Geophysical Research Abstracts
Vol. 17, EGU2015-11917-1, 2015
EGU General Assembly 2015

Post-disturbance dynamics in forest-atmosphere fluxes: Observations from a windthrow site in the European Alps

Bradley Matthews, Mathias Mayer, Klaus Katzensteiner, and Helmut Schume

Institute of Forest Ecology, University of Natural Resources and Life Sciences, Vienna, Austria
(bradley.matthews@boku.ac.at)

Natural disturbances can cause abrupt and substantial changes in ecosystem properties regulating forest-atmosphere exchange. Although forest sites disturbed by e.g. wind, fire, and insects have become important targets of micrometeorological research, investigations of intact and disturbed forests in mountainous areas remain comparatively scarce. This discrepancy is likely explained by the additional methodological challenges posed by mountainous ecosystems, especially with respect to the eddy covariance technique. Nonetheless, the lack of such experiments constitutes a significant void in global and regional flux networks, particularly in the Central European context, where the Alps are forecasted as potential hotspots of intensifying windthrow and bark beetle disturbance regimes. We therefore began a micrometeorological investigation at a forest site in the Northern Calcareous Alps of Austria disturbed by windthrow and subsequent bark beetle infestation in 2009. The objectives of the study were to determine 1) whether the eddy covariance technique provides robust measurements of turbulent surface-atmosphere exchange at the site and 2) how net exchange of carbon dioxide (CO_2), water vapor, sensible heat and shortwave radiation develop over 3 subsequent growing seasons (2011 to 2013) following disturbance. According to a flux quality assessment looking at turbulence, stationarity, flux footprint and energy balance closure, eddy covariance provides defensible estimates of net turbulent exchange at the site, despite the non ideal conditions for its application. While the site remained a CO_2 source in 2013, decreasing net CO_2 release over the three subsequent growing seasons indicated that the ecosystem was in a state of recovery. Moreover, it appeared that this recovery also significantly influenced the net exchange of shortwave radiation and the partitioning between sensible and latent heat fluxes. Taking into account the varying climate over the three campaign seasons, the results suggest a slight increase in the shortwave albedo and a decrease in bowen ratio over this initial period following disturbance.
This study was funded by the European Regional Development Fund (ERDF).