Geophysical Research Abstracts, Vol. 9, 01271, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-01271

Estimating the Plant Area Index of Mountain Grasslands from Multispectral Reflectance

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The plant area index is a crucial input parameter for models which simulate the mass and energy exchange between ecosystems and the atmosphere. Aim of the present study was to estimate the plant area index of mountain grasslands from multi-spectral measurements of radiation reflected from the plant canopies. Multi-spectral (400-1100 nm) reflectance measurements were made in 2006 with a portable spectro-radiometer at four grassland sites in Tyrol/Austria, from which various reflectance indices were calculated. The plant area index was measured concurrently with reflectance, using optical methods and destructive harvesting. The investigated grasslands were mown 2-3 time per year, resulting in a very dynamic canopy development, the plant area index reaching values of up to 7 m^2 m^{-2}. The multi-spectral reflectance measurements were able to capture these seasonal dynamics only poorly, as most of the calculated reflectance indices saturated at plant area indices around 2-3 m^2 m^{-2} at all sites. The implications of these findings for estimating the plant area index of mountain grasslands using multi-spectral reflectance measurements, either on the ground or by remote sensing, are discussed.