Vertical profile of photosynthetic functions and its seasonal variation in a cool temperate forest

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Vegetation activity is affected by many kinds of environmental stresses. To detect those environmental stresses on land ecosystem' photosynthesis remotely, spatially-widely and instantaneously, remote sensing (RS) technics for chlorophyll fluorescence (ChlF) have been developed recently. However, such RS watches only the top of canopy, and may miss the activity under the canopy where much of biomasses are still existing. This leads to an estimation error on the physiological state of ecosystem. To make sure how much of estimation error may exist, therefore, it is necessary to investigate the vertical profile of photosynthetic stresses.
To reveal the vertical profile on the relationship between the photosynthetic stresses and environments, diurnal courses of light, temperature and fluorometric parameters were measured in an evergreen coniferous forest (*Cryptomeria japonica* and *Chamaecyparis obtusa*; 36°08'N, 137°22'E, 800m a.s.l) and an deciduous forest (*Quercus crispula Blume* and *Betula ermanii*; 36°80'N, 137°82'E, 1420 m a.s.l) in Takayama, Japan in June, August, and October in 2015. The measurements were conducted at three heights on the eddy flux towers at both sites. The photosynthetic active radiation and fluormetry parameters were detected by two fluorometers (FlourPen FP100 and FluorPen FP100-MAX, Photon Systems Instruments, Brno, Czech Republic) five times in a sampling day. In addition, leaf temperature also measured simultaneously by radiative thermometer (Radiation thermometer B, Shinwa).
As a result, quantum yield of the foliage in upper layers (21 m) declined in the midday more than those in middle (18 m) and bottom (13 m) layers for cedar leaves in the coniferous forest. On the other hand, in deciduous forest, there was little differences in diurnal course of quantum yield of birch leaves among three layers. This smaller vertical effect in deciduous forest is probably due to lower photosynthetic capacity of photosynthesis of birch foliage under canopy.

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