Poster #1-36

Impacts of Elevated CO_2 and Whole Ecosystem Warming on Photosynthesis and Respiration of Two Ericaceous Shrubs in a Northern Peatland

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The Spruce and Peatland Responses Under Changing Environments (SPRUCE) project is a large-scale, long-term experiment investigating the effects of warming and elevated CO_2 on an ombrotrophic bog in Minnesota. Globally, such northern peatlands store an estimated 500 ± 100 Pg C, a disproportionately large amount relative to the land area they cover. SPRUCE is utilizing 10 large (12-m diameter) enclosures to increase air and soil temperatures to a range of targets (+0 °C, +2.25 °C, +4.5 °C, +6.75 °C, +9 °C) under both ambient and elevated (+500 ppm) CO_2 concentrations for 10 years. This poster focuses on the responses of the two dominant ericaceous shrubs (*Rhododendron groenlandicum* and *Chamaedaphne calyculata*), quantifying the seasonal patterns of photosynthesis and respiration to the first two years of temperature and CO_2 treatments. These two species dominate the understory at this site (~80% of biomass) and are 35% more productive than the trees in this open canopy forest. Whole ecosystem warming extended the physiologically-active season in both spring and fall for these years, increasing the period of active carbon assimilation. Gas-exchange results from the first year exhibited some photosynthetic acclimation to CO_2 treatments and respiratory acclimation to temperature, although the degree of acclimation was species-specific in each case. Nitrogen per unit leaf mass of *R. groenlandicum* decreased under elevated CO_2, but nitrogen per unit leaf area was maintained by a concurrent increase in leaf mass per area. Detailed gas exchange measurements from the second growing season revealed the trade-off between photosynthetic and respiratory rates that underpin a broad thermal optimum of net assimilation rates. We illustrate how these results will be incorporated into modeling efforts for northern peatlands in global dynamic vegetation models.