Geophysical Research Abstracts
Vol. 12, EGU2010-3296, 2010
EGU General Assembly 2010

Influence of soil tillage practices on aggregate stability and distribution of C, N and P in different soil types of Austria

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Soil aggregation is influenced by the soil management practices used, which in turn affects the amount of C and N in the soil. The investigation of aggregates is one way to quantify whether or not the management is improving the soil natural characteristics and agricultural capacity. This study assessed the influence of different tillage practices on soil aggregation by measuring aggregate stability, total carbon (TC), total nitrogen (TN) and total phosphorus (TP) contents. Composite surface soil samples (0-10 cm) were collected from five experimental sites in Austria treated with different tillage practices in spring 2008. The management practices were conventional tillage (CT), reduced tillage (RT) and No till (NT) that are implemented for different period of time. The soil textures at Pyhra, Kirchberg, Tulln, Mistelbach and Pixendorf were loam (L), sandy clay loam (SCL), clay (C), silt loam and silt loam (SL) respectively. The aggregate stability of all soils except clay was significantly improved due to application of NT and RT. In SL and L soils, RT significantly increased the aggregate stability as compared to NT. NT had significantly lower aggregate stability than CT after 9 years of application of soil management systems in SL soil in Pixendorf. One-year application of RT and NT improved TN, TC, and TP in sandy clay loam soil in Kirchberg although the change was not significant. TC and TN were higher in NT than CT at all sites except Pixendorf. Although NT and RT improved the TC and TN of the clay soil in Tulln, they did not improve the aggregate stability. Clay soils have naturally high stability because clay is one of the cementing agents that cause aggregation. This study suggests that tillage practices like NT and RT have the capacity to improve the aggregation, TC, and TN due to less disturbance of the soil by machinery and application of residue on the soil after the cropping season. However, the research should continue to investigate the distribution of C-fractions in different aggregate fractions.