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Ground-Penetrating Radar investigation of representative transects in the Nidda catchment (Hesse/Germany)

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In the ongoing fourth phase of the SFB 299 “Land Use Options for Peripheral Regions“ the subproject “B1 Soil Science” investigates six representative transects in the Nidda catchment. With respect to the geological diverse background of the 1619 km^2 investigation area Ground Ground-Penetrating Radar (GPR) exploration with 200 and 400 MHz zero offset antennas is accompanied by detailed soil analysis to gain a high resolution survey of stable soil properties. Since Loess covers great parts of the catchment, namely the Wetterau region, resolution and depth of GPR analysis are limited. The high clay content of loess substrate attenuates EM-waves of GPR especially in combination with high water contents. To achieve valid information of these limiting factors a 300 m test site on undisturbed luvisol/chernosem soils was established. Soil physical and chemical properties were determined at four soil pits. Time Domain Reflectometry probes (TDR) were installed in various depths to monitor water content, temperature and electric conductivity. Velocities of EM-waves and GPR patterns are determined by known soil strata. Build in 5 x 50 cm steel rods in four different depths act as immobile reflectors along the measuring section. Thus attenuation of EM Waves can be linked to varying water contents, in depth and over time, while measuring in a ten day interval. Interpretation of GPR imagery on loess substrate could be improved significantly by velocity adaptation. A dielectric coefficient for undisturbed loess under changing water contents can be developed by the end of the campaign.