

**Poster #40**

**Whole Ecosystem Warming at SPRUCE: Variable Fine-Root Response of Plant Functional Types**

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Peatlands are long term reservoirs of carbon (C) and the magnitude and mechanisms of increased C losses from peatlands due to global change are poorly understood. Ephemeral fine roots regulate ecosystem C and nutrient cycling and may be the first to respond to increasing temperatures. Ecosystem warming could increase nutrient cycling rates and total fine-root production. However, relative to aboveground, belowground biomass allocation may decrease with warming. The rooting depth distribution may also respond to changes in water and nutrient availability. Here, we present belowground results from the first year of whole-ecosystem warming at the SPRUCE experiment in Northern Minnesota. SPRUCE (Spruce and Peatland Responses Under Climatic and Environmental change) is a whole ecosystem warming and elevated CO<sub>2</sub> experiment in an ombrotrophic peatland. Ingrowth cores were used to study changes in fine-root chemistry and production along a temperature treatment gradient (0, +2.25, +4.5, +6.75 and +9 °C above ambient), prior to the initiation of elevated CO<sub>2</sub>. Initial results from summer 2015 suggest a 3-fold increase in total fine-root production in the +2.25 and +4.5 °C above ambient treatments. However, the +6.75 and +9 °C above ambient treatments show no significant response to warming. The warming response also varied by plant functional type (PFT). Tree fine roots showed a unimodal response to warming with an initial increase in production followed by decreases in the +9 °C plots. Shrub fine-root production remained unchanged except in the +6.75 and +9 °C treatments where production decreased by 50%. Winter (October 2015 to June 2016) fine-root production was also observed in +4.5 °C and higher treatments in all PFTs, suggesting an extended growing season. We will also present results from ongoing analyses on fine-root chemistry to describe changes in belowground C and N allocation after warming. Ecosystem scale experiments are useful to understand ecological and biogeochemical response to climate change and improve predictive power of ecosystem models. Our results highlight non-linear and PFT-specific warming responses that will be useful to parameterize belowground components of peatland models.