A comparison of carbon dioxide and water vapor fluxes between winter wheat and tallgrass prairie ecosystems in Oklahoma

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Winter wheat (*Triticum aestivum* L.) and tallgrass prairie are common land cover types in the southern plains of the United States. During the last century, agricultural expansion into native grasslands has been extensive, particularly either managed pasture or winter wheat. In this study, we measured carbon dioxide (CO_2) and water vapor fluxes (H_2O) from winter wheat and tallgrass prairie ecosystems in Central Oklahoma, using the eddy covariance technique. The objective of this study was to compare CO_2 and H_2O fluxes between two ecosystems for providing insights on how the conversion of tallgrass prairie grassland to winter wheat could impact the carbon and water budgets of the region. Daily net ecosystem CO_2 exchange (NEE) reached seasonal peaks of -9.24 g C m^{-2} d^{-1} and -6.23 g C m^{-2} d^{-1} in winter wheat and tallgrass prairie, respectively. Both ecosystems were sinks of carbon during their respective growing seasons. At the annual scale, the wheat ecosystem was a net source of carbon (56 ± 13 g C m^{-2} yr^{-1}) when fluxes from summer fallow period were considered. In contrast, the tallgrass prairie ecosystem was a net sink of carbon (-128 ± 69 g C m^{-2} yr^{-1}). The daily ET reached seasonal peak values of 6.0 mm d^{-1} and 7.2 mm d^{-1}in winter wheat and tallgrass prairie, respectively. Although, ecosystem water use efficiency was higher in wheat (13.1 g CO_2 mm^{-1} ET) than in tallgrass prairie (7.6 g CO_2 mm^{-1} ET) at the seasonal scale, it was slightly higher in tallgrass prairie (6.9 g CO_2 mm^{-1} ET) than in wheat (6.2 g CO_2 mm^{-1} ET) at the annual scale. Results suggest that the differences in magnitudes and patterns of fluxes between these two ecosystems can exert an influence on the carbon and water budgets of the whole region under land use change scenario.