EDDY COVARIANCE MEASUREMENTS OF WATER AND CARBON DIOXIDE FLUXES IN MID-SOUTH US COTTON

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Abstract

Land-atmosphere interaction on the field scale in cotton (*Gossypium hirsutum*) has been understudied. An eddy covariance system quantified this interaction by measuring water and carbon dioxide (CO_2) fluxes as crop evapotranspiration (ET) and net ecosystem exchange (NEE) respectively. Measurements were made in a commercial field in Northeast Arkansas in 2016 and 2017 growing seasons (May-Oct) following typical production practices of the region. Plant monitoring with COTMAN was used to assess changes in plant structure, maturity, and fruit retention. ET increased after emergence likely due to higher transpiration demand and higher air temperatures; and decreased after physiological cutout during boll maturation, likely due to lower transpiration demand. Average ET was 0.13 in d^{-1} during 2016 and 0.15 in d^{-1} during 2017 growing season (planting till harvest). The average ET values were similar to other lysimeter studies in humid SE US climates, but lower than studies in Arizona and Texas likely due to lower solar radiation and higher relative humidity in the SE US compared to Arizona and Texas. NEE decreased from emergence until first square due to increasing gross primary productivity (GPP), stayed constant during squaring and flowering periods, and then increased after physiological cutout during boll maturation due to decreasing gross primary production (GPP). Average NEE during the growing season was -0.41 µmol CO_2 m^{-2} s^{-1} during 2016 and -0.97 µmol CO_2 m^{-2} s^{-1} during 2017. These findings begin to address questions related to greenhouse gas (GHG) emissions from agricultural fields.