

GENERAL INFORMATION

author(s)	Staelens J, De Schrijver A, Verheyen K, Verhoest NEC
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supervisor	Verheyen K, Verhoest N
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ABSTRACT

Although the spatial heterogeneity of throughfall water (TF) under forest canopies has been related to vegetation structure in several forest types, few reports have been made of the driving factors of small-scale TF variability in deciduous stands. Therefore, the spatial variability of the amount of TF water under one dominant beech (*Fagus sylvatica* L.) tree was quantified in high temporal and spatial resolution over a 2-year period to examine the temporal stability of spatial TF variability and to relate spatial TF patterns to canopy cover determined photographically above each TF collector ($n = 48$). The spatial variability of TF was significantly higher during the leafed periods (coefficient of variation (CV) = 18%) than during the leafless periods (CV = 8%), and a strong negative relationship was observed between the CV of event TF and the TF fraction of rainfall in the open field. Geostatistical analysis showed that the cumulative TF water during the leafed periods was spatially correlated up to a distance of 3–4 m. There was a significant temporal stability of spatial TF patterns in the growing periods and in the dormant periods, but patterns differed largely between the two periods of the year. TF water during the growing periods significantly decreased with increasing canopy cover above the sampling locations ($r = -0.54$, $p = 0.014$, $n = 20$), but was more closely correlated with branch cover ($r = -0.77$, $p < 0.001$). However, the spatial pattern of TF during defoliated conditions was not related to the measured variation in branch cover.

MATERIALS & METHODS

study area	5n (scientific zone, measuring tower)
time period	17/05/2002–16/05/2004
goal	<ul style="list-style-type: none"> - quantification of the spatial heterogeneity of the water flux to the forest soil under a beech canopy - study of the temporal stability of spatial TF patterns - study the relationship between TF and canopy characteristics
set-up	a dominant beech tree <ul style="list-style-type: none"> - throughfall: 20 tipping-bucket rain gauges + 2 types of manual rainfall gauges: 28 with a large diameter, 50 with a small funnel diameter (Fig. 4.1 p 49, Staelens_2006_PhD) - canopy structure measuring tower: precipitation (tipping bucket and manual rain gauges), leaf wetness

data collection	TF: weekly - tipping bucket (17/05/2002–16/05/2004), 24 diam manual collectors (27/06/2002-16/05/2004), monthly - 14 diam funnels (June 2002–May 2004) leaf wetness (15, 22 m): 10 min data canopy structure: digital non-hemispherical photographs above each TF collector (August 2002, March 2003): PAI
remarks	Chapter 4 of Staelens_2006_PhD

RESULTS

As the length of the sampling period increased, the spatial variability of TF decreased and the temporal stability of the TF pattern increased. The branch cover was more closely related to the TF than the foliage structure. The TF patterns were less pronounced in the leafless period and could not be explained by the branch structure.