CO2 balance of a wind-damaged larch forest

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Typhoon is an important disturbance factor for forest ecosystems in East Asia, which are damaged extensively and intensively. It is thought that the disturbance affects ecosystem factors including vegetation dynamics, soil organisms and micrometeorology, and consequently change carbon cycling of forest ecosystems. In particular, the function of forest ecosystems to fix carbon would be changed drastically by typhoon disturbance.

A plantation of Japanese larch (Larix kaempferi Sarg.) in Tomakomai, Hokkaido, Japan was destroyed by Typhoon Songda in September 2004. About 90 % trees were blown down by strong wind. In this study, we have measured CO2 flux in the wind-damaged larch forest to estimate CO2 balance (NEE) and compare it before and after the typhoon damage.

The study site is Tomakomai Flux Research Site in Hokkaido, Japan. Before the typhoon damage, this forest was a 45-year-old plantation of Japanese larch with some broad-leaved trees. The canopy height was 15 m and the maximum leaf area index (LAI) was 5.6 m2 m-2. After the typhoon, all stems of larch trees were removed from the forest floor for commercial use, whereas stumps and branches were left. Dominant understory or invading species was pteridophyte (e.g. buckler fern) in 2001 before the typhoon damage, but was red raspberry (Rubus idaeus) in 2006. Live aboveground biomass was 2.7 ton ha-1, which excludes trees, in 2001 and 3.6 ton ha-1 in 2006. It was larger after the typhoon damage than before that.

CO2 flux has been measured since August 2005, about one year after the typhoon damage, using the eddy covariance technique. Comparison of NEE between before and after the daemge shows that the larch ecosystem changed from carbon sink to source by the typhoon damage.