Geophysical Research Abstracts
Vol. 16, EGU2014-373, 2014
EGU General Assembly 2014

Characteristics of spatial variability in soil CO_2 efflux in a Moso bamboo (Phyllostachys pubescens) forest

Meng Ying Lin, Yi-Fang Hsieh, Tomonori Kume, and Chih-Hsin Cheng
National Taiwan University, Forestry, Taiwan (vicky7933@gmail.com)

The expansion of bamboo forest to surrounding ecosystems in eastern Asian countries such as Taiwan can alter the carbon balance, in which soil CO_2 efflux is an essential component. Spatial heterogeneity of soil CO_2 efflux in forested ecosystems is essential not only for understanding CO_2 dynamics but also for suitable sampling design to estimate annual soil CO_2 efflux and the response to environmental changes. The aim of this study is to understand characteristics of spatial variability of soil CO_2 efflux in a bamboo forest, situated in a montane cloud forest of central Taiwan. To this end, this study 1) evaluated the seasonal changes in spatial variability in soil respiration in Moso bamboo (Phyllostachys pubescens) forest through one year and 2) quantified the spatial variation of soil CO_2 efflux in this stand using the semivariance. We measured soil CO_2 efflux using the closed dynamic chamber method with an infrared gas analyzer (PP system, EGM-4) once a month from April 2012 to November 2013. The semivariance was used to quantify the spatial variability of soil CO_2 efflux. In this study, we found spatially averaged soil CO_2 efflux during each measurement campaign varied from 1.54 to 4.98 μmol CO_2 m-2 s-1, which was larger in bamboo sprouting period (April to August) than other months (September to March). The average coefficient of variation (CV) of the soil CO_2 effluxes was 46.4%. Our CV was comparable to that in other tropical forests. The semivariogram revealed that there was autocorrelation of soil CO_2 effluxes, and the scale was significantly different between bamboo sprouting period and the other periods. The spatial distribution map showed temporal changes in soil CO_2 efflux, and the fairly conservative spatial patterns in soil CO_2 effluxes were found through the year in our site. On the other the hand, the range of autocorrelation was much larger in April (33.4 m - 123 m) than other months (2.4m – 5.5m). This indicated that considering a long distance are necessary for accurate soil CO_2 effluxes during bamboo sprouting time. The spatial variation in soil CO_2 efflux in our site showed significant positive correlation with the soil temperature and soil water content in sprouting period. Also, similar significant correlations were found in the relationships between soil CO_2 efflux and soil C/N ratio, root biomass and soil porosity in the measurement campaigns.