Biogeosciences Discuss.,
doi:10.5194/bg-2016-414-RC2, 2016

Biogeosciences Discussions
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EGU

Interactive comment on "Modelling spatial and temporal dynamics of GPP in the Sahel from earth observation based photosynthetic capacity and quantum efficiency" *by* Torbern Tagesson et al.

Anonymous Referee #2

Received and published: 2 November 2016

General comments: This is an interesting paper providing detailed descriptions of spatial and temporal dynamics in canopy light-response parameters at CO_2 flux observation sites across Sahel region. The authors evaluated MODIS GPP, and reported its serious problem. This paper demonstrated the applicability of alternative model to scale up EC flux-based GPP to regional or continental scales, using EO-based spectral vegetation indices. The dynamics of photosynthetic parameters and some interpretations of several vegetation indices presented in this paper are valuable to estimate CO_2 budget in semi-arid ecosystems, which have included large uncertainties so far. Overall presentation is well structured and clear. The purpose of this paper fits well to this journal.

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Discussion paper

Specific comments:
1. The intra-annual dynamics in F_{opt} and α were well explained with the vegetation indices in relation to the seasonal changes in water thickness and chlorophyll abundance. But the shorter term variations in F_{opt} and α (Fig. 4) do not seem to be explained sufficiently by the regression tree analysis. Some stress events may affect them. Please show the relationships with meteorological variables such as SWC or VPD additionally, and describe more information on the related specific stress events.
2. The result of strong underestimation of ERA Interim PAR against in situ PAR is surprising and important information. Please confirm the ERA Interim PAR data: it is W m^{-2} (Line 157), but μmol m^{-2} s^{-1} (Fig.2). In addition, there seems to be some different tendencies in the relationships in Fig. 2, maybe depending on the periods and sites. Were the PAR sensors calibrated regularly? PAR sensors tend to deteriorate as aging. Please check the deterioration in PAR by comparison with the simultaneously measured Rg.
3. This paper aims to provide a model to scale up observed canopy scale GPP to regional or continental scales, using EO-based spectral vegetation indices. The readers will expect a final map of spatial distribution of GPP in semi-arid areas, and the map would make this paper more valuable.

Minor comments:
Line 184: What do you mean by “air-water interface”?
Table 2: Correlation between “intra-annual” dynamics
Please unify the descriptions: use $F_{opt_{frac}}$ and α_{frac} for intra-annual dynamics instead F_{opt} and α in Table 2, 3, as described in the text.
Fig 3: Some points of ML-Kem are quite low (nearly 0) for MODIS GPP, while around 8 μmol m^{-2} s^{-1} for EC GPP. Why?
Please unify the descriptions: α instead of QE, as described in the text. Clarify the

labels and scales on X-axes.
(f) What is the reason that VI decreased less than 0.15 before the growing season in 2007 at NE-WaM?

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