Geophysical Research Abstracts, Vol. 9, 04772, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04772

Impacts of soil drought on transpiration in a tropical evergreen forest in northern Thailand

T. Kume (1), H. Takizawa (2), N. Yoshifuji (3), K. Tanaka (4), C. Tantasirin (5), N. Tanaka (3), M. Suzuki (3)

(1) Kyushu University (2) Nihon University (3) The university of Tokyo (4) Frontier Research Center for Global Change (5) Kasetsurt University (Kumett@forest.kyushu-u.ac.jp / Phone +81-92-948-3101)

In northern Thailand, there is the 5- to 7-month dry season with higher atmospheric evaporative demand and lower soil moisture under Asian monsoon influences. Our earlier study revealed that canopy-scale transpiration is actively maintained even during the latter part of the dry season in a hill evergreen forest [K. Tanaka 2004; J. Geophys. Res 108, D4533]. To clarify our examination of whether soil drought causes water use limitation in individual trees in the latter part of the dry season at this site, we conducted individual tree-scale measurements such as sap flow and water potential measurements in four evergreen trees, two large emergent trees 29.8 and 25.4 m high, and two smaller understory trees 4.8 and 1.4 m high, during a 2-year period.

We found large interannual variations in rainfall in the 2-year period, and the amount of rainfall preceding the late dry season of 2004 was significantly less than that preceding the late dry season of 2003. Although a distinct decrease in sap-flow velocities in individual trees due to soil water stress was not found in the late dry season of 2003, it did become comparatively apparent in the late dry season of 2004. Moreover, the reductions in sap-flow velocities and predawn stem-water potential were most significant in the smallest tree. These results suggest that shallower roots could be reason for the significant decrease in water use in the smallest trees. The deeper roots of larger trees could be the reason for the reduced impact of soil drought on water use in larger trees even in an unusually severe drought. This study supports our earlier study based on SPAC model analysis [K. Tanaka 2004; J. Geophys. Res 109, D23107] that active canopy-scale transpiration in the latter part of dry season is maintained with deep soil water stored in a thick soil layer and developed root systems.