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Canopy interception during rainfall, storm break time and after cessation of rainfall: experimental study using artificial Christmas trees

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Evaporation of canopy interception can be divided into three phases: evaporation during rainfall I_R, storm break time when it stops raining temporarily I_{Sbt}, and after cessation of rainfall I_{Aft}. In this study, I_R, I_{Sbt}, and I_{Aft} were measured using model forests, i.e. plastic Christmas tree stands. The method and preliminary results are described in Murakami and Toba (2013).

Christmas trees with original height of 65 cm (small tree) and 150 cm (large tree) were placed on three trays. Small trees were set on Tray #1. The same trees with height of 110 cm (extended using plastic rod) were placed on Tray #2, and large trees with height of 240 cm (raised using iron pipe) were set on Tray #3. The dimension of Tray #1 and #2 were a 180-cm square, and Tray #3 was a 360-cm square. Measurement was conducted under natural rainfall. Gross rainfall and net rainfall of each tray (discharge from each tray), in addition to single tree weight on Tray #1 and #3 were measured. Initial tree density of each tray was 41 trees per tray. Thinning was conducted in the middle of the experiment period and it was reduced to 25 trees per tray on Tray #2 and #3, but Tray #1 was unthinned.

Total rainfall for pre-thinning period was 204.2 mm with 16 rain events and canopy interception CI was 10.8% (22.0 mm), 13.9% (28.3 mm) and 16.3% (33.4 mm) of rainfall for Tray #1, #2 and #3, respectively. Amount of rainfall for after thinning period was 291.5 mm with 24 rain events and canopy interception was 12.7% (40.0 mm), 21.7% (63.3 mm) and 13.6% (39.7 mm) of rainfall for Tray #1, #2 and #3, respectively. It is noteworthy that canopy interception increased on Tray #2 after thinning.

I_R, I_{Sbt}, and I_{Aft} were calculated for each tray using gross rainfall, net rainfall and the weight of single tree. Before thinning the value of I_R/CI was 67.3% to74.9% and I_{Aft} occupied the remaining part of CI with I_{Sbt}/CI being nearly equal to zero. After thinning, I_R/CI ranged from 65.3% to 93.8%. Both before and after thinning periods I_R was major part of evaporation. The large values of I_R/CI would be explained by evaporation of small droplets produced by raindrops splashed onto the canopy surface (Murakami, 2006).

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References

Murakami, S. (2006): A proposal for a new forest canopy interception mechanism: Splash droplet evaporation, Journal of Hydrology, 319, 72-82.

Murakami, S., Toba, T. (2013): Experimental study on canopy interception using artificial Christmas trees to evaluate evaporation during rainfall and the effects of tree height and thinning. Hydrological Research Letters, 7, 91-96.