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Advection due to the surface inhomogeneity can lead to systematic errors in the Net Ecosystem Exchange (NEE) estimation in plant canopies. Mean concentrations of carbon dioxide and water vapor were measured at 8 heights in the vertical, and in 9 horizontal locations at the 2 m and 30 m heights, to assist in estimation of the mean advection and storage terms in the NEE equation.

The experiment site is located in old-growth Douglas-fir forest in southern Washington state. The canopy is 65 m tall. Air temperature, wind speed and direction, relative humidity and photosynthetically active radiation are measured at 6 levels in an 83 m high tower.

Eddy-covariance of vertical carbon dioxide and water vapor fluxes are also measured at 3 m and 70 m.

The horizontal advection through whole canopy is examined relative to eddy-covariance at top of the canopy for daytime, nighttime, and seasons, respectively. The vertical advection and storage is also compared to eddy-covariance exchange. The horizontal advection at 3 m is examined to estimate the portion of the under-story exchange.

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