Geophysical Research Abstracts
Vol. 18, EGU2016-9732-1, 2016
EGU General Assembly 2016

Measurement and modelling of rainfall interception by tropical secondary forests in upland Eastern Madagascar

Chandra Prasad Ghimire (1), H.J. (Ilja) van Meerveld (2), Bob W. Zwartendijk (2), Maafaka Ravelona (3), Jaona Lahitiana (3), Maciek W. Lubczynski (1), and L. Adrian Bruijnzeel (4)

(1) Faculty of Geo-information and Earth Observation (ITC), University of Twente, Enschede, The Netherlands, (2) Hydrology and Climate Unit, Department of Geography, University of Zurich, Zurich, Switzerland, (3) Laboratorie des Radio-Isotopes, University of Antananarivo, Antananarivo, Madagascar, (4) Department of Geography, King's College London, United Kingdom

Secondary forests occupy a larger area than old-growth forest in many tropical regions but their hydrological functioning is still poorly understood. As part of a larger venture investigating the "trade-off" between the possibly strongly enhanced water use of vigorously regenerating secondary forest versus likely improved infiltration compared to degraded grassland (baseline situation) in Eastern Madagascar, this presentation reports on a comparison of measured and modelled canopy interception losses for a mature (ca. 20 years; basal area BA 35.5 m2 ha-1, LAI 3.39) and a young (5–7 years; BA 6.3 m2 ha-1, LAI 1.83) secondary forest. Measurements of gross rainfall (P), throughfall (TF) and stemflow (SF) were made in both forests over a one-year period (October 2014–September 2015). Interception losses (I) from the two forests were also simulated using the revised analytical model of Gash et al. (1995), representing a first for tropical secondary forest. Overall measured TF, SF and derived I in the mature secondary forest were 71.0%, 1.7% and 27.3% of incident P, respectively. Corresponding values for the young secondary forest were 75.8%, 6.2% and 18.0%. The high SF found for the latter forest reflects the strongly upward thrusting habit of the branches of the dominant species (Psiadia altissima) which favours funneling of incident P. The presently found I for the mature forest is similar to that reported for other tropical montane rainforests not affected by fog but that for the younger forest is higher than reported for similarly aged lowland forests. These findings can be explained by the prevailing low rainfall intensities and frequent occurrence of small rainfall events ($\sim$70% < 5 mm). The Gash model was able to reproduce measured cumulative I at both sites accurately and succeeded in capturing the variability in I associated with seasonal variability in rainfall characteristics, provided the TF-based value for wet-canopy evaporation rate was used instead of that based on the Penman-Monteith equation.

Key words: Secondary tropical forest, Stemflow, Throughfall, Gash's analytical interception model