

## Assessment of Relationship Between Winter Wheat Carbon Exchange and Vegetation Dynamics

E. Semizoglu (1), L. Saylan (2), B. Caldag (2), S. Karayusufoglu (1,3)

(1) Institute of Science and Technology, Meteorological Engineering Department, Atmospheric Sciences Programme, Istanbul Technical University, Maslak, Istanbul, Turkey (semizoglue@itu.edu.tr), (2) Meteorological Engineering Department, Faculty of Aeronautics and Astronautics, Istanbul Technical University, Maslak, Istanbul, Turkey (saylan@itu.edu.tr; caldagb@itu.edu.tr), (3) Turkish State Meteorological Service, Weather Forecast and Analysis Dept., Ankara, Turkey (skarayusufoglu@dm.gov.tr)

### ABSTRACT

Terrestrial ecosystems are one of the important components of carbon cycle on the Earth. In these ecosystems, plants both capture and release carbon but mainly have a decreasing effect on atmospheric carbon dioxide concentration. There is still a lack of information about carbon dioxide fluxes of agricultural crops. According to this, a research project was carried out over a winter wheat field in Kırklareli city located in the Thrace Region of Turkey to estimate the carbon dioxide fluxes of winter wheat ecosystem using the Eddy Covariance micrometeorological method.

Winter wheat was planted on October 9th of 2009 and harvested on July 6th of 2010. Three wind components ( $u$ ,  $v$ ,  $w$ ), air temperature and  $CO_2$  fluctuations were measured at 2 m above ground. Eddy covariance (EC) data were collected at 10 Hz interval and covariance was averaged at 30-min by using a datalogger. During data processing; spike removal, frequency response, WPL (Webb, Pearman, Leuning) and coordinate rotation corrections have been applied to the EC data set. Gap filling and flux partitioning of EC data have been done according to the methods which are explained by Reichstein et al. (2005).

The Eddy  $CO_2$  flux measurements pointed out that Net Ecosystem Exchange (NEE), Gross Primary Production (GPP) and Ecosystem Respiration (Reco) are -342.7, 1132.8 and 791.4 gC/m<sup>2</sup> respectively, during the whole growing period of winter wheat. In this study, the relationships of NEE, GPP and Reco with Normalized Difference Vegetation Index (NDVI), Leaf Area Index (LAI) and biomass were investigated. The determination coefficient ( $r^2$ ) between GPP and LAI is 0.71 when LAI values were continuously rising ( $0 < LAI < 3.7$ ). Additionally, good agreement ( $r^2 = 0.95$ ) between GPP and NDVI has been determined for whole growing period. Furthermore, quite meaningful nonlinear relationship ( $r^2 = 0.98$ ) between cumulative NEE and biomass has been estimated during the growing period (2009-2010) of winter wheat.

Key words: net ecosystem exchange, winter wheat, carbon sequestration.

### Acknowledgements

We thank the Scientific and Technological Research Council of Turkey (TUBITAK) for supporting this research within the project entitled "Determination of Carbon Dioxide, Water Vapor and Energy Fluxes for Winter Wheat" (Project No: 109R006).