Geophysical Research Abstracts,
Vol. 11, EGU2009-10339, 2009
EGU General Assembly 2009

Analysis of the energy balance closure as function of atmospheric stability and wind velocity at 27 European FLUXNET sites

H.-J. Hendricks Franssen (1,2), R. Stöckli (3), I. Lehner (1), and S.I: Seneviratne (1)

(1) ETH Zurich, Institute for Atmospheric and Climate Science,8092 Zurich, Switzerland (hendricks@ifu.baug.ethz.ch, irene.lehner@env.ethz.ch, sonia.seneviratne@env.ethz.ch), (2) ETH Zurich, Institute of Environmental Engineering, 8093 Zurich, Switzerland., (3) Meteoswiss, 8044 Zurich, Switzerland

It was shown in several studies that the energy balance (EB) closure at eddy-covariance (EC) flux tower sites tends to improve for more unstable conditions and increased wind velocity. We present here an investigation for 27 European FLUXNET sites, where we analyzed the EB closure as a function of the stability parameter ξ and the wind velocity. Both an analysis for the individual sites and a multi-site synthesis for 20 sites (and around half a million of data) with tall vegetation showed that the EB deficit is larger for (very) unstable conditions ($\xi <$ -0.5) than for less unstable conditions (-0.1 $< \xi <$ -0.5). An analysis of the EB deficit as function of the wind velocity showed that the deficit first decreases for higher wind velocities, but reaches a minimum for 3.5 ms^{-1} and then increases significantly for higher wind velocities. As the stability parameter also depends on the wind velocity, the EB deficit was additionally analyzed simultaneously as function of ξ and wind velocity. This further analysis confirmed that the EB deficit is significantly worse for very unstable than for less unstable conditions independent of the wind velocity. Also the increase of the EB deficit for wind velocities larger than 3.5 ms^{-1} cannot be explained from changes in atmospheric stability or the sensible heat flux density. We conclude that it is relevant to analyze systematic errors in EC data as non-linear functions of multiple variables. An improved procedure to handle the EB closure of EC data will help to improve the assessment of land-atmosphere exchanges of water and carbon dioxide over ecosystems.