Seasonal carbon fluxes for an old-growth temperate forest inferred from carbonyl sulphide

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Characterizing and quantifying the processes that control terrestrial ecosystem exchanges of carbon and water are critical for understanding how forested ecosystems respond to a changing climate. A small but increasing number of studies has identified carbonyl sulfide (OCS) as a potential tracer of canopy photosynthesis and stomatal function. Here we present seasonal fluxes of OCS from a 60m tall old-growth temperate forest. An off-axis integrated cavity output spectroscopy analyzer (Los Gatos Research Inc.) was deployed at the Wind River Experimental Forest in Washington (45.8205°N, 121.9519°W) in 2014 and 2015. GPP (Gross Primary Production) is inferred from OCS fluxes and compared with estimates derived from measurements of NEE (Net Ecosystem Exchange) from eddy flux data as well as GPP predictions using a process based model. Our findings seek to resolve scientific questions regarding ecosystem carbon exchange from tall old growth forests, which have a complicated vertical leaf area structure, high above ground biomass and amount and aerial cover of epiphytic vegetation. Estimates of canopy conductance calculated using tower flux data are also combined with measurements of stable isotopologues of CO_2 to infer emergent ecosystem properties such as canopy ci/ca and water use efficiency.