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Effect of microtopography and species composition on small-scale variability of CO_2 fluxes in a subalpine grassland

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Grassland ecosystems cover around 30% of the Earth's land surface and consequently play an important role in the terrestrial carbon balance. Climate and land use changes have a significant effect on the sink/source strength of grasslands, especially in mountain regions. For these reasons the carbon cycle of high-altitude grasslands has recently received higher attention, however little is know on the within-ecosystem variability in CO_2 fluxes. In fact, alpine and subalpine grasslands are often characterized by complex topography which generates differences in snowmelt dynamics at site level and related different microhabitats. The deriving patchy distribution of vegetation leads to the coexistence of different plant functional traits and developmental strategies within the same ecosystem. In this study we evaluated the effect of microtopography and associated vegetation types on the CO_2 flux components of an unamanaged subalpine grassland located at 2160 m asl, by means of automated clear and opaque chambers. In order to disentangle the contribution of different growth forms to the whole ecosystem carbon sequestration we compare chambers with eddy covariance CO_2 flux data. Results show that: i) different growth forms are associated with concave o convex shapes of the terrain and, in detail, grass species dominate in convex areas while forbs are especially found in concave ones ii) two distinct CO_2 flux trajectories associated to these shapes can be distinguished in this ecosystem: graminoids show a later beginning of the carbon uptake period but higher CO_2 net uptake (NEE), while forbs develop just after snowmelt but show lower NEE. The observed small-scale patterns of carbon sequestration may reflect the distinct vegetation type responses to snowmelt and different adaptations to resource use efficiency (light, temperature, nutrients) specific of their own microhabitat. Further investigations will be carried on to better evaluate the role of microhabitat-related environmental factors, such as temperature, soil water content and nutrients on small-scale variability in species distribution and heterogeneity in ecosystem processes.