JWARP> Vol.2 No.10, October 2010

OPEN ACCESS

Micro-Droplet Flux in Forest and its Contribution to Interception Loss of Rainfall – Theoretical Study and Field

PDF (Size:0KB) PP. 872-879 DOI: 10.4236/jwarp.2010.210104

Author(s)

Huaxia Yao

ABSTRACT

A new approach to explain forest interception was proposed by introducing micro-droplets of crushed raindrops during rainfall. The aerodynamic diffusion and transfer of both vapour and micro-droplets from canopy to upper air were described and calculated, and proposed formulas applied to eight rainfall events at the Okunoi Experimental Station, Tokushima, Japan. Contributions from droplet transfer were 0.9-58.2 times of contributions from vapour transfer, taking a majority portion in total interception loss. Accounting only the vapour transfer or evaporation loss as estimated by Penman equation was not able to account for actual interception loss. The micro-droplet flux component took major portion in the two heavily rained events, and completely made up the interception as happened in October 2004. The droplet flux could accommodate a high interception rate, even when the air was nearly vapour-saturated and vapour flux was zero. This approach provided a new explanation to extraordinarily high interception rates.

KEYWORDS

Rainfall Interception, Micro-Droplet Transfer, Vapour Flux, Forest Canopy, Aerodynamic

Cite this paper

H. Yao, "Micro-Droplet Flux in Forest and its Contribution to Interception Loss of Rainfall – Theoretical Study and Field," *Journal of Water Resource and Protection*, Vol. 2 No. 10, 2010, pp. 872-879. doi: 10.4236/jwarp.2010.210104.

References

[1] V. T. Chow, D. R. Maidment and L. W. Mays, "Applied Hydrology", McGraw-Hill Book Company, New York, USA, 1988.

[2] R. Burkard, W. Eugster, T. Wrzesinsky and O. Klemm, "Vertical divergence of fogwater fluxes above a spruce forest," Atmospheric Research, vol. 64, 2002, pp. 133-145.

[3] G. M. Lovett, "Rates and mechanisms of cloud water deposition to a subalpine balsam fir forest," Atmospheric Environment, vol. 18, 1984, pp. 361-371.

[4] A. P. Dykes, "Rainfall interception from a lowland tropical rainforest in Brunei," Journal of Hydrology, vol. 200, 1997, pp. 260-279.

[5] J. Schellekens, F. N. Scatena, L. A. Bruijnzeel and A. J. Wickel, "Modelling rainfall interception by a lowland tropical rain forest in northeastern Puerto Rico," Journal of Hydrology, vol. 225, 1999, pp. 168-184.

[6] L. Zimmermann, C. Fruhauf and Ch. Bernhofer, "The role of interception in the water budget of spruce stands in the Eastern Ore Mountains/Germany," Physics and Chemistry of the Earth (B), vol. 24, 1999, pp. 809-812.

[7] M. Hashino, H. Yao and H. Yoshida, "Studies and evaluations on interception processes during rainfall based on a tank model," Journal of Hydrology, vol. 255, 2002, pp. 1-11.

[8] S. Murakami, "A proposal for a new forest canopy interception mechanism: splash droplet

• Open Special Issues
• Published Special Issues
• Special Issues Guideline

JWARP Subscription

Most popular papers in JWARP

About JWARP News

Frequently Asked Questions

Recommend to Peers

Recommend to Library

Contact Us

evaporation, " Journal of Hydrology, vol. 319, 2005, pp. 72-82.

[9] R. R. E. Vernimmen, L. A. Bruijnzeel, A. Romdoni and J. Proctor, "Rainfall interception in three contrasting lowland rain forest types in Central Kalimantan, Indonesia," Journal of Hydrology, vol. 340, 2007, pp. 217-232.

[10] M. Chang, "Forest Hydrology: An Introduction to Water and Forests," CRC Press LLC, Boca Raton, Florida, USA, 2006.