Kolloquium
Boden, Wasser, Luft

Mittwoch 06. Februar 2019, 16 ct – 18 Uhr
Hörsaal Fahnenbergplatz, Friedrichstr. 39

ÄNDERUNG DES VORTRAGSTHEMAS

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Soil Ecological Challenges of RemovingLignocellulose from Forest Ecosystems

Forest use and management disrupt litter and succession cycles by removing lignocellulose in the form of woody biomass. This removal is an ecological perturbation through the future absence of bio- and necromass in the form of fine and coarse woody debris. This disruption affects forest biodiversity through loss of habitat and nutrients, while the removal of lignocellulosic carbon is thought to minimally affect forest soils. The influence of woody debris lignocellulose on forest soils was tested by comparing soil properties between test points adjacent to coarse woody debris and paired reference points 2–3 meters away from ten European beech (Fagus sylvatica L.) stands in southwestern Germany. The stands had either mull or moder forest floors on calcareous or silicate bedrock, and woody debris was mainly beech in various decay classes.
Lignin-derived phenols near beech coarse woody debris increased in the forest floor at moder sites and in mineral soil at mull sites, had more syringyl phenols compared to vanillyl phenols, became more oxidized in mineral soil, and had strong correlations with particulate organic matter. Particulate organic matter in pores and non-aggregated particles decreased on calcareous bedrock and increased on silicate bedrock, indicating nutrient loads and pH regulated the rates of microbial co-metabolization of accessible organic matter. Near woody debris in more advanced decay classes, particulate organic matter occluded in aggregates increased. Additionally, beech affected soil organic matter composition and availability of base cations and phosphorus to a greater extent than silver fir (Abies alba Mill). Soil properties near beech woody debris also had strong correlations with both soil organic carbon and water-extractable aromatic matter. Additionally, on silicate bedrock, nutrient availability and pore space increased more and had stronger correlations with lignin-derived phenols than on calcareous bedrock.
These additions, losses, translocations and transformations of lignocellulose, organic

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matter, nutrients, and pore space induced by coarse woody debris are soil forming biogeochemical and biogeophysical processes. As these processes are spatially and temporally limited, coarse woody debris can be designated as “pedogenic hot-spots” that alter soil development and functioning. Pedogenic hot-spots have memory of integrated effects on forest soils that in turn create forest soil heterogeneity through resilience to disturbances. Consequently, managing coarse woody debris for soil development, functioning, and resilience is possible. Potential gains can be estimated from the difference between soils influenced by coarse woody debris and soils under normal leaf litter, which can guide possible site and tree species-specific threshold, rotation, and density parameters. If successfully put into practice, forest soil functions, resilience, and productivity can be maintained and likely improved.