

Seasonal Variation of Soil Respiration in Old-Growth Forest at Oshirakawa

Vilanee Suchewaboripont, Yasuo Iimura, Ma Qian, Shinpei Yoshitake, Toshiyuki Ohtsuka (River basin research center, Gifu university), Seigo Kato, Akira Komiyama (Applied biology, Gifu university)

Introduction

Soil respiration is a major component of carbon efflux from the forest to the atmosphere. Some studies of soil respiration in old-growth forest reported that varied and seasonal soil respiration mainly depends upon the environmental factors, such as soil temperature and soil water content. Due to no information of soil respiration in old-growth forest at Oshirakawa, this work aims to study the seasonal soil respiration using soda-lime method in old-growth forest at Oshirakawa. Total soil CO₂ efflux during growing season was calculated and evaluated.

Study Site and Methodology

The study plot was located in more than 300-year-old beech forest at Oshirakawa, Gifu. A plot of sized 100x100 m² was dominated by *Fagus crenata* and *Quercus mongolica* var. *crispula*. The understory was crowned by dwarf bamboo (*Sasa kurilensis*).

The soil respiration was observed using soda lime technique every month during the growing season (June 2012 to November 2012). Soil temperature was measured at a 1-cm and 5-cm soil depth near the chamber. Soil respiration rate was calculated from the gain weight and duration of exposure with the equation proposed by Keith and Wong (2006). The regression model of the soil CO₂ efflux was fitted to the soil temperature to estimate total soil CO₂ efflux from soil respiration in growing season. Q₁₀ was also calculated.

Result and discussion

The highest rate of soil respiration was found in August (2.5576±0.9158 g C m⁻² d⁻¹). Although the daily soil temperature in September was the highest, the soil CO₂ efflux was lower than that in August due to the limiting activity by daily soil water content (Figure 1). Soil CO₂ efflux from soil respiration was significantly fitted to the daily soil temperature at 1-cm soil depth in the exponential regression ($y=0.5566e^{0.0513T}$, R²=0.2569, p<0.01; figure 2). Total soil CO₂ efflux during growing season was 201.95 g C m⁻² and Q₁₀ was 1.67 which was lower than that in temperate deciduous broad-leaved forest at Takayama, Gifu.

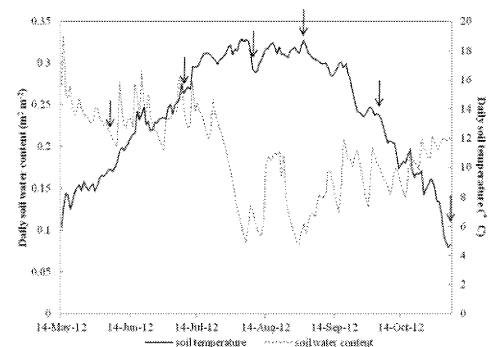


Figure 1 Daily soil temperature and daily soil water content during the experiment.

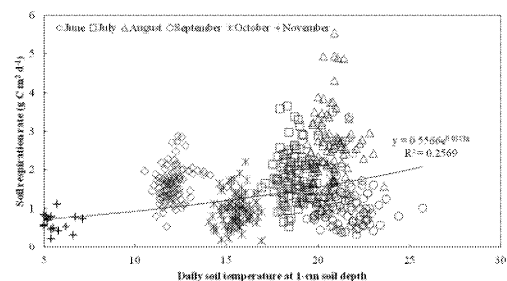


Figure 2 The exponential regression between soil CO₂ efflux from soil respiration and daily soil temperature at 1-cm soil depth.