Hungarian University of Agriculture and Life Science

Szent István Campus

Institute of Environmental Sciences

M.Sc. Environmental Engineering

THESIS TITLE:

INTERANNUAL VARIATION OF WHEAT ECOSYSTEM RESPIRATION

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SUMMARY

Accurate assessment of the terrestrial ecosystem respiration (RE) from carbon dioxide emissions of croplands is essential for the development of regional- to global-scale carbon budgets. In order to quantify the fluctuations in ecosystem respiration (RE) using temperature sensitivity and other parameters, continuous measurements of nighttime RE were obtained in wheat fields using the eddy covariance method from 2017 to 2022 growing periods. Based on correlation analysis, there was a relationship between the average soil temperature, CO_2 flux, and the interannual variations in the wheat field. The temperature response curve for three periods (1, 5, and 9) from October to June was analyzed using Van't Hoff, Arrhenius, and Lloyd and Taylor's models. Lloyd and Taylor's model was the most precise and well-suited to the data among the three models in the March-April subperiod where it has the maximum correlation coefficients (R^2) of 0.23 to 0.59 and lowest in the other subperiods namely October-February and May-June respectively. The correlation in period 5(0.23) of March-April was weak due to the low amount of precipitation and drought in 2019 and the absence of correlation indicated dormant or no growth periods in the field. The variation in RE of the wheat field was significantly influenced by soil and air temperature, and precipitation but less influenced by soil water content. The interannual variations in the wheat field showed a connection between the average soil temperature and CO_2 flux, as indicated by the results of the correlation analysis. It was suggested that day and night period ecosystem respiration be studied and compared in heterogeneous ecosystems to arrive at a clear conclusion in CO_2 flux as influenced by various climatic factors within the environment.