Poster #1-43

Initial Effects of Warming and Elevated CO_2 on Organic-Matter Decomposition in a Black Spruce-*Sphagnum* Bog

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Peatlands are disproportionately important for landscape carbon storage. These ecosystems store ~30% of terrestrial carbon, primarily in peat, despite comprising only ~3% of global land area. Peat accumulates when primary production exceeds decomposition. Therefore, it is important to understand how decomposition rates are affected by climate change. We are examining the response of organic-matter decomposition to warming and elevated CO_2 within the Spruce and Peatland Responses Under Changing Environments (SPRUCE) experiment. SPRUCE uses ten 12-m diameter enclosures built within a bog in northern Minnesota to increase air and peat temperatures (+0, +2.25, +4.5, +6.75, +9 °C) at ambient and elevated CO_2 (eCO_2) (+500 ppm) for 10 years. A litterbag technique was used to measure decomposition rates of 6 litter types that vary in chemical quality (spruce needles and fine roots, Labrador tea leaves and fine roots, and two *Sphagnum* moss species). The litterbags were deployed in both hummock and hollow microtopographies in the SPRUCE enclosures, and the first series of collections in a decade-long experiment were retrieved at 0, 0.5, and 1 years for measurement of dry mass and chemistry. We predicted that decomposition rates would increase with warming, with little effect of eCO2. We also predicted a stronger response in hollows than hummocks if saturated hollows typically become drier with warming and microbial activity increases. After 1 year, fine-root decomposition rates increased with warming (decomposition coefficients increased from 0.33/y to 0.46/y [+0 to +9°C] for Labrador tea roots and from 0.35/y to 0.45/y for spruce roots). There was no clear difference in hummocks vs hollows and no effect of eCO_2. In contrast to roots, all aboveground litter types did not respond to warming or eCO_2. *Sphagnum magellanicum* decomposed slowest (0.27/y), while the 3 other litter types decomposed at a similar rate (Labrador tea leaves 0.51/y; spruce needles 0.50/y; *Sphagnum angustifolium*/*fallax* 0.45/y). A standardized cotton-strip assay (95% cellulose) was also deployed vertically into the peat to examine seasonal, interannual, and depth-specific decomposition rates. In general, tensile loss increased with warming across all depths, suggesting that labile carbon decomposition responds positively to warming. The lack of response of aboveground litter decomposition to warming may be due to differences in chemistry (e.g., labile cotton strips vs less-labile litter) or differences in techniques (e.g., experiment duration). Litter decomposition and cotton strip tensile loss will continue to be measured over the 10-year duration of SPRUCE to understand longer-term decomposition responses to warming and eCO_2.