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Linkage between canopy water storage and drop size distributions of leaf drips

Kazuki Nanko (1), Ai Watanabe (2), Norifumi Hotta (3), and Masakazu Suzuki (4)

(1) Forestry and Forest Products Research Institute, Tsukuba, Japan (nanko-kazuki@gi.main.jp), (2) Tokyo University of Agriculture, Tokyo, Japan, (3) University of Tsukuba, Tsukuba, Japan, (4) The University of Tokyo, Tokyo, Japan

Differences in drop size distribution (DSD) of leaf drips among tree species have been estimated and physically interpreted to clarify the leaf drip generation process. Leaf drip generation experiments for nine species were conducted in an indoor location without foliage vibration using an automatic mist spray. Broad-leaved species produced a similar DSD among species whose leaves had a matte surface and a second similar DSD among species whose leaves had a coated surface. The matte broad leaves produced a larger and wider range of DSDs than the coated broad leaves. Coated coniferous needles had a wider range of DSDs than the coated broad leaves and different DSDs were observed for different species. The species with shorter dense needles generated a larger DSD. The leaf drip diameter was calculated through the estimation of a state of equilibrium of a hanging drop on the leaves based on physical theory. The calculations indicated that the maximum diameter of leaf drips was determined by the contact angle, and the range of DSDs was determined by the variation in contact length and the contact diameter at the hanging points. The results revealed that leaf drip DSD changed due to variations in leaf hydrophobicity, leaf roughness, leaf geometry and leaf inclination among the different tree species. This study allows the modelization of throughfall DSD. Furthermore, it indicates the possibility of interpreting canopy water processes from canopy water storage to drainage through the contact angle and leaf drip DSD.

The part of this study is published in Nanko et al. (2013, Agric. Forest. Meteorol. 169, 74-84).