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Effects of long-term elevated CO_2 exposure on Arctic Tundra ecosystem greenhouse gas emissions.

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The Arctic is the bellwether of global change and represents an important reserve of uniquely adapted biodiversity and biogeochemistry. Recent work suggests that changes in climate are demonstrably having a significant effect on the Arctic biome and its ecology. Predicting whether arctic ecosystems will remain carbon stores or become sources of carbon dioxide is a major scientific uncertainty as atmospheric CO_2 concentrations and temperature continue to rise. Understanding the role of plant-soil interactions and the feedbacks between ecosystem biogeochemistry and climate change is crucial to making reliable predictions on the future of this fragile environment. Atmospheric CO_2 concentrations are predicted to increase by at least 25% above current levels by the middle of the 21st century, but the effects of this global change on terrestrial ecosystem properties and function is still uncertain. This research examines the long-term acclimation of plant community and ecosystem carbon dynamics in arctic Tundra heath exposed to elevated CO_2 concentrations for 20 years. Using this unique experimental setup we are able to test the hypothesis that increased carbon inputs below-ground will accelerate overall ecosystem carbon dynamics resulting in greater ecosystem CO_2 exchange and greater carbon effluxes. Here we present ecosystem greenhouse gas (CO_2, CH4 and N2O) emissions (including NEE, Rs) from four experimental treatments within the experiment: control, elevated CO_2 (600ppm), elevated UV radiation, and elevated CO_2 interacted with elevated UV) and discuss the implications for plant-soil carbon dynamics. Initial results show an increase in carbon cycling (respiration) under elevated CO_2 conditions, while the presence of increased UV-B radiation suppresses the respiration rate.