Proximal sensing of CO_2 uptake in terrestrial ecosystems

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Linking remote sensing with carbon fluxes and vegetation biophysical parameters is critical to exploit spatial and temporal extensive information useful for validating model simulations at different scales. Proximal sensing is fundamental to quantify and understand the seasonal dynamics of ecosystems and to upscale the observations carried out at the ground level.

In this study we present chosen activities of an ongoing international PhD project granted by Fondazione Edmund Mach, Italy. Principal aim of this research project is the investigation of the relationship between CO_2 uptake from terrestrial ecosystems (measured by the eddy covariance technique) with ground multi- and hyperspectral spectral observations, as well as quantitative estimation of vegetation biophysical variables from proximal sensing.

Within this study we present in particular:

1) the potential of a commercially available proximal sensing system – based on a 16-band multispectral sensor – for monitoring mean midday gross ecosystem production (GEP_m) in a subalpine grassland of the Italian Alps equipped with an eddy covariance flux tower
2) a new tower-based hyperspectral system designed for the estimation of CO_2 fluxes and biophysical parameters (f_{APAR}, total chlorophyll content, green herbage ratio) in a subalpine grassland ecosystem
3) the ability of ground spectral signal for capturing the temporal changes in the green herbage ratio of the grassland ecosystem (the percentage of green biomass with respect to the total phytomass) and for determining the phenology delay inside the ski run in the grassland ecosystem as regards to the areas not used for sports