Geophysical Research Abstracts
Vol. 14, EGU2012-7407-2, 2012
EGU General Assembly 2012

Influence of windthrows and tree species on forest soil plant biomass and carbon stocks

B. Veselinovic and H. Hager

University of Natural Resources and Applied Life Sciences, Inst. of Forest Ecology, Dep. of Forest- and Soil Sciences, Vienna, Austria (bojana.veselinovic@boku.ac.at)

The role of forests has generally been recognized in climate change mitigation and adaptation strategies and policies (e.g. Kyoto Protocol within articles 3.3 and 3.4, RES-E Directive of EU, Country Biomass Action Plans etc.). Application of mitigation actions, to decrease of CO_2-emissions and, as the increase of carbon(C)-stocks and appropriate GHG-accounting has been hampered due to a lack of reliable data and good statistical models for the factors influencing C-sequestration in and its release from these systems (e.g. natural and human induced disturbances). Highest uncertainties are still present for estimation of soil C-stocks, which is at the same time the second biggest C-reservoir on earth. Spruce monocultures have been a widely used management practice in central Europe during the past century. Such stands are in lower altitudes (e.g. submontane to lower montane elevation zone) and on heavy soils unstable and prone to disturbances, especially on blowdown. As the windthrow-areas act as CO_2-source, we hypothesize that conversion to natural beech and oak forests will provide sustainable wood supply and higher stability of stands against blowdown, which simultaneously provides the long-term belowground C-sequestration. This work focuses on influence of Norway spruce, Common beech and Oak stands on belowground C-dynamics (mineral soil, humus and belowground biomass) taking into consideration the increased impact of windthrows on spruce monocultures as a result of climate change.
For this purpose the 300-700m altitude and pseudogley (planosols/temporally logged) soils were chosen in order to evaluate long-term impacts of the observed tree species on belowground C-dynamics and human induced disturbances on secondary spruce stands. Using the false chronosequence approach, the C-pools have been estimated for different compartments and age classes. The sampling of forest floor and surface vegetation was done using 30x30 (homogenous plots) and 50x50cm (inhomogeneous plots) frame. It was distinguished between following fractions: fine/coarse roots (</> than 2mm), woody debris (dead wood, branches and seeds), living vegetation (ground vegetation and its roots), litter (leaves fresh and decomposed until the stage where the basic form can still be recognized) and humus layer (more than 30% organic matter in the fine fraction). Mineral soil was sampled down to 1m depth. The C stocks for 60 and 100cm depth were evaluated.
The data enable a good overview of allocation of organic C within the belowground compartments, and its dynamics over the stand development stages for the relevant tree species of the Northern Alpine Foothills. In addition, these data enable the simulation of the long-term development of the belowground biomass and C-stocks for the three different stand types (pure spruce stands, mixed beech-spruce stands and oak stands). These results enable improvement of the statistical models in relation to site factors or stocking tree species and serve herewith further, as a valuable decision support for the innovative forest management practices and ensure the accomplishment of ecological, social and economical services of forest ecosystems.