

## General comments:

This manuscript describes the efforts to characterize the leaf relative uptake (LRU) under natural field conditions. Understanding the variability of this parameter is necessary to link COS fluxes to gross primary production. This study is carried out adequately with a thorough analysis and interpretation of the available data and it contributes to the understanding of the variability of LRU.

The manuscript has improved now that it is shown with data that the share of stomatal resistance to the total resistance is larger for COS than for CO<sub>2</sub>. This provides evidence that COS is indeed more stomatal limited than CO<sub>2</sub>, which was hypothesized, but not shown with data in the previous version of the manuscript. The main concern that I have is that the second hypothesis in the introduction is not well introduced. The introduction describes the expected light dependence of LRU well (hypothesis 1), but the hypothesis that diurnal variation of vapor deficit will have effects on LRU is not explained here at all. This deserves some explanation in the introduction already.

## Specific comments:

### Introduction

Page 3, line 6-7: reference missing.

Page 3, line 17-18: Introduce the hypothesis that LRU will depend on the diurnal variation of vapor deficit.

### Results

At the end of each results section (3.1, 3.2, 3.3) there is an interpretation of the data that I think would fit better in the discussion section: page 8, line 32-33; page 9, line 11-14; page 9, line 32.

Page 9, line 12-13: “For COS, stomatal limitation is always a much stronger component compared with that of CO<sub>2</sub>.” Rather say how much the difference is on average, instead of stating “much stronger”.

Page 9, line 22: “[...] due to the stronger stomatal limitation on fluxes as a response to the high vapor deficit.” It has not been introduced here why stomatal limitation would affect LRU. Such interpretation would fit better in the discussion section, and it would have to be explained (preferably already in the introduction) why/how the stomatal conductance affects the LRU.

### Discussion

Page 10, line 11-13: “This light response of LRU arises from the difference between the marginal gain (i.e., partial derivative) of COS uptake and that of CO<sub>2</sub> uptake with respect to the

same increase of PAR (Fig. 5a, b).” It is not clear to me what you mean here, can you describe it in other words?

Page 10, line 16-19: This is not easy to follow. Perhaps it is easier to comprehend if you explain it in terms of  $F_{\text{CO}_2}$  and  $F_{\text{CO}}$  (Fig 5a-b?) than in terms of  $r_{\text{CO}_2}$  and  $r_{\text{CO}}$ ? Also I do not find it that evident in Fig. 6b that the relative increase of  $r_{\text{CO}_2}$  is higher than that of  $r_{\text{CO}}$ , it would be helpful if you can provide numbers of the relative increase of each.

Page 10, line 28-29: If you want to introduce the hypothesis that LRU depends on vapor deficit in the introduction section then it would be good to mention the difference between the catalytic efficiencies there already.

## Supplement

S1: “For COS, the use of a correction factor of 1.0 was acceptable.”

This is only in the case that the instrument software fitting parameters split the fit between the COS and H<sub>2</sub>O peak, so that the H<sub>2</sub>O peak does no longer influence the COS peak. Was that the case? If not, the correction factors -0.0146 (for CO<sub>2</sub>) and 0.030 (for COS), e.g.  $[\text{CO}_2\text{dry}] = [\text{CO}_2\text{wet}]/(\text{corr.fact.} \cdot [\text{H}_2\text{O}] + 1)$  suggested by Kooijmans et al. (2016) should be used.