



Temporal variation of transpiration and latent heat fluxes from isolated linden crowns and lawns in a park at Strasbourg, France

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Title: Temporal variations of transpiration and latent heat fluxes from isolated linden crowns and lawns in a park at Strasbourg, France

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Abstract (2500 charac. Max.)

In a context of global climate change, mitigating the “urban heat island” effect is becoming an urging necessity with respect to human health. Among the different mitigating strategies, increasing the vegetated surface areas, such as trees and lawns, is thought to induce a cooling effect by increasing the latent heat flux (E) from the transpiring plants. However, there is nearly no information on direct assessment of plant transpiration to the total latent heat flux of a city center.

The aim of this study is to estimate the latent heat flux emitted by a lawn surface (E_L) and isolated linden crowns (E_T) in the city centre of Strasbourg (France), and to characterize the seasonal evolution of these fluxes with respect to atmospheric and soil variables.

Six adult linden (*Tilia tomentosa*) trees grown in an urban park were equipped with Granier’s thermal dissipation probes for continuously monitoring the total crown transpiration starting from April 2013. The estimated total sap flux was assumed to be the total transpiration and converted into E_T . The E_L values were measured manually on two measurement locations using a closed chamber system during five summer diurnal cycles. Both E_T and E_L were expressed on ground surface area basis.

During the growing season, the E_T varied daily, according to the main meteorological variables (global radiation, air temperature, vapor pressure deficit). The maximum E_T values ranged from 183 W.m⁻² to 284 W.m⁻² during August, according to the crown size (and location). In comparison, the maximum E_L values ranged from 290 W.m⁻² to 302 W.m⁻². When compared to the ETP values, the E_T /ETP ratio increased from budburst to mid June according to leaf area development. The ratio remained rather steady within the 0.3-0.4 range (regarding the trees) until October. In late summer and autumn, the E_T /ETP dropped below 0.1 several days, indicating a possible stomatal regulation of E_T in response to soil water limitation. Further analyses will be conducted to better assess the water balance dynamics in this urban park. The daily variations in diameter of the trees, which reflect their hydric status dynamics, will be compared to stomatal closure. The measured values of linden and lawn transpiration will be used for validating the estimates of latent heat flux performed by the eddy correlation method on the same site.

Keywords: Urban park, Tree, lawn, Transpiration, Sap-flow