富士北麓カラマツ林における林床炭素収支の推定と変動要因
Estimation of understory carbon budget and environmental factors influencing on the processes in a larch forest on the northern foot of Mount Fuji

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Forest ecosystem is very important component of terrestrial ecosystems, and elucidating the carbon cycle mechanism in forest ecosystem is vital for understanding global carbon cycle and predicting future carbon budget along with global climate change. There are many studies reported carbon budget of specific forest ecosystem using eddy-covariance method, however, this technique cannot provide detailed information about each process of forest carbon cycle. Especially, information about understory carbon budget include understory vegetation is limited.

To understand the impact of forest understory carbon budget and environmental factors influencing on processes of understory carbon cycle, we set multi-channel automated chamber measurement system in larch forest on northern foot of Mt. Fuji in 2006. The control unit of chamber system mainly consisted of a data logger (CR1000, Campbell Scientific), an infrared gas analyzer (LI820, LI-COR) and an air compressor. We set soil chambers (90 cm ×90 cm ×50 cm) for soil CO_2 flux measurement. Surroundings of the half of those soil chambers were root cut with chainsaw until 25 cm depth for the measurement of heterotrophic respiration (Rh), and the remaining control chambers were used for soil respiration (Rs) measurement. We also set plant chambers (90 cm ×90 cm ×100 cm) which included understory vegetation to measure understory net CO_2 exchange (NUE), understory respiration (Ru) and understory gross primary production (GPP_u).

We got continuous data for 8 years from 2006 to 2013 with chamber measurement method. Comparison with eddy-covariance data showed that annual Ru accounted for 68.6% of annual ecosystem respiration, and annual GPP_u accounted for 16.3% of annual gross primary production of the larch forest. Primary factor for GPP_u was light intensity of forest understory, and positive correlation between annually estimated GPP_u and annual average of understory PPFD (R^2 = 0.64) was confirmed. Remarkable exponential correlations between soil temperature and Rs, Rh and Ru were observed, and total Q_{10} values for Rs, Rh and Ru were 2.49, 2.57 and 2.25, respectively. On the other hand, influence of soil moisture on those soil CO_2 fluxes were minor except summer season when soil moisture was notably decreased due to few rainfall.

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