ELS2014 –The Earth Living Skin: Soil, Life and Climate Changes
EGU – SSS Conference
Bari | Italy | 22 – 25 September 2014
ELS2014-9-1

Soil organic carbon in continuous and discontinuous permafrost on the Tibetan Plateau: Effect of climate and topography

Corina Dörfer (1), Frank Baumann (1), Peter Kühn (1), Jin-Sheng He (2), and Thomas Scholten (1)

(1) Department of Geosciences, Physical Geography and Soil Science, University of Tuebingen, Ruemelinstrasse 19-23, 72070 Tuebingen, Germany, (2) Department of Ecology, College of Urban and Environmental Sciences, Peking University, 100871 Beijing, China

Thawing of permafrost on the Tibetan Plateau has increased in recent decades due to climate change with significant effects on soil moisture content and soil organic carbon (SOC) dynamics. The study sites are located on the northeastern Tibetan Plateau, Qinghai Province, in continuous (CPF) and discontinuous permafrost (DCPF) and seasonally frozen ground (SFG). Soil pits were arranged along slope gradients at six sites (three per transect) and sampled at four depth-increments (0-5, 5-10, 10-20 and 20-30 cm) plus 50, 75 and 100 cm for C analysis. Three density fractions were isolated (FPOM and OPOM < 1.6 g cm^3, MOM > 1.6 g cm^3). SOC stocks were calculated down to a depth of 30 cm (individual fractions) and 1 m (bulk soils). The maximum active layer thickness (ALT) was detected by drilling down to 2 m. FPOM contained 257 g kg-1 SOC on average. Higher SOC contents (351 g kg 1) were found in OPOM while MOM showed lowest SOC contents (35 g kg-1). SOC stocks increase with decreasing permafrost (CPF < DCPF < SFG) on regional scale, showing generally higher SOC stocks at the eastern transect. Fractional SOC stocks particularly differ depending on water supply - extremely moist soils show highest contents of easily decomposable POM fractions. Both mean annual precipitation and mean annual air temperature influence SOC stocks on regional scale in grassland ecosystems. At catena scale, soil moisture overrides soil temperature as main controlling factor, resulting in more complex interactions between SM, ALT and SOC distribution. The sensibility of SOC stocks to soil moisture emphasize that distinct responses of grassland ecosystems to climate warming in permafrost-influenced ecosystems particularly depend on changes in soil moisture conditions caused by proceeding permafrost thawing. Since permafrost distribution varies greatly in large parts on the Tibetan Plateau, it is necessary to consider catena-scale variations in future research.