

CHARRED ORGANIC CARBON FROM VEGETATION FIRES IN SOILS

Schmidt, M. W. I. 1*, Skjemstad J. O. 2, and Koegel-Knabner I. 1. 1Lehrstuhl für Bodenkunde, Technische Universität München, 85350 Freising-Weihenstephan, Germany, 2CSIRO, Land and Water, Glen Osmond, SA 5064, Australia, *present address: Dept. Geography, Univ. Koeln, Zulpicher Str 49a, 50674 Koeln, Germany

Vegetation fires produce large amounts of charred plant material, which could contribute to the highly refractory proportion of soil organic matter. The presence of char was investigated in nine Central European soils using a suite of complementary methods (high energy ultraviolet photo-oxidation, electron microscopy, solid state ^{13}C nuclear magnetic resonance, lignin analysis by CuO oxidation). Char contributed up to 45 % to the bulk soil organic carbon, which is equivalent to approximately 8 g/kg of the bulk soil. A color-sequence of soils showed a strong relationship between color and the content of char, suggesting that here the presence of char dominates the soil color. Finely divided char seems to be a major constituent of many chernozemic soils in Germany, but the origin of this fire induced form of organic carbon remained unclear. Due to its recalcitrant nature, char can be preserved in soils for long periods of time. Consequently, it could originate from vegetation fires in the postglacial vegetation or from post-mesolithic human use of fire for the clearing of forests and subsequent agricultural use. However, so far we have too little information on the fire and vegetation history to draw many conclusions. The time of char formation will be determined by ^{14}C analysis. The results suggest that the presence of char from vegetation fires in soils has major implications for the pedogenesis of Chernozems and may contribute to the sequestration of C in these soils.