Atmos. Chem. Phys. Discuss., 14, C5049–C5050, 2014
www.atmos-chem-phys-discuss.net/14/C5049/2014/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Observations of the scale-dependent turbulence and evaluation of the flux-gradient relationship for sensible heat for a closed Douglas-Fir canopy in very weak wind conditions" *by* D. Vickers and C. Thomas

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Received and published: 17 July 2014

C. Thomas and D. Vickers, Additional responses, 17-Jul-2014

- 'Vanishing relatively large momentum fluxes at 16m during the day': We assume that the reviewer refers to the slight increase in spectral density at the smallest time scales. Carefully examining both ensemble-averaged spectra yields that these motions occur during both day- and nighttime intervals, with about the same

magnitude and sign at 0.25 m^2 s^{-2}. However, the y-axis scale for the daytime data is different from that at night since the main peak around 60 s is much larger in spectral density, so it's difficult to see the contribution of the smallest motions. As pointed out in the first authors' comments, the error bars indicate that this contribution at the smallest scales is highly variable in both magnitude and sign, and thus their behavior in the ensemble-averaged spectra should not be physically overinterpreted.

- 'Significance of large negative signals of $\overline{u'w'}$ and $\overline{v'w'}$ at $\approx$ 1000s': The presented spectra are an ensemble-average over more than 8200 individual 30-min spectra, and error bars indicate that this peak is statistically significant. One would expect the momentum transport to be negative, i.e., directed toward the ground, but it is surprising that is the dominant signal. We currently don't have a sound physical explanation for the occurrence of these motions, but note that non-turbulent submeso-motions are largely responsible for the sub-canopy flow and transport of heat at this site as found in Thomas (2011).

Cited literature

1. Thomas CK. Variability of subcanopy flow, temperature, and horizontal advection in moderately complex terrain. Boundary-Layer Meteorol. 2011;139:61-81. doi:DOI: 10.1007/s10546-010-9578-9.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 11929, 2014.