Biogeosciences
Discussions

Interactive comment on "Land use affects the net ecosystem CO$_2$ exchange and its components in mountain grasslands" *by* M. Schmitt et al.

Anonymous Referee #2

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General comments

The authors present a well written paper on seven years of static chamber NEE data from six grassland sites, differing in management and altitude. Gas exchange measurement campaigns were conducted in 3-4 week intervals. Management practices range from a meadow with three cuts per year at the valley bottom, via subalpine, seasonally grazed, low nutrient pasture and abandoned pasture to a site under afforestation near the altitudinal forest line. The data collected include biomass, LAI, photon flux density (PFD), soil- and air temperature.

The hypotheses announced to be tested in the Introduction are (1) that GPP and (ecosystem) R are 'controlled by PFD, temperature, LAI, biomass and canopy physiology, and decrease from meadows to pastures and a nutrient-poor abandoned grass-

land' and that (2) 'there is a close relationship between GPP, R and LUE (light use efficiency) across seasons and study sites.'

In the following the authors exactly do what the hypothesis testing requires. The problem is that these hypotheses are neither controversial nor new. Instead, the factors under investigation and their relationships are rather well established. Also, once one of these factors is found to be correlated, the rest of them must follow automatically, since they are all extremely tightly coupled to the progress of seasons during the course of the year.

The Results section is full of qualitative rankings. The authors should quantify and contrast results more clearly. For example Fig. 1 data clouds need much more integration to be accessible to the reader. Possible lumping of data includes e.g. NEE of comparable PFD grouped by site plotted over time (months/years?) / water availability / temperature / Climate dependency.

In the Discussion the authors do not reveal how the results of their study relate to the very interesting issue they refer to in the Introduction: What do the contrasts contained in the different study sites teach us on the grassland carbon cycle and its feedback on the atmospheric greenhouse budget? The general deficiency of the ms is its lack of addressing this question quantitatively.

As it is, the ms is more a 'technical paper' confirming textbook physiology. On the other hand, extremely valuable information on the feedback of mountain grasslands to the greenhouse gas budget may result, if the authors would take the analysis one step further.

I therefore suggest to reanalyse the data and focus on a (semi-) quantitative comparison of C sink/source properties of different grasslands under different management and climate (years). Even assuming some time gaps in the measurement campaigns, this data set likely represents a true treasure of information. Effects of management (e.g. nutrient supply, species composition, canopy structure), successional stages (grazed

pasture / abandoned grassland / regrowing subalpine forest) and climate/altitude (temperature, soil moisture, length of growing period) on the ecosystem C source/sink properties apparently wait to be contrasted and discussed.

Because these 'General comments' imply such substantial changes to the ms, I do not include 'Specific comments' or 'Technical corrections'.

Interactive comment on Biogeosciences Discuss., 6, 11435, 2009.

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