GENERAL INFORMATION

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ABSTRACT

While the hydrological balance of forest ecosystems has often been studied at the annual level, quantitative studies on the factors determining rainfall partitioning of individual rain events are less frequently reported. Therefore, the effect of the seasonal variation in canopy cover on rainfall partitioning was studied for a mature deciduous beech (*Fagus sylvatica* L.) tree over a 2-year period. At the annual level, throughfall amounted to 71 % of precipitation, stemflow 8 %, and interception 21 %. Rainfall partitioning at the event level depended strongly on the amount of rainfall and differed significantly ($p < 0.001$) between the leafed and the leafless period of the year. Therefore, water fluxes of individual events were described using a multiple regression analysis ($R^2 > 0.85$, $n = 205$) with foliation, rainfall characteristics and meteorological variables as predictor variables. For a given amount of rainfall, foliation significantly increased interception and decreased throughfall and stemflow amounts. In addition, rainfall duration, maximum rainfall rate, vapour pressure deficit, and wind speed significantly affected rainfall partitioning at the event level. Increasing maximum hourly rainfall rate increased throughfall and decreased stemflow generation, while higher hourly vapour pressure deficit decreased event throughfall and stemflow amounts. Wind speed decreased throughfall in the growing period only. Since foliation and the event rainfall amount largely determined interception loss, the observed net water input under the deciduous canopy was sensitive to the temporal distribution of rainfall.

MATERIALS & METHODS

study area	5n (scientific zone, measuring tower)
time period	17/05/2002–16/05/2004
goal	- quantification of the partitioning of rainfall into throughfall, stemflow, and interception at the scale of individual rainfall events - study the influence of foliation, rainfall characteristics, and meteorology on the rainfall partitioning
set-up	a dominant beech tree - throughfall: 20 tipping-bucket rain gauges (Fig. 3.1 p 25, Staelens_2006_PhD) - stemflow measuring tower: precipitation (tipping bucket and manual rain gauges), meteorology

data collection	throughfall (5 min), stemflow (< 1 week), precipitation meteorology: net radiation, short-wave radiation (36 m), air temperature (1, 8, 15, 22, 29, 36 m), relative air humidity (22, 29 m), wind speed (29 m), wind direction (36 m), leaf wetness (15, 22 m): 10 min data
remarks	Chapter 3 of Staelens_2006_PhD the understory in an area of 15 m x 12 m around the beech tree was removed (tree n° 472 of the inventory of VandeWalle_etal_1998_rep)

RESULTS

The partitioning of rainfall into throughfall, stemflow, and interception is affected by rainfall characteristics, meteorology, and vegetation structure. Foliation and rainfall amount were the most important factors affecting rainfall partitioning. Wind speed and vapour pressure deficit were also key variables.