Background/objective
Plant phenology, plant structure, and litter properties affect the soil microclimate. Soil temperature and moisture regulate ecosystem carbon losses through their effect on heterotrophic respiration ($R_H$). Here, we quantify differences in soil microclimates and their effect on $R_H$ in maize and switchgrass bioenergy cropping systems.

Approach
- Measured soil temperature, soil moisture, and $R_H$
- Modeled $R_H$ under the true microclimate and the microclimate of the other cropping system.

Results
- Summer soil temperatures were warmer in maize than switchgrass, reflecting differences in plant phenology.
- Near-surface soil moisture was lower in maize.
- Soil microclimates differences accounted for 4%-17% of the annual $R_H$ carbon loss, equivalent to 8%-30% of the average annual biomass carbon input into the systems.

Significance
- The soil microclimate represents a link between aboveground properties and belowground carbon cycling.
- Management for cool summertime soil microclimate may help to maintain soil organic carbon in bioenergy systems.