Poster #49

Ecophysiology at SPRUCE: Impacts of Whole Ecosystem Warming and Elevated CO_2 in A Northern Peatland

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The Spruce and Peatland Responses Under Climatic and Environmental change (SPRUCE) project is a large-scale, long-term experiment investigating the effects of warming and elevated CO_2 on a 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 will focus on the responses of two dominant trees (*Picea mariana* and *Larix laricina*) and two dominant ericaceous shrubs (*Rhododendron groenlandicum* and *Chamaedaphne calyculata*) detailing the methods being used to characterize photosynthesis, respiration and water relations of each species. Results from the first year of treatments indicated that whole ecosystem warming extended the physiologically active season in both spring and fall, increasing the period of active carbon assimilation, but also exposing plants in these treatments to greater risk of damage from extreme cold events. In addition, the drying heat has resulted in increased water stress, indicated by large reductions in predawn water potentials (even in the spring), quicker drying following rain events, and minimum water potentials reached earlier in the day. Initial gas-exchange results suggest some photosynthetic and respiratory acclimation to both temperature and CO_2 treatments, although the degree of acclimation was species-specific. These results indicate the potential for shifts in community composition due to differential biochemical acclimation and stress responses among the dominant species. Such efforts will provide critical data for modeling efforts both at the site scale and more generally for northern peatlands in global dynamic vegetation models.