Geophysical Research Abstracts
Vol. 12, EGU2010-10290, 2010
EGU General Assembly 2010
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Soil compaction on an agricultural post-mining recultivation site in Eastern Germany

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Our study is concerned with the agricultural recultivation of post lignite mining areas in Lusatia, where Germany's largest lignite mining area is located. In this region mining leads to disturbances on a landscape level. Recultivation efforts attempt to regenerate post mining areas for various land use options. In this study, the agricultural recultivation is considered.
The sandy to loamy substrate that is used for recultivation stems from depths of several meters and is free of soil organic matter. The substrate itself is unstructured when used to construct the sites. During site construction, the substrate is subject to strong mechanical stresses due to excavation, deposition and re-levelling. This practice leads to more or less serious soil compaction which can cause decreased yields of agricultural crops. Our experimental area has been heaped up and re-levelled in 2006/2007. On various subplots the extent of compaction, the effect of amelioration by deep loosening, differing organic soil additives and crop rotations which include deep rooting plants is studied. We compare results of the soil physical status-quo sampling (before the application of any recultivation measure, sample collection in 2007) with recent results (sample collection in 2010) to show the development of soil stability, soil structure and soil functions depending on the recultivation practice. The results of the first soil sampling (2007) revealed bulk density values between 1.3 and 1.9 g/cm^3 but comparably low values of precompression stress. We found no correlation between bulk density, saturated hydraulic conductivity and air permeability and for one soil depths a negative correlation between bulk density and precompression stress.
We show the degree of compaction on different subplots after site construction and the persistence of recultivation measures such as deep loosening, deep-rooting plants (e.g. alfalfa and sweet clover) by investigating their effects on bulk density, precompression stress and saturated hydraulic conductivity and air permeability.