

SOIL, WATER, & CLIMATE

-PHD THESIS DEFENSE-

Using Stable Isotope Techniques to Investigate Carbon Cycle Dynamics of an Agricultural Ecosystem

BY

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Abstract:

Ecosystem-scale estimation of photosynthesis and respiration using micrometeorological techniques remains an important, yet difficult, challenge. This study examines the application of stable isotope techniques to partition the net ecosystem CO₂ exchange into its component fluxes for an agricultural ecosystem. Continuous measurements of the mixing ratios of ¹²CO₂ and ¹³CO₂ with tunable diode laser (TDL) absorption spectroscopy were combined with micrometeorological observations to partition the net ecosystem CO₂ exchange into photosynthesis and respiration in a corn-soybean rotation ecosystem for the summer 2003 corn phase. The dynamics of the canopy-scale isotope discrimination, isotope ratios of ecosystem respiration and net ecosystem CO₂ exchange, and isoflux were examined using both TDL data and a modified multilayer canopy model.