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Complex soil mass redistribution along a catena using meteoric and in-situ 10Be as tracers

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In hilly and mountainous landscapes, the bedrock is actively converted to a continuous soil mantle. The bedrock-soil interface lowers spatially at the soil production rate, and the soil acts as a layer removing sediment produced locally and transported from upslope. Forested soils of a hummocky ground moraine landscape in Northern Germany exhibit strongly varying soil thicknesses with very shallow soils on crest positions and buried soils at the footslope. We explored the explanatory power of both ^{10}Be forms (in situ and meteoric) for forest soils on a hillslope to shed light into the complex mass redistribution. Our main research questions were: how do meteoric and in-situ ^{10}Be compare to each other? What do they really indicate in terms of soil processes (erosion, sedimentation, reworking)? By using both types of ^{10}Be, the dynamics of soils and related mass transports should be better traceable. Both ^{10}Be forms were measured along three profiles at different slope positions: Hydro1 (summit), Hydro3 (shoulder), Hydro4 (backslope). Furthermore, a buried horizon was found in the profile Hydro4 at 160 cm depth and ^{14}C-dated. The distribution pattern of meteoric ^{10}Be of Hydro4 shows an inverse exponential depth profile, and an almost uniform content of in-situ ^{10}Be along the profile. Meteoric ^{10}Be indicates on the one hand that a new soil was put on top of an older, now buried soil. On the other hand, meteoric ^{10}Be is involved in pedogenetic processes and clearly exhibits clay eluviation in the topsoil and clay illuviation in the subsoil. The uniform content of the in situ ^{10}Be shows soil mixing that must have occurred during erosion and sedimentation. The^{14}C dated buried soil horizon indicates a deposition of eroded soil material about 7 ka BP. Consequently, an increase in the in-situ ^{10}Be content towards the surface should be expect which however was not the case. The reason for this is so far unknown. Radiocarbon dating and ^{10}Be data demonstrate that strong events of soil mass redistribution in Melzower Forest are mainly a result of ancient natural events. Further measurements of fallout radionuclides ($^{239+240}$Pu) showed no erosion for the last few decades in the same catchment.