GENERAL INFORMATION

author(s)	Verbeke C
year	1999
English title	Determination of the transpiration in a mixed broadleaved forest based on sap flow measurements
original title	Bepaling van de transpiratie in een gemengd loofbos op basis van sapstroommetingen
reference	Msc thesis, Ghent University, Ghent
pages	138
type	dissertation (d2)
ecosystem service	regulating – water cycle
keywords	upscaling, sap flow
taxa	*Quercus robur*, *Fagus sylvatica*, *Fraxinus excelsior*
project	
supervisor	Lemeur R, Samson R
institution	Laboratory of Plant Ecology
document	pdf_short, hardcopy at the Laboratory of Plant Ecology
data	

MATERIALS & METHODS

study area	5n (measuring tower)
time period	August – November 1998
goal	Determination of the sap flow dynamics in branches (at 3 height levels for beech, 1 height level for ash) and stems (oak, beech, ash) in the Aelmoeseneie forest, and gaining insight into the relationship between sap flow and meteorological data. Calculate the transpiration of a mixed broadleaved forest via upscaling with Penman Monteith.
set-up	branches of beech (level 1, 2, 3) and ash (level 3) near the measuring tower: heat balance method stem of beech, ash, oak near the measuring tower: thermal dissipation technique
data collection	measuring tower: shortwave radiation, PAR, net radiation (10 min data), air temperature (10 min data), wind speed (hour data), air humidity (10 min data), precipitation (day data), soil heat flux (10 min data) sampled branches: sap flow, number of leaves (5 sample dates), leaf area (leaves sampled at other branches, 13 November), 17 August – 30 October, 10 min data stems: sap flow, 24 August – 23 November, 10 min data
remarks	data for upscaling from Samson_etal_1997_SilvGand_1 (LAI), Janssens_etal_1998_rep (circumference), Samson_etal_1997_SilvGand_22 (species composition),

RESULTS

Nine days were chosen: sunny (3), mainly sunny (3), cloudy (3). For these days, the changes in leaf wetness, precipitation, temperature, wind speed, relative humidity, shortwave radiation, PAR, net radiation, and sap flow are shown and discussed.

Between 18 August and 22 November, precipitation was 356.1 mm. The beginning of August and the end of September received little rainfall, and the soil was saturated with water during much of the sampling period. Branch sap flow rates were higher for ash, and - for beech - higher at level 3 than at level 1 and 2. Sap flow did not quit entirely during rainfall periods, and the saturation deficit and radiation seemed to

have the largest impact on sap flow. There was a time lag between sap flow and meteorological variables because of the internal water storage in the stem of the trees.

The sap flow at stem level showed a lag with precipitation. Sap flow rates decreased during the season, but showed a peak at the end of the growing season. Oak stayed physiologically active longest. Sap flow was correlated with relative humidity and temperature; wind speed showed no significant correlation. Beech showed the largest stem flow rate until mid September (followed by oak and ash). Ash showed some peaks before leaf fall in mid October. Ash and beech reacted faster on rain fall periods than oak.

A time lag occurred between sap flow in the branches and the stem, except for rainy days.

Estimated transpiration values were higher for beech (high LAI, high amount of sap wood). The heat balance method and the Penman Monteith equation were used to calculate stand transpiration and evapotranspiration.