## GENERAL INFORMATION

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## ABSTRACT

This paper focuses on the quantification of the green – vegetation related – water flux of forest stands in the temperate lowland of Flanders. The underlying reason of the research was to develop a methodology for assessing the impact of forests on the hydrologic cycle in comparison to agriculture. The tested approach for calculating the water use by forests was based on the application of the soil water balance model WAVE. The study involved the collection of data from 14 forest stands, the calibration and validation of the WAVE model, and the comparison of the water use (WU) components – transpiration, soil and interception evaporation – between forest and cropland.

For model calibration purposes simulated and measured time series of soil water content at different soil depths, period March 2000–August 2001, were compared. A multiplesite validation was conducted as well. Actual tree transpiration calculated with sap flow measurements in three forest stands gave similar results for two of the three stands of pine (*Pinus sylvestris* L.), but WAVE overestimated the actual measured transpiration for a stand of poplar (*Populus* sp.).

A useful approach to compare the WU components of forest versus cropland is scenario analysis based on the validated WAVE model. The statistical Profile Analysis method was implemented to explore and analyse the simulated WU time series. With an average annual rainfall of 819 mm, the results reveal that forests in Flanders consume more water than agricultural crops. A 30 years average of 491mm for 10 forests stands versus 398mm for 10 cropped agricultural fields was derived. The WU components, on yearly basis, also differ between the two land use types (transpiration: 315 mm for forest and 261 mm for agricultural land use; soil evaporation: 47 mm and 131 mm, for forest and cropland, respectively). Forest canopy interception evaporation was estimated at 126 mm, while it was negligible for cropland.

## MATERIALS & METHODS

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| **study area** | 5n |
| **time period** | 01/03/2000 – 31/08/2001 |
| **goal** | Comparison of the water use of forests and agricultural fields. |
| **set-up** | 14 forest stands with different tree species and soils: 8 plots for calibration (e.g., Gontrode), 6 for validation |
| **data collection** | 6 undisturbed soil samples per diagnostic soil horizon: water retention curve, hydraulic conductivity relation<br>2 TDR probes: soil moisture content<br>10 throughfall collectors + tipping bucket: water volume |
| **remarks** | Fig. 1 p 229: set-up data collection |

## RESULTS

Statistical analysis of the simulated and observed SMC at different depths of the soil profile leads to the conclusion that an accurate description of the root water extraction function remains a bottle-neck.

Poplar stands consumed more water than pine stands, but the contribution of interception was much smaller for pine stands. During periods with a high atmospheric water demand (summer), the contribution of the canopy interception evaporation to the total amount of the actual evapotranspiration was lower, while the actual transpiration became a larger fraction of the actual evapotranspiration. Furthermore, it has been shown that the simulated transpiration for two plots corresponded well with the results of sap flow measurements.