Temporal and spatial variation of soil CO_2/CH_4 fluxes in two cool-temperate forests in Japan

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Forests cover about 30% of global land surface and the total forest carbon stocks (860 Pg) are responsible for about 45% of the carbon in the terrestrial biosphere. Forest soil carbon fluxes which include CO_2 and CH_4 play an important role in global climate change due to both high soil respiration and CH_4 absorption. Consequently, clarifying of mechanisms in forest soil carbon fluxes is critical for understanding the future global carbon cycle and climate change.
To investigate soil CO_2/CH_4 fluxes, we installed multi-channel automated chamber measurement systems in two cool-temperate forests of Tomakomai (natural recovered forest following the typhoon in 2004) of Hakkaido and Fuji-Hokuroku (65-year-old larch plantation) of central Japan. The chambers were separated into 3 groups each with control, trenching and covering understory treatment, respectively. Soil carbon fluxes were continuously measured at hourly and two-hour intervals during snow-free season.
In both forests, soil CO_2/CH_4 fluxes showed high seasonal variation. Soil respiration increased exponentially with changing in soil temperature, whereas soil CH_4 uptake was negatively correlated with soil moisture. Though both the soil temperature and moisture were not significant difference between two forests, we found significant larger soil respiration as well as CH4 absorption in Fuji-Hokuroku larch forest as compared with that of Tomakomai natural forest probably due to both the higher root biomass and soil organic carbon.

Keywords: Soil carbon fluxes, Chamber, Temporal variation, Spatial variation

