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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Technical note: An experimental setup to measure latent and sensible heat fluxes from (artificial) plant leaves" *by* Stanislaus J. Schymanski et al.

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Dear Prof. Savenije,

Thank you for your supportive review and for your suggestions. We will modify the sentence on L395 in the following way:

"In addition to the discovery of surprisingly strong temperature gradients between the two sides of a hypostomatous leaf (this study), previous experiments using the same setup have already led to the discovery of inconsistencies in the widely used Penman-Monteith equation for transpiration, mainly resulting from the neglect of two-sided sensible heat exchange by planar leaves (Schymanski and Or, 2017)."

We will also add the missing bracket in L.202, thanks for pointing this out.

We have inspected Fig. 9 again, and found that Panels (a) and (b) are a bit tricky to compare due to different axes scaling. To make the comparison easier, we re-drew the figure with common axes and added dashed lines to the points of correspondence (see attached Fig. 1). The points of correspondence should be at 1 m/s in 9a, i.e. slightly to the right of the left-most data points, and at 1.2-1.34 kPa in 9b, i.e. not on the right but roughly in the middle of the panel. At these points, the simulated values in 9a and 9b correspond very closely, whereas the observed net energy fluxes in 9a (second panel from top) deviate from the simulated by 60 W/m2, resulting in a mismatch between 9a and 9b in the observed values. We will explain this more clearly in the revised document.

Best regards,

Stan Schymanski, Dani Breitenstein and Dani Or

Full figure caption for attached figure: Artificial leaf with wet surface on the lower side (no stomatal resistance), under (a) varying wind speed and (b) varying vapour pressure. Numerical model results (lines) based on the same boundary conditions as observations (symbols). Red dashed lines indicate conditions in the plots where the forcing was roughly equivalent between Panels (a) and (b). E_l: latent heat flux; H_l: sensible heat flux; $R_s - R_{ll}$: absorbed net radiation; $T_l - T_a$: leaf-air temperature difference; g_{tw}: total leaf conductance to water vapour; h_c: convective heat transfer coefficient; "bulk": bulk leaf temperature model; "2s": model based on different leaf temperatures on both leaf sides. Boundary conditions: $g_{sw} = 999$ m s^{-1}; $R_s = 0$; $T_a = 295.4 - 295.6$ K (a) and $295.4 - 296.6$ (b); $P_{wa} = 1200 - 1342$ Pa (a); $v_w = 1.0$ m s^{-1} (b); $k_l = 0.1$ W K^{-1} m^{-1}; $z_l = 0.5$ mm.

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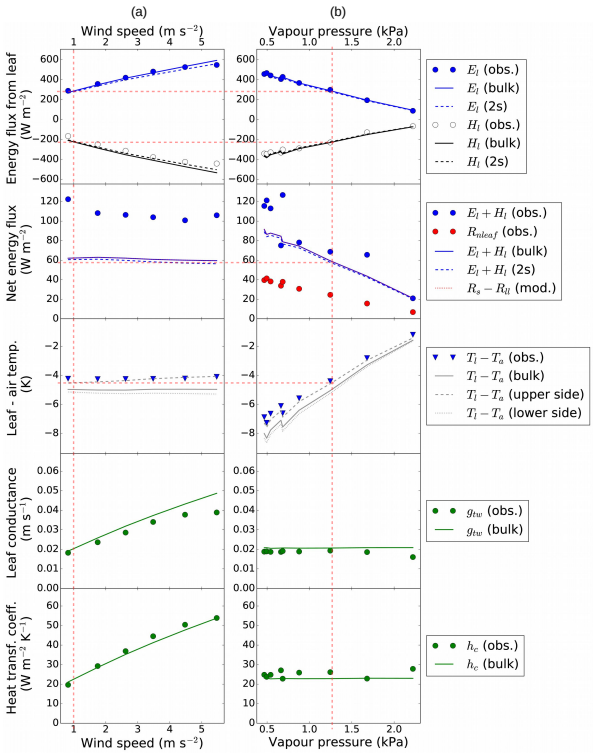

Fig. 1. Revised Fig. 9. (See main text for full figure caption.)