GENERAL INFORMATION

author(s)	Denys T
year	2003
English title	Branch respiration dynamics of some tree and shrub species in the Aelmoeseneie forest
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project	
supervisor	Samson R, Lemeur R
institution	Laboratory of Plant Ecology
location	short_pdf, hardcopy at the faculty library
data	

MATERIALS & METHODS

study area	5n (measuring tower)
time period	August 2002 - May 2003
goal	- understanding the branch respiration dynamics - mathematical description of the branch respiration based on meteorological variables - integrate the branch respiration equations in the FORUG model
set-up	3 hazel shrubs, 3 sycamore maple shrubs, 1 ash tree, 1 beech tree close to the measuring tower
data collection	- branch temperature (beech, 2 hazel shrubs, 2 sycamore maple shrubs): 14 April- 8 May, thermo couples, 1 branch per tree/shrub - respiration (ash, beech, 2 hazel shrubs, 2 sycamore maple shrubs) o soda lime (integrated measure): 30 August-16 September (flexible cuvette), 16 September-8 October (rigid cuvette), 22 October – 19 November (PVC cylinder cuvette), 19 November – 07 May (PVC cylinder + extra cylinders); 3 branches per species (for beech 3 branches at the 3 height levels) o IRGA (continuous): different set-ups between 27 August and 31 January, final set-up between 31 January and 8 May; beech 7m, hazel 2m - air temperature (at 1, 7.5, 14.6, 21.6, 28.6, 35.6 m above ground level; 5-10 min data), Pt100 sensors
remarks	

RESULTS

A linear relationship was found between air and branch temperature. No time dilatation was found between air temperature and branch temperature.

The soda lime method gave branch respiration values comparable with the values found in literature. However, two problems arose with this method. 1) because of strong winds (certainly at the 21 m level),

the soda lime escaped from the cuvettes, got wet, and the measurements could not be used; 2) it was difficult to close the cuvettes hermetically.

The IRGA method gave a lot of problems. The measuring instrument seemed to be little sensitive, and showed also a systematic measuring error.

The branch respiration showed a seasonal pattern: maximum respiration at the end of the summer, minimum respiration during winter. Peak values occurred after periods of frost and during flushing. Branch respiration did not differ between the studied species, nor between the different measuring heights in the beech crown. Yet, the branch respiration of the top level (21 m) differed significantly from the branch respiration at shrub level (1.5 m).

The exponential relationship between air temperature and branch respiration had a low coefficient of determination (R^2 = 0.17-0.40). To implement the branch respiration in FORUG, equations were parameterized for the tree and shrub layer separately. When compared to the models of VanHecke_2002_th, the branch respiration was lower than the stem respiration.

The model was applied to the 1997 data for the Aelmoeseneie forest. The branch respiration of the tree layer was much larger than that of the shrub layer, because of the larger branch surface. The calculated values were 2 ton C/ha respiration coming from aboveground woody parts (0.3 ton C branch respiration), or 1.7 ton C/ha if the calculation was done with a temperature-dependent Q10 parameter.