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

Response to community comment #1

Dear Yakun Tang,

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 comment. 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).

General comments:

The author should clarify why the radiation exhibited negative effect on gs, however, temperature exhibited positive or no effect on gs in different regions. Generally, radiation may influence plant gs through its influence air temperature, thus, the consistent effect of radiation and temperature on gs may be more reasonable.

Response: Thank you very much for your comment. We respond this comment from three aspects.

(1) We corrected the structure equation method result about the effect of temperature on gs in Losses Plateau: "$Temp_{max}$ in LP did not exist significant effect on community $1/\triangle^{18}O$ ($P>0.05$)."

(2) We rephrased the discussion about the negative effect of solar radiation on canopy conductance (Gs, presented by community $1/\triangle^{18}O$) via drought stress: "Solar radiation and temperature regulated variability in G_s within transect via drought stress (Fig.4). Solar radiation exhibited consistently negative effects on G_s, because it increased with increasing aridity within three transects (Fig.1h, Table S1). These results were consistent with those of Fu et al. (2006), who demonstrated that the net CO_2 exchange of grassland in MP and shrubland in TP was significantly reduced by high solar radiation. In this study, solar radiation exhibited negative effect on G_s via drought stressors (Fig.4 a-c). On one hand, increasing solar radiation would decrease SM by increasing energy partitioning in evaporation and transpiration (Zhang *et al.* 2019). Solar radiation had negative effects on SM in the three transects in this study (Table S5). On the other hand, increasing solar radiation can increase VPD by increasing temperatures (Grossiord *et al.* 2020). However, a positive relationship between temperature and VPD was observed only in TP (Table S2)."

(3) We rephrased the discussion about the negative effect of temperature on Gs via drought stress: "The drought stress on G_s within transect was exacerbated by higher

temperatures in TP (Fig.4c). In TP, temperature increased with increasing aridity (Table S1), and was negatively related to SM and positively to VPD (Table S5, Fig.4c). As with solar radiation, increases in temperature tend to increase evaporation and transpiration rates ultimately reducing SM, while VPD always increased with increasing temperatures (Grossiord *et al.* 2020; Oren *et al.* 1999). Consequently, increasing temperature exacerbate soil and atmospheric drought, ultimately reducing G_s along an aridity gradient in TP. In LP, the temperature exhibited negative correlations with community 1/$\triangle^{18}$O, while did not exhibited significantly effect on community 1/$\triangle^{18}$O (Fig.4a). The reason was that temperature was significantly correlated with SM in LP (Table S5). ”