

***Interactive comment on “Towards a more  
harmonized processing of eddy covariance CO<sub>2</sub>  
fluxes: algorithms and uncertainty estimation” by  
D. Papale et al.***

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The paper is important for understanding the uncertainties of carbon uptake of forests. The paper is well written and can be published with minor modifications in ‘Biogeosciences’.

However, the title as well as some other parts of the text can be misunderstood thus, ‘Eddy covariance fluxes’ should be replaced by ‘NEE’ as NEE can be determined as a sum of the turbulent flux (eddy covariance), the storage and advection term (see relevant equations, e.g. in Aubinet et al., 2003). You discuss in the paper mainly the last two parts of the equation and not the eddy covariance part. The eddy covariance is

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only included in your discussion on when it fails to work and must be replaced because of low turbulence ( $u^*$  criteria). In discussion of the problems of the eddy covariance method on page 965, line 8-10, the given references are not very relevant and a private communication is not necessary when many papers are available (see e.g. Lee et al., 2004).

Furthermore, spikes are extreme errors of single values in a time series for which correction methods are available (Højstrup, 1993; Vickers and Mahrt, 1997). The errors of mean (30 minutes) values, however, can be caused by spikes but also by biophysical reasons as you discussed. Perhaps in this context, you can replace spike by another term or you can give a more precise definition what you mean.

You discuss on p. 964, line 14ff that the  $u^*$  criteria can not fully justify the reason for unrealistic data. Have you thought about other criteria which can do this (Ruppert et al., 2006). Unfortunately these criteria can not be applied on mean values but only raw data.

Some minor remarks: Göckede et al (2004) should be replaced by Göckede et al. (2006), or the second reference should be added.

Give the full text for ANOVA.

You should not mix  $u^*$  and  $U_{star}$ , e.g. in Table 2 (caption and Table) Fig. 5, 6: please include in the Figures a, b, c.

References:

Aubinet, M., Heinesch, B. and Yernaux, M., 2003. Horizontal and vertical CO<sub>2</sub> advection in a sloping forest. *Boundary-Layer Meteorology*, 108: 397-417. Göckede, M., Markkanen, T., Hasager, C.B. and Foken, T., 2006. Use of footprint modelling for the characterisation of complex measuring sites. *Boundary-Layer Meteorology*, 118: 635-655.

Göckede, M., Rebmann, C. and Foken, T., 2004. A combination of quality assessment

tools for eddy covariance measurements with footprint modelling for the characterisation of complex sites. *Agricultural and Forest Meteorology*, 127: 175-188.

Højstrup, J., 1993. A statistical data screening procedure. *Measuring Science Technology*, 4: 153-157.

Lee, X., Massman, W.J. and Law, B. (Editors), 2004. *Handbook of Micrometeorology: A Guide for Surface Flux Measurement and Analysis*. Kluwer, Dordrecht, 250 pp.

Ruppert, J., Mauder, M., Thomas, C. and Lüers, J., 2006. Gap-filling strategy for annual sums of CO<sub>2</sub> net ecosystem exchange based on a new quality assessment. *Agricultural and Forest Meteorology*, 138: 5-18

Vickers, D. and Mahrt, L., 1997. Quality control and flux sampling problems for tower and aircraft data. *Journal of Atmospheric and Oceanic Technology*, 14: 512-526.

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