Geophysical Research Abstracts
Vol. 16, EGU2014-10662, 2014
EGU General Assembly 2014

How extreme weather events can influence the way of thinking about forest management?

Klaudia Ziemblińska (1), Lutz Merbold (2), Marek Urbaniak (1), Matthias Haeni (2), and Janusz Olejnik (1)

(1) Meteorology Department, Poznan University of Life Sciences, ul. Piatkowska 94, 60-649 Poznan, Poland, (2) Institute of Agricultural Sciences, ETH Zürich, Universitätstrasse 2, 8092 Zurich, Switzerland

One third of the total area of Poland, which is covered by forests, is currently managed by "The State National Forest Holding" – the biggest organization in Europe managing forests. Common management practice is based on clear-cutting the vegetation to maintaining forests and ensuring regrowth. While sufficient information exists on the quantity of harvested biomass and particularly its economic value, little knowledge exists on the overall environmental impact of such management including the carbon budgets of forests in Poland. At the same time these forests are very vulnerable to extreme events such as wind throws. Large wind throws can be used as an experimental platform to study both, the effects of extreme events itself but also the effects of management such as clear-cuts, due to the fact that after such kind of natural disasters similar steps then following clear-cuts are implemented. These activities include the removal of whole trees, collection of branches and pulling out stems with heavy machinery, causing additional disturbance.

In this study, we aim at providing information to fill the current knowledge gap of changing C budget after clear-cuts and wind throws. We hypothesize large C losses after clear-cuts and ask whether one can improve current forest management to "save" C and/or enhance C sequestration? To answer this specific question we used the eddy covariance (EC) method to adequately measure the net ecosystem exchange of carbon dioxide (NEE) between a deforested area and the atmosphere (treatment) and compare it to measurements from an intact forest of the same type (control). Both sites have the same soil type (brunic arenosoil - after FAO classification) which is sandy and relatively not fertile. Moreover, main species and composition were similar.

The treatment area was chosen after the occurrence of a 20min-lasting tornado in July 2012 in Western Poland. The storm resulted in the destruction of more than 500 ha of 75-year old pine forest and provided a unique situation to assess the C budget of a pine forest after wind throw leading to the construction of the Trzebciny EC tower (treatment site). Measurements of CO_2 and H_2O exchange continue since the beginning of 2013. Measurements from both sites were directly compared to an already established monitoring station (65-year old Tuczno forest, control). We observed a huge difference in NEE between an intact middle age coniferous forest (control site, net gain of 463 g(C-CO_2) m-2 in 2013) and an area of similar forest that was destroyed by a tornado and cleared thereafter (treatment site, net loss of about 518 g(C-CO_2) m-2 in 2013). Our results provide a great opportunity to re-evaluate current forest management in Poland and will provide a first step towards adjusting forestry management and policy to become less susceptible to climate change (especially extreme events).