Geophysical Research Abstracts
Vol. 19, EGU2017-5878, 2017
EGU General Assembly 2017

Land use changing SOC pool: A field investigation from four catchments on the Loess Plateau in China

Shengli Guo, Rui Wang, and Yaxian Hu
Northwest A&F University, China (slguo@ms.iswc.ac.cn)

The Loess Plateau in China has long been known for severe erosion, a degraded ecosystem and heavy sediment delivery to the Yellow River. Apart from, the highly erodible loess soil and the hilly geomorphology, intensive cultivation has been caused such most destructive human activities. This made the Loess Plateau once the least fertile region in China with extreme poverty. To restore soil fertility and ecosystem sustainability, a national-level project was launched in 1990s to encourage land use changes via afforestation or conversion of cropland back to grassland or woodland. After nearly three decades of land use conversion, the SOC pool in the soil can be expected to have substantially changed. However, climate conditions, geomorphic types and soil properties were spatially distinctive across the Loess Plateau. Their individual as well interactive impacts on changes of soil carbon pool during land use conversions must thus be properly accounted for.
In this study, four watersheds distributed over the Loess Plateau were investigated. The four watersheds mainly consisted of three geomorphic types: wide gully, loess ridge, and round knoll. On each geomorphic feature, three land use types prevailed: cropland, grassland and woodland. In total, 695 soil samples were taken from the top 20 cm of the four watersheds during 2010 and 2011. Our results show: 1) Degrees of erosion hugely differed among the four watersheds, with Catchment A (hilly) having three times more erosion modulus than the least eroded Catchment D (gully) (12000 vs. 1800 Mg per km2 per year). 2) The increasing SOC content from 4 mg g-1 at Catchment A to 8.1 mg g-1 at Catchment D agreed well with their decreasing erosion, suggesting that geomorphology induced erosion history was the predominant factor to set the general level of watershed-scale SOC reservoir. 3) Within each watershed, grassland and woodland consistently had at least 34% more SOC than cropland, demonstrating the influence of land use changes on local SOC pool. Overall, our field investigation suggests that on watershed scale, geomorphic types and the associated erosion are the decisive factor regulating the local SOC reservoir. Within each watershed, land use conversions from cropland to grassland and woodland had significantly improved SOC pool.