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Eddy covariance measurements of annual carbon dioxide exchange in two natural ecosystems of the northwestern Italian Alps

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In consequence of the relationship between climate change and atmospheric greenhouse gases concentrations, a prime issue of recent researches is the quantification of the carbon balance of terrestrial biomes. In the last decades an increasing number of monitoring sites has recently been implemented worldwide, with the aim to better understand and quantify how inter-annual climate fluctuations affect net carbon exchange and the length of growing season over different vegetation types, land uses and climates. Eddy covariance (EC) technique is a widespread method that provide a direct measure of net carbon dioxide exchange across the biosphere-atmosphere interface by measuring the covariance between fluctuations in vertical wind velocity and CO2 mixing ratio.
Two long-term monitoring sites have been equipped in the northwest Italian Alps (Aosta Valley) with the aim of quantify the annual carbon dioxide sequestration by grassland and forest ecosystems in relation to climate change. Grasslands and European larch forests (Larix decidua, Mill.) are the most representative vegetation types of this alpine region. The grassland site, located at an elevation of 2160 m asl, has been equipped in summer 2008 in an abandoned pasture with Nardus stricta as dominant species. European larch stand is located at 2050 m asl, at a distance of $\sim$8 km from the grassland, and measurements has started in winter 2009. Both sites have been equipped with the same eddy flux system mounted at 2.5 m and 20 m above the ground in the grassland and in the larch forest, respectively. Both sites were equipped with a basic EC system: a3D sonic anemometer and an open-path infrared gas analyser (LI-7500, LICOR Inc.). Along EC the main meteorological variables are measured (e.g. air temperature, humidity, precipitation, photosynthetically active radiation, PAR, , soil water content, snow height etc..). In order to link annual sites productivity to the growing seasons length, phenological observations are made continuously trough webcam images,field observations of the main phenofases, and continuous observation of transmitted PAR below canopy by using a transect of photodiodes. Furthermore, continuous and long-term measurements of canopy spectral spectral reflectances were collected with a robotic system developed since summer 2008 ((Robotic HyperSpectral Irradiometer ,HSI).These measures are collected with the aim of i) monitoring seasonal trends of vegetation indexes (e.g. NDVI, PRI) and radiative quantities (Fy760) and ii) analyzing the relationship between carbon, water fluxes and vegetation indexes (VIs) derived from canopy reflectance. The first results concerning the seasonal variability of carbon dioxide exchange, water and canopy structure of the sites will be presented during the conference.