Biogeosciences Discussions

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Response to reviewer#3

Jing Wang and Xuefa Wen

Author comment on "Excess radiation exacerbates drought stress impacts on canopy conductance along aridity gradients" by Jing Wang and Xuefa Wen, Biogeosciences Discuss., https://doi.org/10.5194/bg-2022-50-AC6, 2022

Response to reviews of manuscript "Excess radiation exacerbates drought stress impacts on stomatal conductance along aridity gradients" bg-2022-50

Response to reviewer#3

Dear Reviewer,

We would like to thank you for the thoughtful and valuable comments and suggestions on our manuscript entitled "Excess radiation exacerbates drought stress impacts on stomatal conductance along aridity gradients" (bg-2022-50). We have carefully revised our manuscript to take account of your comments and suggestions. Meanwhile, we have rephrased our manuscript title as "Excess radiation exacerbates drought stress impacts on canopy conductance along aridity gradients".Here are the point-to-point responses (responses in upright Roman in black front) to the comments (original queries in Italic in blue front).

Specific comments:

1) Introduction: Please put the last paragraph (Line 81-91) before the penultimate paragraph (Line 72-80).

Response: Thank you very much for your comment. This paragraph has been revised and removed to section "2.2.3 Stable isotope analysis": "Given that leaf $\delta^{18}O$ at species level was affected by the leaf water evaporation process, variability in gs should show up in leaf $\delta^{18}O$ (Barbour 2007; Barbour & Farquhar 2000; Farquhar *et al.* 1998). Negative relationship between □^{18}O and gs has been observed at species (Barbour & Farquhar 2000; Cabrera-Bosquet *et al.* 2011; Grams *et al.* 2007; Moreno-Gutierrez *et al.* 2012) and canopy scales (Cabrera *et al.* 2021; Hirl *et al.* 2021), and among communities along soil (Ramirez *et al.* 2009) and climate (Keitel *et al.* 2006) gradients. Consequently, we selected 1/□^{18}O was used as a proxy for gs in this study. ".

2) Fig.1: Is the Y variable in (b) consistent with (f)? If yes, please unify them. Similarly,

please modify the Y variable in (c) (d) (g) (h).

Response: Thank you very much for your comment. Figure 1 has been changed as follows according to the comment of reviewer 1.

Figure 1. Comparison of aridity (a), growing season precipitation (b), soil moisture (SM) (c), vapor pressure deficit (VPD) (d), solar radiation (SR) (e), temperature (f), maximum temperature (g), and community leaf area (h) and leaf specific leaf area (SLA) (i) among transects. LP: Loess Plateau; MP, Inner Mongolia Plateau; TP, Tibet Plateau. Lowercase letters indicate significant differences among transects ($P<0.05$). Error bars indicate standard error of the mean.

*3) Fig.2: Please delete the "***" in Fig. 2(b).*

Response: Thank you very much for your comment. Change has been done.

Figure 2. Patterns of 1/□^{18}O (a) along aridity gradient within transects, and among (b) transects. Different letters indicate significant differences ($P < 0.001$) among transects and grassland types. LP, Loess Plateau; MP, Inner Mongolia Plateau; TP, Tibet Plateau.

4) Fig.3: The X variable name in Fig.3(c) (TSR) is inconsistent with the name in the legend (SR). Please modify it.

Response: Thank you very much for your comment. Change has been done.

Figure 3. Patterns of the intercept obtained from standardized major axis analysis (SMA) among transects. VPD, vapor pressure deficit; SR, solar radiation; $Temp_{max}$, maximum temperature. LP, Loess Plateau; MP, Inner Mongolia Plateau; TP, Tibet Plateau. Shaded area represents the 95% confidence interval of the SMA intercept.

5) Table 1: The asterisk in the seventh row is inconsistent with other rows. Please revised them.

Response: Thank you very much for your comment. Change has been done.

Table 1 Pearson's coefficients among community 1/□^{18}O and environmental factors and plant properties.

	Loess Plateau	Inner Mongolia Plateau	Tibet Plateau

Aridity	-0.848**	-0.843**	-0.773**
SM	0.719*	0.707*	0.659*
VPD	-0.554	-0.384	-0.912**
SR	-0.639*	-0.728*	-0.850**
$Temp_{mean}$	0.641*	0.303	-0.670*
$Temp_{max}$	0.678*	0.038	-0.852**
LA	0.757*	0.913**	0.610
SLA	-0.519	-0.576	-0.648*

**, P<0.01; *, P<0.05. SM, soil moisture; VPD, vapor pressure deficit; SR, total solar radiation; $Temp_{mean}$, mean temperature; $Temp_{max}$, maximum temperature; LA, log-transformed leaf area; SLA, log-transformed specific leaf area.

6) Fig.4: Please label the P value in each figure to ensure the reliability of the model. In addition, please add a priori model of effects of variables on the gs to Supplementary Information.

Response: Thank you very much for your comment. To ensure the reliability of the model, P value of SEM model has been added in each sub-figure.

Figure 4. Structural equation models of abiotic factors explaining 1/□^{18}O in Loess Plateau (LP) (a), Inner Mongolia Plateau (MP) (b) and Tibet Plateau (TP) (c). □^{18}O, ^{18}O enrichment

of leaf organic matter above source water; $Temp_{max}$: maximum temperature; SR, solar radiation; SM, soil moisture; VPD, vapor pressure deficit. Solid and dashed arrows represent significant and non-significant relationships in a fitted SEM, respectively. ***, P<0.001; **, P<0.01; *, P<0.05.

Figure 5. Structural equation models of abiotic and biotic factors explaining 1/□^{18}O in Loess Plateau (LP) (a), Inner Mongolia Plateau (MP) (b) and Tibet Plateau (TP) (c). □^{18}O, ^{18}O enrichment of leaf organic matter above source water; $Temp_{max}$: maximum temperature; SR, solar radiation; SM, soil moisture; VPD, vapor pressure deficit. LA, log-transformed leaf area; SLA, log-transformed specific leaf area. Solid and dashed arrows represent significant and non-significant relationships in a fitted SEM, respectively. ***, P<0.001; **, P<0.01; *, P<0.05.

7) Fig.4: Why are there many types of SEMs for gs? Even in the same area, there are two SEMs for gs. How to determine which is the most accurate?

Response: Thank you very much for your comment. To avoid confusion, we split Figure 4 into two graphs (Figure 4 and Figure 5). Figure 4 are the best-fitting models illustrating the effects of abiotic variables on 1/□^{18}O, and Figure 5 are the best-fitting models illustrating the effects of abiotic and biotic variables on 1/□^{18}O.

8) There are many problems in the manuscript. For example, (1) "s" of gs should be a subscript; (2) leaf area (Line 114); (3) as follows (Line 118); (4) "max" of Tempmax should be a subscript (Line 194); (5) All the abbreviations in the figures should be explained; etc. Please check the full text carefully

Response: Change has been done according to your suggestions.

Please also note the supplement to this comment:
https://bg.copernicus.org/preprints/bg-2022-50/bg-2022-50-AC6-supplement.pdf