

Reduced soil respiration in gaps in logged lowland dipterocarp forests

Abstract

We studied the effects of forest composition and structure, and related biotic and abiotic factors on soil respiration rates in a tropical logged forest in Malaysian Borneo. Forest stands were classified into gap, pioneer, non-pioneer and mixed (pioneer, non-pioneer and unclassified trees) based on the species composition of trees >10 cm diameter breast height. Soil respiration rates did not differ significantly between non-gap sites (1290 ± 210 mg CO₂ m⁻² h⁻¹) but were double those in gap sites (640 ± 130 mg CO₂ m⁻² h⁻¹). Post hoc analyses found that an increase in soil temperature and a decrease in litterfall and fine root biomass explained 72% of the difference between gap and non-gap sites. The significant decrease of soil respiration rates in gaps, irrespective of day or night time, suggests that autotrophic respiration may be an important contributor to total soil respiration in logged forests. We conclude that biosphere-atmosphere carbon exchange models in tropical systems should incorporate gap frequency and that future research in tropical forest should emphasize the contribution of autotrophic respiration to total soil respiration. © 2009 Elsevier B.V. All rights reserved.