

Litter-induced priming in the Arctic: Does plant litter chemistry mediate decomposition of old soil organic matter?

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Abstract. Historically, massive carbon (C) stocks accumulated in northern latitudes as decomposition was more limited than productivity by low temperatures and nutrient availability. This reservoir is critical to global C budgets as it exceeds the storage capacity of plants and sub-arctic soils combined and appears chemically vulnerable to decomposition as soils warm. Significant uncertainties in our understanding of Arctic C processes limit our ability to predict changes in C balance under future conditions. In particular, soil priming, whereby increased labile C inputs promote turnover of old soil organic matter (SOM), has not been explored in the Arctic, despite its potential to convert the system from a C sink to source. This project uniquely couples above and belowground processes, linking litter input chemistry with organic matter decomposition. Predicting ecosystem response to climate change is riddled with complexity and requires integrating multiple avenues of research. Combining field experiments with laboratory incubations will improve global climate change model tractability by providing the fundamental data required for proper parameterization.