Climate Effects on Plant and Microbial Metabolism in Grassland Soil Porewater

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Soil carbon (C) and nitrogen (N) are major elemental pools that are being redistributed due to climate change. Belowground, elemental cycling is a microbially mediated process and dissolved organic matter (DOM) is the atomic currency through which reactions take place. We examined changes in the molecular composition of the DOM pool via meta-metabolomics over two years (2011 and 2012) as a way to assess shifts in the collective belowground plant and microbial metabolism as a result of climate change, including the effects of combined and separate elevated CO_2 and warming treatments in the Prairie Heating and Carbon Enrichment site (PHACE) located outside Cheyenne, WY. The drier year, 2012, had higher metabolite concentrations than the wetter year, although plant biomass was lower and microbial biomass was higher than in 2011. Year was the major significant driver of DOM compositional differences, with 46% of the variability within the dataset described along PC1 for liquid chromatography (LC) mass spectrometry (MS) data ($p < 0.001$) and 65% for gas chromatography (GC-MS) data ($p < 0.001$). Examining the enriched metabolic pathways based on identified driver molecules is expected to provide insights on collective belowground metabolism, and enhance our knowledge of DOM processing in response to global environmental change.