

Response to Interactive comment on “Modeling photosynthesis of discontinuous plant canopies by linking Geometric Optical Radiative Transfer model with biochemical process” by Q. Xin et al.

We thank the reviewer for the constructive comments. We studied the comments and revised the draft accordingly. Our responses to the comments follow below.

This revised manuscript has incorporated most of the comments previously issued by the reviewer, and properly addressed reviewer’s questions. Now it is easier to follow, so I suggest it to be published with following minor revisions.

1. This manuscript has been based on some previous work of the community, e.g., some coefficients, so I suggest to have a table to contain the values of the coefficients, as VPD_min in current Page 3691 Line 4, and their sources.

Reply: thank you for your kind suggestion. We added another table in the appendix to describe used coefficients and their values. Now it reads as follows,

Table A2. Values for model parameters.

Symbols	Value	Units	Reference
k_C	500	W / m ²	Ding et al. (2014)
k_Q	150	W / m ²	Ding et al. (2014)
T_{min}	0	°C	Kalfas et al. (2011)
T_{max}	45	°C	Kalfas et al. (2011)
T_{opt}	25	°C	Kalfas et al. (2011)
VPD_{min}	0.65	kPa	Heinsch et al. (2003)
VPD_{max}	4.6	kPa	Heinsch et al. (2003)
VPD_0	30	kPa	Katul et al. (2000)
Γ	40	μmol/mol	Katul et al. (2000)
m_L	4.0		Katul et al. (2000)

2. What is the solar zenith angle for Figure 3b?

Reply: we now included a definition for solar zenith angle in the texts, and it reads “Extraterrestrial solar radiation and solar zenith angle (i.e., the angle that the sun away from directly overhead) are calculated ...”

3. Suggest to add two scatter plots in Figure 4 to emphasize the correspondence between measured radiation and modeled radiation.

Reply: we revised Figure 4 and the related captions. Now it reads as follows,

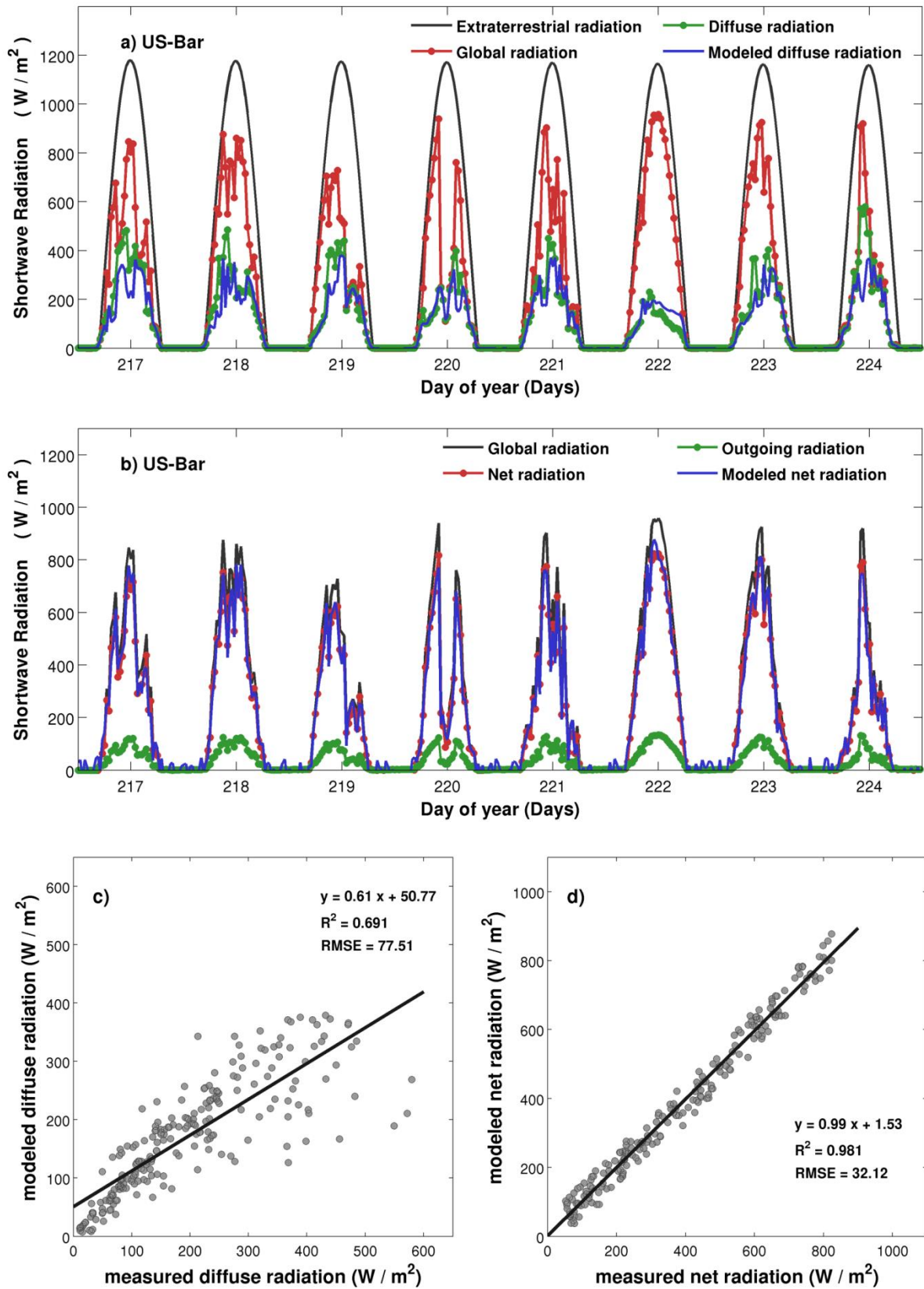


Figure 4: Measured and modeled components of radiation in 8 successive days are shown for a) the partition of global solar radiation, b) surface radiation balance, c) modeled and measured diffuse radiation, and d) modeled and measured net radiation. Extraterrestrial radiation is derived following methods outlined in Allen et al. (1998). Muneer’s method is applied to model diffuse radiation. The GORT model is applied to model net radiation. Data are shown from the Day of Year 217 to 224 in 2004 for the US-Bar site.

4. Figure caption and text relating to Figure 13 is very hard to follow, consider revising.

Reply: we revised figure captions and texts related to Figure 13 as follows,

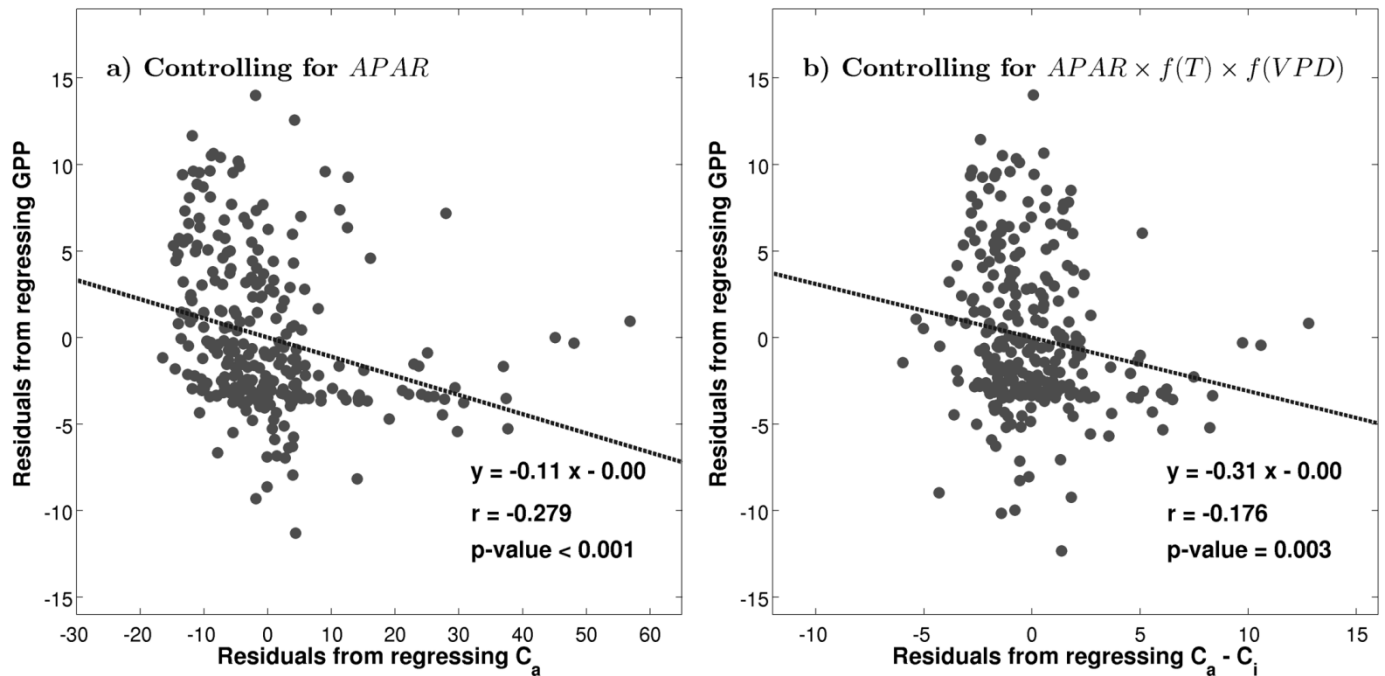


Figure 13: Residual plots are shown for a) the partial correction between GPP and ambient CO₂ concentration (C_a) while controlling for the variable of $APAR$ and b) the partial correction between GPP and $C_a - C_i$ while controlling for the variable of $APAR \times f(T) \times f(VPD)$.

5. The assertion of the last sentence in Section 5.2 has potential conflict with the statement in Ni-Meister et al., 2001, which mentioned that not accounting for the clumping and discontinuous plant canopies will lead to underestimation of biomass. Suggest to revise or delete.

Reply: thank you for your insights. We deleted relevant sentences to avoid possible conflicts.