東シベリアカラマツ林の蒸発散を相補的に支える森林構成と土壌水分特性

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Complementary role of canopy composition and soil water availability on evapotranspiration over larch forests in eastern Siberia

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Unusually wet active layer maintained for a few years at Spasskaya Pad larch forest of Yakutsk caused decline of larch trees and would change water and carbon flux (Ohta et al., 2014). To investigate the vulnerability of larch forest faced to too wet condition, we compared two larch forests on different location. One is the Spasskaya Pad station (SP) at Yakutsk, and the other named Elgeeii station (EG) is located at 300 km southeast of Yakutsk. During the comparing period (2010-2012), the evapotranspiration and CO_2 exchange, observed by the eddy covariance method, showed that the two forests gave almost the same total evapotranspiration; however, the net and gross uptakes of CO_2 at the EG forest were 1.6 and 1.3 times those at the SP forest, respectively. The difference in aboveground biomass was probably responsible for the higher productivity (CO_2 uptake) at EG. Less aboveground biomass would result in less transpiration at SP, which would be compensated for in total evapotranspiration by soil evaporation and transpiration by the forest floor vegetation. Another contrasting feature between the two sites was the dynamics of soil water availability for plants. Although soil water was generally greater at EG than SP, clay-rich soils high water capacity at EG would limits plant to uptake water. It is likely that forest transpiration is commonly optimized to the same level of evapotranspiration under similar meteorological conditions through differences in the contributions of evapotranspiration from the floor vegetation and the soil water availability. There would be some robost system supporting stable evapotransipiration in dispite of temporal and spatial variability in forest composition in this region.

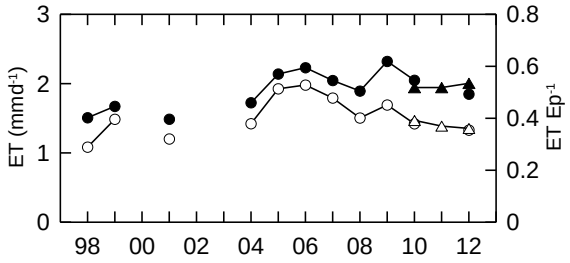

Fig.1 Annual variation of evapotranspiration (black) and evaporative coefficient (white) at SP (circle) and EG (triangle). Each plot indicates mean during JJA.

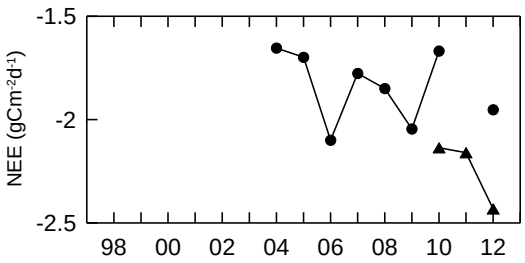

Fig.2 Annual variation of CO_2 exchange at SP (circle) and EG (triangle). Each plot indicates mean during JJA.

References

Ohta, T. et al., Effects of waterlogging on water and carbon dioxide fluxes and environmental variables in a Siberian larch forest, 1998–2011, Agricultural and Forest Meteorology, 188, 64-75, 2004.