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Spatial variation of carbon dioxide fluxes in corn and soybean fields

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ABSTRACT

Spatial variation of soil carbon dioxide (CO_2) flux during a growing season within corn and soybean canopies has not been quantified. These cropping systems are the most intense in the United States and the potential for carbon (C) sequestration in these systems through changes in soil management practices create an opportunity for reduction in greenhouse gas emissions; however, the need to understand the variation in fields is critical to evaluating changes in management systems. A study was designed to evaluate the spatial variation in soil CO_2 fluxes along two transects in corn and soybean fields. Samples were collected every 5 m along a 100 m transect between the rows of the crop and also along a transect in which the plants had been removed to reduce the potential of root respiration. Soil CO_2 fluxes were collected at each position with air temperature, soil temperature at 0.05 m, and soil water content (0 - 0.06 m). At the end of the season, soil samples for the upper 0.1 m were collected for soil organic C content, pH, sand, silt, and clay contents. On each day measurements were made, the observed CO_2 emissions were scaled by dividing the CO_2 flux at each position by the mean CO_2 flux of the entire transect. Observed CO_2 fluxes were signifycantly larger in the row than in the fallow position for both crops. There were no differences between the corn and soybean fallow transects; however, the corn row samples were larger than the soybean row samples. No consistent spatial patterns were observed in the CO_2 fluxes or any of the soil properties over the course of the study. When the CO_2 flux data were combined over the season, there was a significant spatial pattern in the fallow transects for both crops but not for the row transects. Sampling for CO_2 flux values in cropping systems has to consider the presence of a crop canopy and the amount of root respiration.

KEYWORDS

Spatial Variation; Transects; Soil Organic Matter; Soil Temperature; Soil Moisture; Soil Texture

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