

A Southern Washington Chronosequence Study: The Impact of Interannual Climate Variability on Ecosystem Exchange of Carbon, Water, and Energy in a Newly Established and Old-Growth Coniferous Forest

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The T.T. Munger Research Natural Area of southern Washington provides a unique opportunity to study carbon exchange between coniferous forests and the atmosphere in a region that experiences a significant amount of forest harvesting disturbance and interannual climate variability. Here we present initial biometeorological measurements of carbon and water exchange at a 10 year old Douglas-fir stand with the goal of gaining information on how regional climate change will affect the carbon and hydrological budgets of a newly established forest. The young forest is 1.25 km from the Wind River Canopy Crane Research Facility, an AMERIFLUX site that has been continuously measuring carbon, water, and energy fluxes at an old-growth forest since 1998. Though still in its infancy, data from this chronosequence study will be used to quantify how sensitive net ecosystem exchange (NEE) of carbon is to interannual climate variability at different aged stands of the Washington western Cascades.

Because the young stand is in close proximity to the old-growth forest, the climates at both forests will be identical, though the microclimates will not. The response in NEE at the young stand during the seasonal drought may be very different from that at the old-growth forest due to dissimilar canopy understory composition, which will lead to site differences in soil moisture and soil temperature. How this affects respiration rates and photosynthetic rates at both stands is one of the questions that will be addressed by this study. As the chronosequence study progresses, we hope to show any sensitivities that a newly established forest has to climate variability and in conjunction with data from the old-growth stand, give the global carbon community important information on the forest carbon sequestration potential of the Pacific Northwest.

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