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Assessment of eddy covariance energy balance closure scenarios using water balance modelling and volumetric water content measurements

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Eddy covariance (EC) is widely used method to measure evapotranspiration and other energy and trace fluxes in the soil-plant-atmosphere continuum. One of the broadly discussed issues of the EC method is the lack of energy balance closure (EBC). In the presented study, we aimed to evaluate different EBC scenarios using a water balance model that by definition follows mass conservation law to indicate which EBC scenario is more likely. We used *in-situ* measurement of latent heat (*LE*) and sensible heat (H) flux by EC and treated them in three EBC scenarios. Namely: i) H adjustment – the entire lack of EBC is assigned to H (hence *LE* remained as measured); ii) Bowen ratio adjustment – the lack of EBC is distributed to both H and *LE* according to Bowen ratio; iii) *LE* adjustment – the entire lack of EBC is assigned to *LE*. The three versions of *LE* were than used as an input for the soil water balance model and volumetric water content (*VWC*) simulated. The simulated *VWC* was compared to the measured *VWC* and the agreement between the measured and simulated *VWC* was used as an indication of the most likely EBC scenario.

Experiment took place in an agricultural field in Polkovice (the Czech Republic) in 2015-2016 over spring barley and winter wheat. Eddy covariance system was installed 2.7 m above ground surface and *VWC* was recorded using time domain reflectometry probes in three depths. Available energy in the ecosystem was measured by net radiometer and two soil heat flux plates.

Preliminary results showed that assigning entire energy residuum to *LE* in unlikely as it would lead to very high water uptake and consequently very low *VWC*, which was not supported by the *VWC* measurement. Therefore, we conclude that the either the Bowen ratio adjustment or assigning the entire residuum to H is more likely. More detailed results will be presented at the conference.

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