Geophysical Research Abstracts, Vol. 8, 03025, 2006
SRef-ID: 1607-7962/gra/EGU06-A-03025

Biotic, Abiotic and Anthropogenic Controls on the Net Ecosystem CO_2 Exchange of European Mountain Grassland Ecosystems

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The net ecosystem CO_2 exchange (NEE) of nine European mountain grassland ecosystems was measured during 2002-2004 using the eddy covariance method. Overall, the availability of PPFD was the single most important abiotic influence factor for NEE. Its role changed markedly during the course of the season, PPFD being a better predictor for NEE during periods favourable for growth, which was spring and autumn for the sites characterised by summer droughts and (peak) summer for the Alpine and Northern study sites. This general pattern was interrupted by grassland management practises, i.e. mowing and grazing, when the variability in NEE explained by PPFD suddenly decreased together with the amount of aboveground biomass. Temperature was the abiotic influence factor which explained most of the variability in ecosystem respiration at the Alpine and Northern study sites, but not at the sites characterised by a pronounced summer drought, where the reduction in soil water availability and as-

similate supply, mowing and grazing coinciding with the onset of the summer drought, were more or equally important. The amount of assimilating plant area was also the single most important biotic variable determining the maximum ecosystem carbon uptake potential, i.e. the NEE at saturating PPFD. Good correspondence, in terms of the magnitude of NEE, was observed with many (semi-)natural grasslands around the world, but not with grasslands sown on fertile soils in lowland locations, which exhibited higher maximum carbon gains at lower respiratory costs.