MINERALOGY OF ERODED SEDIMENTS DERIVED FROM HIGHLY WEATHERED SOILS

J.N. Shaw[1], C.C. Truman[2], D.W. Reeves[3], and D.G. Sullivan[1]

AUTHORS: [1]Agronomy and Soils and Dept., 202 Funchess Hall, Auburn University, Auburn, AL36849, [2]USDA-ARS, SE Watershed Laboratory, P.O. Box 946, Tifton, GA; and [3]USDA-ARS NSDL, 411 S. Donahue Dr., Auburn, AL36832. Corresponding author: J.N. Shaw (jnshaw@acesag.aubum.edu).

ABSTRACT

Coarse textured surface horizons are common in highly weathered southeastern Coastal Plain soils. Historically, these soils have been managed under conventional tillage practices, but current trends suggest increases in conservation tillage use. Clay (< 2 μm) contents are typically low in these soils (< 10 %), but the relatively reactive nature of the surfaces of this fraction plays a dominant role in colloidal facilitated transport of pollutants. In this study, we evaluated the partitioning of clay minerals of in situ soil vs. runoff sediment under simulated rainfall. Because water dispersible clay (WDC) has been shown to be correlated with soil erodibility, we also evaluated WDC as a function of tillage practices. Plots were established at a site in the Upper Coastal Plain of central Alabama, where soils classified as coarse-loamy, siliceous, subactive, thermic Plinthic Paleudults and Typic Hapludults. Surface tillage reatments included conventional vs. no surface tillage treatments, with and without crop residue, and with or without para-tilling (non-inversion subsoiling). Mineralogical analyses and quantification were conducted using thermogravimetric (TGA) and x-ray diffraction (XRD) techniques. The amount of WDC was shown to be highly correlated with the % soil organic carbon (% SOC), which was a function of tillage treatment. Although no differences in the clay mineralogy of the sediment were observed between tillage treatments, runoff sediments were enriched in quartz and depleted with respect to kaolinite as compared with in situ soils. These results may help in the development of mechanistic models that predict sediment attached losses of nutrients and pesticides.