

Estimating random uncertainty of flux measurements by the eddy covariance technique

I. Mammarella*, O. Peltola, Ü. Rannik and T. Vesala

Department of Physics, University of Helsinki, P.O. Box 48, Helsinki 00014, Finland

*Corresponding author: ivan.mammarella@helsinki.fi

The large variability in flux estimates is inherent to turbulent flux observations. We review different error estimates used to characterize the random errors of eddy covariance (EC) flux measurements. Flux errors are calculated using measured turbulent records. We recommend two flux errors with clear physical meaning: the flux error of the co-variance, defining the total random error of the measured flux over turbulent record of typically 30 min to 1 hour duration; and the error of the flux due only to the instrumental noise. We use EC measurements of scalars from different sites (forest, lake and wetland) characterised by low as well as high signal-to-noise ratios. We suggest that the numerical approximation by Finkelstein and Sims (2001) is useful in calculation of the total random error. For the error due to instrumental noise the method by Lenschow et al. (2000) is useful in evaluation of the flux error. Limitations of these two methods as well as other available methods are analysed and discussed.

References

Finkelstein, P. L. and Sims, P. F.: Sampling error in eddy correlation flux measurements, *J. Geophys. Res.*, 106, NO. D4, 3503-3509, 2001.

Lenschow, D., Wulfmeyer, V. and Senff, C.: Measuring second- through fourth-order moments in noisy data, *J. Atmos. Ocean. Technol.*, 17, 1330-1347, 2000.