

## ABSTRACT

**Title:** Partitioning responses of rhizosphere respiration and soil carbon decomposition to warming and altered precipitation in a grassland ecosystem

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Soil CO<sub>2</sub> efflux is a main component of the global carbon cycle, and also forms the critical link between soil carbon storage and global greenhouse warming. Understanding how climate change factors will impact soil CO<sub>2</sub> efflux is at the center of much global change research. This project specifically investigates the individual sources of soil CO<sub>2</sub> as they respond to warming and change of precipitation regimes in a grassland ecosystem.

We plan to test three hypotheses: **Hypothesis 1**--Warming a temperate grassland substantially intensifies the rhizosphere priming effect on soil organic matter (SOM) decomposition, thereby increasing the temperature sensitivity of overall CO<sub>2</sub> flux from heterotrophic respiration; **Hypothesis 2**--Prolonged drought periods without a change in total precipitation over the growing season reduce total belowground CO<sub>2</sub> efflux, primarily due to lower C input from reduced plant production/allocation and a lower level of rhizosphere priming effects on SOM decomposition; **Hypothesis 3**--The impacts of ecosystem warming and extended drought periods on autotrophic and heterotrophic belowground respiration are non-additive.

We will test these hypotheses with a combination of field and greenhouse experiments. The field experiment will be located at the Konza Prairie rainfall manipulation (RaMPs) experimental site at the Konza Prairie Biological Station, an LTER grassland research site in NE Kansas. The greenhouse experiment will be executed in the environmentally controlled greenhouse at the Department of Environmental Studies, University of California, Santa Cruz.

The proposed research will capitalize on the existing rainfall manipulation facility at the Konza experimental site, the recently established <sup>13</sup>C-labelling facility at UC Santa Cruz, and unique <sup>13</sup>C tracer methods. These facilities and <sup>13</sup>C isotope approaches give us the capability to address challenging research questions regarding belowground responses to climate change and to test the above-mentioned hypotheses.

This project addresses Focus Area 1 of the NICCR Notice-04, and aims to decipher the responses of individual components of soil CO<sub>2</sub> efflux to warming and altered precipitation. Using stable isotope methods for partitioning total soil CO<sub>2</sub> into separate sources, we will be among the first to assess the temperature and moisture sensitivities of SOM decomposition and autotrophic respiration in a field ecosystem. Our results have the potential to reduce the uncertainty of some common carbon cycling models. New knowledge to be produced from this project will be disseminated through publishing papers and reports in scientific journals, presenting results in scientific meetings, and posting data sets on publicly accessible web pages.