Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2017-638-RC2, 2017

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Turbulent and non-turbulent exchange of scalars between the forest and the atmosphere at night in Amazonia" *by* Pablo E. S. Oliveira et al.

Anonymous Referee #2

Received and published: 2 October 2017

The authors analyzed nighttime vertical fluxes of heat, water vapour, carbon dioxide, and ozone within and above a rainforest. They used multiresolution decomposition to determine the scales of atmospheric motions contributing to the vertical fluxes, focusing on low-frequency, non-turbulent fluctuations. I suggest rejection of the current manuscript because the authors failed to address a fundamental issue that no sonic anemometer can be aligned perfectly with the vertical direction perpendicular to the underlying surface. One may use a plumb bob to align sonic anemometer with the vertical direction, but an error of one or two degrees is expected over flat topography, and the error can be larger over slopes. One can use coordinate rotation techniques in the post-processing, but an uncertainty of two degrees still exists (e.g., Forken et al. 2004;

Vickers and Mahrt 2006). Aubinet et al. (2003) highlighted that "The 2^o offset would induce systematic errors on the vertical velocity up to 0.05 m s^{-1} under typical stable conditions and up to 0.11 m s^{-1} under near-neutral conditions. The resulting error in the vertical advection flux in the presence of a 10 μmol mol^{-1} vertical CO_2 concentration difference may be as high as 5 μmol m^{-2} s^{-1}". The errors in sonic coordinate system estimates would convert a few percent of variation in horizontal velocity components to variation in the vertical velocity component. On low-frequency, non-turbulent scales, horizontal velocity components are typically two orders of magnitude larger than the vertical velocity component. Consequently, the artificial variation induced by errors in sonic coordinate system estimates is at least comparable to the true variation in vertical fluxes on low-frequency, non-turbulent scales. Using eddy-covariance measurements to draw conclusions about low-frequency, non-turbulent vertical fluxes does not make sense unless the authors can distinguish true variation in vertical fluxes and artificial variation inherited from horizontal velocity components due to errors in the sonic coordinate system estimates. This fundamental issue must be resolved before the manuscript can go to more detailed review.

References

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Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2017-638, 2017.