

Response:

General comments: The major contribution of this paper is to presents CO₂ flux measurements for over semi-arid grassland at the Loess Plateau of Northwest China and explores how these fluxes vary with variations in diffuse radiation, cloud cover and aerosol loading. The data are unique and it is the first attempt to assess carbon cycle over the Loess Plateau. The analyses show significant potential. In general, I found the paper well written and appropriate for an ACP audience. My primary criticism is that the authors spend too little time discussing the difference of the effect of temperature on NEE at SACOL site with that in forests and crops. My specific comments are listed as following:

Response: We appreciate reviewer's suggestion. This paper is a preliminary study of clouds and aerosol loading effects on the carbon uptake by a grass ecosystem located at the semi-arid Loess Plateau region. Please see Figure 9, at SACOL site covered with short grass, the ecosystem respiration was relatively steadily. According to the fitting results of equation 5, from Figure 9c we could see that when the air temperature changed from 12 to 30 °C, the respiration rate increased only from around 1.17 to 1.30 $\mu\text{mol m}^{-2} \text{s}^{-1}$, while the canopy photosynthesis reduced much larger from around 7.71 to 3.15 $\mu\text{mol m}^{-2} \text{s}^{-1}$. Therefore, the CO₂ uptake decreased with the increased temperature (Figure 9a). These relationships also confirmed the fact that the canopy of vegetation at SACOL site reached the light saturation point at lower temperature, and then the carbon uptake reduced with the raised temperature. For all that, the enhanced light use efficiency of vegetation with the increased diffuse fraction is still an exactly conclusion at SACOL site covered with short grassland (Figure 5 and Figure 7c).

This result shows significant difference with that in crops and forests. However, considered the main topic in this paper, we didn't give the detailed comparative

analysis. This study is now underway. Please see a good reference for us: Norman, J.M. and Arkebauer, T.J., 1991. Predicting canopy light-use efficiency from leaf characteristics. In: J. Hanks and J. Ritchie (Editors), Modeling Plant and Soil Systems. Agronomy Monograph. ASA-CSSA-SSSA, pp. 125-143.

Specific comments:

1. Page 13338, line 5, author should give the full name of NEE.

Response: We have increased the full name of NEE in the abstract by following reviewer's suggestion..

2. Page 13341, lines 11-12, change "and it has" to be "with".

Response: We have changed the sentences by following reviewer's suggestion..

3. Page 13342, line 19, change "in" to be "at" and delete "at" before "wavelengths". Note: this type of minor editing is needed on occasion throughout the manuscript.

Response:

Response: We have revised the sentence and improved the other words and sentences. We hope it can make our results more clearly.

4. Page 13344, line 12, change "increase" to be "increasing"

Response: We have changed "increase" to "increasing".

5. Page 13350, line 1, the sentence is poorly worded.

Response: We appreciated reviewer's suggestion and revised the sentence.

6. Page 13352, lines 13-14, the sentence is confusing.

Response: We have revised the sentences and hope it can make our result more clearly.

7. Page 13353, line 6, please change "it corresponds" to "they correspond".

Response: We have changed "it corresponds" to "they correspond".

8. Page 13356, line 3, change "reach" to be "reached".

Response: We have changed "reach" to "reached".

9. Page 13356, line 10, correct it to have "optically thick clouds".

Response: Thanks for referring to the spelling error. We have revised it in text.