



Comparison of CO₂ fluxes from eddy covariance and soil chambers measurements in a vineyard

Nadia Vendrame, Luca Tezza, Franco Meggio, and Andrea Pitacco
University of Padua, DAFNAE, Legnaro (PD), Italy (nadia.vendrame@studenti.unipd.it)

In order to study the processes involved in the carbon balance of a vineyard, we set up a long-term monitoring station of CO₂, water vapour and energy fluxes. The experimental site is located in an extensive flat vineyard in the north-east of Italy. We measure the net ecosystem exchange with the eddy covariance (EC) technique using a Campbell Scientific closed-path IRGA and sonic anemometer, and the soil CO₂ flux using a Li-Cor multiplexed system connected with six automatic dynamic chambers. Ancillary meteorological and soil variables are also measured. The vineyard is planted with north-south oriented rows spaced 2.2 m apart. Floor is grass covered, and a strip 0.6 m wide on the rows is chemically treated. To represent the different soil conditions existing in the EC footprint and to study the components of the CO₂ soil flux, we placed dark soil chambers both on the vineyard rows and in the inter-row space.

A well-known limit of the EC technique is the underestimation of fluxes during calm wind periods, mainly occurring at night. In the autumn/winter vine dormancy period, the EC and soil chambers CO₂ fluxes should be similar. We compared the CO₂ fluxes measured using the two methods to evaluate the reliability of EC measurements at different atmospheric turbulent mixing conditions and stability. The EC technique underestimates the ecosystem respiration during night time periods with friction velocity lower than 0.1 m/s. The present comparison could enable the assessment of a friction velocity threshold, representing the limit above which the EC fluxes can be considered representative of the vegetation-atmosphere exchanges at our specific site.