

Scaling-up estimation of soil respiration using an automatic open-close chamber system in an old-growth beech-oak forest, central Japan

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Abstract

Soil respiration (R_s) is a key component in the estimation of net ecosystem production (NEP) in old-growth forests that generally thought to cease to accumulate carbon. The clear seasonal variation in it was found in many forest ecosystems even though old-growth forests; however, there has been no report of the spatial variability, especially between gap and canopy, of R_s in old-growth forests. In our previous study, we measured the R_s in 100 chambers in a 1-ha study plot using the soda lime technique in an old-growth beech-oak forest, central Japan, and found spatial and seasonal variations in R_s . To conduct ecological inventories on carbon cycling in this forest, our objective in the present study is to upscale estimation of R_s in a 1-ha study plot using an infrared gas analysis connected to automatic open-close chamber system. We measured the R_s in gap and canopy areas during June–October 2013 and June–October 2014, and then estimate the R_s of our study plot on the basis of the percentage of gap and canopy areas. We found that the R_s in canopy was higher than that in gap. Although the seasonal R_s in both gap and canopy was related to soil temperature (T_s) and soil water content (θ), the hysteresis loop related to T_s was found in only canopy. This hysteresis loop that the R_s increased during June to August and then decreased during September to November was possibly due to root phenology. The percentage of gap was 25.6% of all areas, whereas the canopy was estimated to be 74.4% of all areas. The scaling-up estimation of R_s for 1-ha study plot has been analyzing.

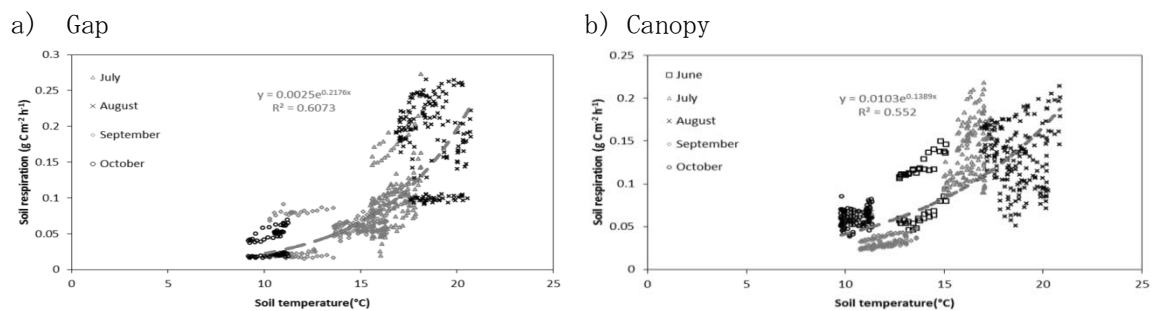


Fig. 1 Relationship between soil respiration (2013) and soil temperature (-5 cm) in gap (a) and canopy (b).