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Importance of the canopy wet-up phase for throughfall drop generation revealed by use of a large-scale rainfall simulator

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Throughfall drop size and its distribution are important for soil erosion in forest and forest water balance. An indoor experiment was employed to deepen our understanding of throughfall drop generation processes to promote better management of forested ecosystems. Throughfall drop generation was examined for four species– Cryptomeria japonica D. Don (Japanese cedar), Chamaecyparis obtusa Endl. (Japanese cypress), Betula platyphylla Sukaczev (Japanese white birch) and Zelkova serrata Thunb. (Japanese zelkova)– under both leafed and leafless conditions in the large-scale rainfall simulator in the National Research Institute for Earth Science and Disaster Resilience (Tsukuba, Japan) at varying rainfall intensities ranging from 15 to 100 mm h-1.

Drop size distributions of the applied rainfall and throughfall were measured by 20 laser disdrometers. Utilizing the drop size dataset, throughfall was separated into three components: free throughfall, canopy drip, and splash throughfall. The throughfall component percentage and drop size of canopy drip differed among tree species and rainfall intensities and by elapsed time from the beginning of the rainfall event. Preliminary analysis revealed that the time differences to produce branch drip as compared to leaf (or needle) drip was partly due to differential canopy wet-up processes and the disappearance of branch drips due to canopy saturation, leading to dissimilar throughfall drop size distributions beneath the various tree species examined.

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