

Interactive comment on “Remote sensing-based estimation of gross primary production in a subalpine grassland” by M. Rossini et al.

Anonymous Referee #1

Received and published: 27 March 2012

In the proposed manuscript, the authors present the results of an experiment that aimed to evaluate the link between time series of optical remote sensing (RS) parameters and plant photosynthesis (expressed as gross primary production (GPP)). An automated monitoring system installed in alpine grassland ecosystem was used to measure the radiometric response of a grass canopy in temporal high resolution. Observations were performed over a critical time span of two phenological cycles. Several vegetation indices with different functional meanings were derived from the radiometric data. The indices were then put into a simplistic photosynthesis model (Monteith) to model diurnal and annual courses of GPP. Modeled GPP courses were compared against GPP measured with an eddy covariance tower.

The authors comprehensively describe the experimental setup and the obtained re-

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sults. The sophisticated setup, including the observation of most relevant environmental properties, is appropriate to fulfill the research objectives. Data preparation and processing was carefully performed, according to common standards.

The aspects and findings presented in the manuscript are of high scientific interest and will address a broad scientific community. Apart of a few minor issues mentioned below, the manuscript is relatively well written, the structure is clear, the findings are properly discussed, and the figures seem to be appropriate. The manuscript is definitely worth publishing.

Edits and comments for improvements:

The introduction has to be strengthened. In particular a clearer argumentation on the importance of the proposed experiment and stated objectives is essential. In this context you could consider extending the discussion on advantages and disadvantages of present RS parameters or RS approaches used to estimate LUE (e.g., PRI, fluorescence, or the chlorophyll content). From this overview it could be concluded that the mechanistic understanding and knowledge of superimposing effects on RS proxies is currently insufficient and the outcome of the proposed research intends to partly clarify this issue.

The discussion should reflect the representatives of the experiment in more detail. This is of particular importance as your findings might be interesting for several groups involved in observation activities (e.g., SpectNet). Please note that your findings are based on a small scale experiment by observing a structural less complex canopy. This of course has implications for your conclusions e.g., about the strength of PRI as proxy for LUE. PRI might work fine in your case but translating this approach to other sites, which are potentially characterized by a more complex structure, might be difficult. Please consider in your discussion past studies highlight the strong structural dependency of the PRI (e.g., Hilker et al. 2008, *Science of the Total Environment* 404 or Grace et al. 2007, *Global Change Biology* 13). In analogy to this, please discuss

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the representativeness of the other components (i.e., NDVI as proxy for LAI and fIPAR; MTCI as proxy for CAB) needed to monitor GPP.

The manuscript appears as a composite of the contributions of many co-authors and needs further work to seamlessly mold all contributions.

Other editorial comments:

Abstract

Page 1713, line16: "... the NDVI showed better correlations with LAI..." Better than what? Please complete the sentence.

Page 1713, line 21: Please add: "based on Monteith's light use efficiency model..."

Introduction

Page 1715, line 7: You wrote: "e.g., enhanced vegetation index, EVI, Huete et al. 2000". From this the reader could get the impression that Huete et al. is an index, which is of course not true. Please set brackets or so.

Page 1716, lines 12-15: This argumentation would mean that crops per se are un-stressed. I do not agree on this statement.

Methods

Page 1718, line 7-8: Do you mean daily time series or annual time series?

Page 1718, equation 2: Please introduce the abbreviations for PAR_i and PAR_t

Page 1719, line 9: Please reword: "...were partitioned into ecosystem respiration and GPP:"

Page 1719, line9: Please shortly introduce why a gap-filling is needed.

Page 1721, line 28: Please reword to: "...averaging the index values collected between..."

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Page 1723, line 3: Please reword to: "the model comparison"

Page 1723, line 11: Please define $\ln(\text{PAR})$.

Interactive comment on Biogeosciences Discuss., 9, 1711, 2012.

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