swansesa SA2 8PP, UK (r.bryant@swan.ac.uk)

Wildfires can profoundly affect the amount, composition and distribution of organic carbon is soils. Apart from the addition of various forms of black carbon and other organic material released during the burning of litter and above ground biomass, the thermal energy released into the soil profile can lead to the alteration and redistribution of the in situ organic content. Processes affecting the composition and distribution of in situ total organic carbon (TOC) during wildfire include, for example, dehydration, pyrolysis and combustion. Furthermore, the loss of volatile organic compounds to the atmosphere, as well as their condensation at lower, cooler parts of the soil profile can alter TOC distribution and can markedly affect soil wettability by, for example enhancing or destroying soil hydrophobicity. These processes depend, amongst other factors, on oxygen availability as well as on the temperature profile and its temporal changes during burning. The aim of this study was to examine the effects of different thermal energy inputs on the vertical distribution of TOC in soils. Soil columns (height 120 mm, 59 mm diameter) of different textural composition were prepared from homogenised soil samples from Australia (sand), Portugal (loamy sand) and the UK (sandy loam) and exposed, to surface fires of various durations (1-3 h), but of approximately the same energy release rate, under controlled laboratory conditions. The soil columns were subsequently sectioned into layers (12 mm), which were homogenised, before measuring TOC using a PrimacsSC carbon analyzer, and soil hydrophobicity using the water drop penetration time (WDPT) technique. Although there was some radial loss of heat from the column, and therefore, some radial mass transfer (of water and other vapours) may have occurred, there is nevertheless internal consistency between TOC and WDPT values although the overall effects of soil heating in comparison with an event in the field may be underestimated. Semi-quantitative information of the effects of overall transport of volatile materials arising from heating of soils by

surface fires is presented in relation to TOC distribution, soil hydrophobicity and bulk soil properties.