

GENERAL INFORMATION

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ABSTRACT

The effect of canopy phenology on major ion fluxes beneath a mature European beech (*Fagus sylvatica* L.) tree is examined. Annual and seasonal ion fluxes to the forest floor were significantly higher than the incoming wet-only deposition for all ions measured other than H⁺. The annual throughfall to wet deposition ratio generally ranged from 2.1 to 4.8. Stemflow contributed 9-19 % of the ion input to the forest floor, except for H⁺. Throughfall enrichment of K⁺, Ca²⁺, Mg²⁺, and NO₃⁻ was significantly higher in the leafed than in the leafless season, in contrast to Na⁺, NH₄⁺, and H⁺. The temporal pattern of ion enrichment indicated canopy release of K⁺, Ca²⁺, and Mg²⁺ throughout the leafed season, of Na⁺, Cl⁻, and NH₄⁺ from emerging leaves, and of Cl⁻ and SO₄²⁻ from senescing leaves. The contribution of canopy leaching to annual net throughfall and stemflow was estimated at 96 % (K⁺), 54 % (Ca²⁺) 40 % (Mg²⁺), 12 % (Cl⁻), and 7 % (Na⁺, SO₄²⁻). Dry deposition accounted for 58-75 % of the total deposition onto the canopy. The throughfall enrichment during the leafless season indicated high particulate and gaseous dry deposition onto the woody canopy as well as K⁺ release from European beech branches.

MATERIALS & METHODS

study area	5n (scientific zone, measuring tower)
time period	March 2003–2004
goal	<ul style="list-style-type: none"> - quantification of the throughfall and stemflow ion deposition beneath a beech tree - study of the effect of seasonal changes in canopy cover and phenology on throughfall and stemflow chemistry - estimation of the ion exchange within the deciduous canopy for each phenological canopy phase
set-up	a dominant beech tree <ul style="list-style-type: none"> - leaf emergence, fully leafed period, leaf senescence, leafless period - throughfall: 12 collectors (Fig. 5.1 p 71, Staelens_2006_PhD) - stem flow measuring tower: wet-only and bulk precipitation (tipping bucket and manual rain gauges)
data collection	bulk precipitation & TF: weekly (04/03/2003–04/03/2004) wet-only precipitation: weekly (04/03/2003–09/12/2003)

	stem flow: at least weekly (04/03/2003–04/03/2004) weekly analysis until December 2003, biweekly afterwards pH, conductivity, NO ₃ , SO ₄ , PO ₄ , Cl, NH ₄ , K, Ca, Mg, Na
remarks	Chapter 5 of Staelens_2006_PhD

RESULTS

Foliation and canopy phenology influenced the chemical enrichment of throughfall and stemflow water, differently for the various ions. The excretion of weak acids by leaves was highest during leaf emergence and the fully leafed period. Throughfall enrichment was higher during the leafed period, but was also observed during the leafless period (for all ions except H⁺). K and Ca were leached from the beach branches during rainfall in the leafless period. The estimated contribution of dry deposition of seasalt-derived aerosols, S, and reduced N was similar on the leafless and leafed canopy.