Geophysical Research Abstracts
Vol. 14, EGU2012-7336, 2012
EGU General Assembly 2012

Energy balance closure evaluation based on closed path and enclosed path eddy covariance measurements

R. Slipkova (1), P. Sedlák (2), R. Pokorný (1,3)

(1) Global Change Research Center AV CR, v.v.i., Bělidla 4a, CZ-603 00 Brno, Czech Republic (slipkova.r@czechglobe.cz), (2) Institute of Atmospheric Physics, Academy of Sciences of the Czech Republic, Boční II/1401, CZ-14131 Praha, Czech Republic, (3) Departement of Silviculture, Faculty of Forestry and Wood Technology, Mendel University, Zemědělská 3, CZ-613 00 Brno, Czech Republic

Evapotranspiration has a great role in the water cycle of the terrestrial ecosystems. A large number of methods for measuring and estimating *LE* do exist. *LE* measured by eddy-covariance technique is usually underestimated. In case of heat flux without phase changes of water, sensible heat flux (H), there is a similar situation. Available energy for turbulent *LE* and H fluxes can be estimated by energy balance closure (*EBC*) approach almost independently of the eddy-covariance (*EC*) technique. Enclosed path *EC* system is supposed to measure *LE* fluxes more precisely compared to closed path *EC* system due to short inlet tubes etc. *EBC* was defined as *Rn*-$G - J = H$+*LE*, where available energy consists of net radiation balance (*Rn*), soil heat flux (G) and heat storage term (J). The heat storage term expresses instantaneous change of heat inside the vegetation cover. This extra term should be specified when EBC is applied for forest study sites. Imbalance between available energy and energy used for turbulent fluxes H and *LE* is known as a lack of energy balance closure. A mean imbalance varies in order of 20% in FLUXNET study sites at mediterranean, temperate and arctic ecosystems. We have performed a simultaneous measurement of *LE* and H by closed path (with analyser LI-7000) and enclosed (with analyser LI-7200) EC systems in young spruce forest from August to September 2011. In case of closed path eddy covariance system, there was no correction for adsorption of water on the tubing system. Raw data were post-processed using software EddyPro 3.0. Days with rain events were included. The aim of this study was to (i) quantify available energy by *EBC* from micrometeorological parameters and biomass temperature measurement, (ii) to evaluate *EBC* calculated by both EC systems and (iii) to evaluate possible differences between *LE* fluxes expressed in evapotranspiration term for both EC systems too.Mean daytime lack of energy balance closure for enclosed path and closed path EC systems were about 27% and 48%, respectively. Mean LE fluxes measured by enclosed path EC were significantly higher ($t = 4.99$, $df = 53$, $p << 0.0001$). The mean daily actual evapotranspiration measured by enclosed path EC system was 1.33 mm and 0.52 mm by closed path EC system in August. Mean H fluxes measured by enclosed path EC system were approx. 13% higher compared to closed path EC system.Enclosed path EC system was found as a suitable tool for energy balance closure and *LE* measurement. Additional correction of the water vapour fluxes measured by the closed path EC system (Ibrom et al. 2007) must be applied.

Acknowledgement

The research under CzechGlobe (CZ.1.05/1.1.00/02.0073) and the National Infrastructure for Carbon observation – CzeCOS/ICOS was supported by Ministry of Education of the CR (LM2010007).