Geophysical Research Abstracts
Vol. 19, EGU2017-17614, 2017
EGU General Assembly 2017

Spatial distribution of water infiltration in erosion-affected arable soils of morainic landscapes

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In heterogeneous morainic soil landscapes, the effect of soil erosion and compaction on water infiltration can be highly complex while the erosion and tillage history may depend on the slope position. The aim was to evaluate compaction effects on the water infiltration of cultivated soils at contrasting landscape positions for no-till and conventionally tilled plots of the eroded landscape. Infiltration was measured using use the Guelph permeameter in two depths (20 and 40 cm) at two different locations with more-or-less eroded Luvisols. The saturated hydraulic conductivity (Kfs) was calculated from the steady infiltration rate of two pressure steps. Data from 4 locations at the arable soil of the CarboZalf-D field site Holzendorf (Uckermark) were characterized by relatively large spatial heterogeneity in top- and subsoil and without spatial trends. For the erosion plots in Müncheberg, infiltration data were obtained at 6 locations, 3 at a conventionally tilled and 3 at the neighboring no-till plot (i.e. one location each at the up-, mid-, and downslope positions). Here, the Kfs-values were always larger in the top- than in the subsoils and larger for the conventionally tilled than for the no-till plot. In contrast to expected tillage-induced subsoil compaction, the subsoil Kfs-values of the no-till plot were smaller than those of the tilled plot. The sampling time was before harvest of the Sudan grass crop in Müncheberg such that the plant root system was still intact while it was after harvest and soil tillage at the CarboZalf plots. The results suggest that the soil state at the time of infiltration measurement was more important for describing the soil hydraulic properties than the spatial distribution of compacted regions.