Geophysical Research Abstracts, Vol. 8, 00780, 2006
SRef-ID: 1607-7962/gra/EGU06-A-00780
© European Geosciences Union 2006

Land use and phenology affect the net ecosystem exchange of CO_2 in temperate mountain grasslands

M. Schmitt, M. Bahn, G. Wohlfahrt and A. Cernusca
University of Innsbruck, Austria

In mountain regions land-use changes have occurred rapidly over the past decades. Due to methodological problems with assessing the net ecosystem exchange of CO_2 (NEE) in complex terrain there is currently a lack of data concerning the C sequestration potential of mountain grasslands differing in land use. The aim of this study was to assess the seasonal variation of net ecosystem exchange of CO_2 (NEE) for differently managed and abandoned mountain grasslands in response to abiotic and biotic environmental factors. NEE of two meadows, a pasture and an abandoned grassland located in the Austrian Central Alps (Stubai Valley) was measured from 2002-2004 using portable ecosystem chambers, which were cross-calibrated against an eddy-covariance system.

The diurnal and seasonal amplitudes of NEE decreased from the meadows to an abandoned grassland and a pasture. Diurnal courses of NEE were primarily affected by changes in photon flux density and temperature, but also by high water vapour pressure deficits on a hot summer day. Seasonal peak flux rates were largely determined by changes in the plant area index and the amount of canopy biomass. Mowing caused meadows to turn from sinks to short-term sources of CO_2. Canopy photosynthesis was strongly correlated with changes in both light-use efficiency and canopy nitrogen content, which was highest on the meadows and lowest on the abandoned grassland. Across all study sites there was a positive correlation between maximum rates of canopy photosynthesis (A_c) and ecosystem respiration (R_c). A_c and R_c of the managed grasslands were well in the range reported for other meadows and pastures on the globe, values for the pasture being somewhat lower values than those reported for pastures from lower altitudes. Our results suggest that land management has a major impact on the factors controlling the CO_2 source/sink function of mountain grasslands.