



Inter-annual variability in net CO₂ exchange of an alpine grassland

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Six years of continuous eddy covariance measurements were used to analyse the inter-annual variability of CO₂ exchanges of an alpine meadow (1550 m a.s.l.) on the Italian Alps. The site was on average a net sink of CO₂, and showed a large inter-annual variation, ranging between being a small source and a moderate sink of CO₂ during the study period. The inter-annual variability in the CO₂ fluxes was mainly controlled by snow melting (which determined the onset of the growing season) and by the re-growth after mowing. The present work is aimed to factor out the sources of the observed interannual variability in CO₂ fluxes, isolating the part justified by variations in climatic drivers from the changes in the ecosystem responses to the climate (acclimation). Ecosystem acclimation of both assimilation and respiration was evident in the inter-annual variation of the light and temperature responses. In particular, the ecosystem quantum yield efficiency and the optimal GPP were inversely related to the mean incoming photosynthetic radiation, while the temperature sensitivity of soil respiration decreased at increasing soil temperature. The results suggest that the meadow undergoes acclimation which sensibly reduces the inter-annual variability of carbon fluxes and that there are negative feedbacks between the climate variability and the ecosystem response to climate.