

Comparison of quantity and quality of soil organic carbon between matured and gap areas in an old-growth beech forest

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We performed this study to further understand the effect of canopy gap stands on surface soil carbon dynamics in cool-temperate deciduous broad-leaved old-growth forests. We investigated the annual aboveground litter production, soil organic matter content, and soil humic acids (soil organic matter) quality in several matured (n=7) and gap (n=3) areas (each area was 20 m times 20 m) in a Japanese old-growth beech forest. The annual fine litter (foliage) production from 2005 to 2011 in the matured area was totally higher than that in the gap area; however, those of annual coarse litter production were not so different. The gravimetric soil carbon content in the matured area was significantly higher than that in the gap. In addition, the C:N ratios in the matured area were significantly higher than those in the gap. The estimated compositions of carbonyl C and aromatic C and those of O-alkyl C and alkyl C in total C of soil humic acids in the matured area were higher and lower, respectively, dependent on higher A600/C values, than their respective compositions in the gap area. Furthermore, the ratio of alkyl C to O-alkyl C in the matured area was significantly lower than those of the gap. Our data strongly suggests that, compared to the closed canopy stands, canopy gap stands in this study site can be a carbon source, which is particularly dependent on labile carbon dynamics.