Using Measured Variances to Compute Surface Fluxes and Dry Deposition Velocities: A Comparison With Measurements From Three Surface Types

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ABSTRACT *Fluxes of temperature, water vapour, O_3, SO_2 and CO_2 were estimated from the measurement of their variances, taken over a wetland region in northern Ontario (Canada) during the summer of 1990 and over a deciduous forest when it was fully leafed during the summer of 1988 and when it was leafless during the winter of 1990. A set of flux-variance relations was employed, including empirical forms of universal functions that could be adjusted with some constants. Results from the present study show that these constants needed to be adjusted with site-specific data in order to achieve a closer agreement between estimated and observed fluxes. Best estimates were obtained for the fluxes of temperature and water vapour and it was found that the flux estimates of O_3, SO_2 and CO_2 correlated better with water vapour than with temperature. For these trace gases the flux-variance method yielded estimates of dry deposition velocities that were either comparable with or larger than those obtained from a resistance analogue model. Both methods yielded values that overestimated the observed dry deposition velocities. The employment of the flux-variance method in an operational network would require the use of fast-response sensors and a*