

Responses and actions on referee comments on the manuscript ACP2013-698, The effect of atmospheric aerosol particles and clouds on Net Ecosystem Exchange in Amazonia, by Glauber Cirino et al.,

We thank very much both reviewers for the positive comments on our manuscript. We accepted virtually all suggestions for corrections and changes that helped the final version of the manuscript to be clearer and we removed some inconsistencies that the reviewers have pointed out.

We will address all individual comments from each of the two reviewers and we are making clear our exact actions on each comments or suggestion. We will start with the answers from referee 1, followed by referee 2. Our answers are in **BOLD** bellow each comment.

Referee Comments #1

General comments:

The authors report on the effect of aerosol particles and clouds on the net ecosystem CO₂ exchange at two sites in the Amazon. These sites are located where the Amazon forest experiences either a short or a lengthy dry season, in combination with either more or less influence of biomass burning. Although this type of research was already performed in Amazonia, there is a novelty in trying to validate remote sensed AOD derived from MODIS products against AERONET data, which I think the authors failed in highlight.

Authors comment: The most important scientific issue in our manuscript is the effects of aerosols and clouds on NEE, not the AOD comparison between MODIS and AERONET. This was a nice sub product, but is not the focus of our manuscript. The novelty was analyzing the aerosol effects on NEE in a pristine rainforest in central Amazonia. Previous work has analyzed this effect on Rondonia and Santarem, both places where the dry season is quite extended, and also where land use changes are significant. This is not the case for our K34 (Manaus site). No previous work analyzed this effect in Central Amazonia in pristine rainforest. In order to that, we had to develop new techniques using MODIS AOD, instead of AERONET AOD, because this was not available at K34. Additionally the developed technique allows the study of any place with NEE measurements that could be associated with MODIS AOD determinations. Additionally, we have not used radiative transfer codes such as SBDART, and instead we went to the more direct approach developed by Gu et al., 1999, applied to the Harvard Forest and that worked pretty well in Amazonia.

There was a massive work performed by the authors to reach the results presented here, even though I sense that it was not fully exploited (e.g., 10 years of AOD and NEE may allow to draw some conclusions about interannual variability).

We thanks for the suggestion on the analysis of interannual variability. We have done a detailed analysis of fire counts, average AOD and average NEE for daily averages from 1999 to 2009 to get the interannual variability. This analysis was not included in the manuscript because of size limitations, and because the results are NOT really conclusive. Water stress,

cloud cover, radiation fluxes, aerosols, etc, all influences carbon uptake simultaneously. In 2005 there was a very strong drought in Amazonia and recent papers shows that water stress influences significantly NEE in Amazonia (Gatti et al., 2014, Mercado et al., 2009). We have included a discussion on this important issue. This is now included in the revised version at the end of section 3.6, and reads like:

“It was also analyzed the yearly variability of the relationship between observed AOD, fire counts and NEE for the long time series of 10 years at K34. A significant year to year variability was observed, and some stronger NEE in days with high fire counts. But, hydro stress also plays a major role in carbon update (Gatti et al., 2014) that confounds the effects of aerosols on NEE in terms of attribution. More studies are necessary to address the interannual variability.”

However, the manuscript has many flaws that are not acceptable for the standard of ACP. For example, there are several moments that I sense that I know what the authors meant, but I am not sure. In addition, I have the impression that some sections were written in a rush, e.g. the results and discussion, and the authors either ended up them abruptly or introduced sentences out of blue that are not self-standing. The objectives of the work are not stated clearly, and leave the reader without a clue whether this research was to assess the influence of clouds and aerosol particles on NEE or to test and validate the AOD derived from MODIS in Amazonia. Finally, I missed any discussion or reference to soil water availability in the dry season. The authors mentioned the biotic factor (i.e. forest canopy and stomatal conductance) as it only responds to radiation loads (either direct or diffuse).

Authors response: We have done a careful revision of the text, rewriting some sections in a more straight way. We also changed the text on the objectives to make clear that our intent was to analyze the effects of aerosols and clouds on NEE for two different sites in Amazonia. The third line of the abstract of our original version reads: *This work examines the effects of changes in net radiation due to atmospheric aerosol particles and clouds on the Net Ecosystem Exchange (NEE) of CO₂ in the Amazon region.*

According to my point of view, the results are interesting and sounding, but not self-standing. The authors themselves acknowledge that to observe only the aerosol effect on the solar irradiance flux and consequently on the NEE measurements, the aerosol effect has to be isolated from the cloud effect. I therefore only recommend the publication of this manuscript after major revisions.

Authors response: Due to the strong aerosol-cloud interactions in Amazonia (Andreae et al., 2004, Koren et al., 2008, 2009, etc), it is not possible to fully separate the aerosol and clouds effects. Both affects the radiation balance in different ways, and are intrinsically connected (Boucher et al., 2014). Also both influence atmospheric thermodynamic properties in complex and not well know mechanisms. This discussion was included in the revised version at page 19, L6-10.

Specific comments:

1. P1L18-19: *when, during all year round or in dry season only?*
The analysis was done all year round from 1999 to 2009 at K34. For Rondonia (Rebio Jaru) from 1999 to 2002. Of course the effect of enhanced aerosols is stronger during the dry season. We added text on abstract at [Pg2, L1-2](#).
2. P1L27: *Eddy covariance technique rather than eddy correlation techniques.*
Ok! Changed in every occasion all over the manuscript.
3. P2L2: *"... AOD ranged from 0.10 to 1.5." - Also at 550 nm?*
Ok! Yes (AOD-500nm). Changed. Pg2, L4.
4. P2L6: *"... approaches 0." - Change to "approaches zero."*
Ok! Done. Pg2, L7.
5. P2L18-19: *"... modify CO2 exchanges in the biosphere- atmosphere interface." – How?*
A short text was added in Page 2, line 22-25 to make this point clearer.
6. P2L29: *"vonRadow et al., 2004) ..." – Change to "von Radow et al., 2004)..."*
Ok! Done. Pg3, L2.
7. P3L4: *"Long-term studies coordinated by the LBA experiment..." - In 2000 the LBA project was at its infancy, and there were no data to support this sentence (i.e. long-term studies).*
Ok! Done. We have replaced. Pg3, L12-13.
8. P3L12-13: *"... recent numbers indicate a kind of balance in uptake/emissions." - Please, add a reference to support this sentence.*
OK! We have added a reference to support this sentence. P3, L19-20.
9. P4L1-2: *"... Central Amazon, which suffer smaller impacts from biomass burning emissions." - I sense that this is the objective of your work. That is, to investigate and compare the impacts of aerosol loads on NEE on forests close to and far from burning emissions. Why not to make it clear to the reader?*
Ok! Added text on P4, Lines 7-9.
10. P4L10-11: *"... but these were made from relatively short data time series..." - Are you going to present a study with a longer data set? Why not explore that you are going to perform analysis with a data set that is longer than previous studies have used?*
Ok! Done. Thanks for the suggestion. Included on Pg4, L21-23.

11. P4L11-12: "... two regions of the Amazon: Rondônia-RO and Santarem-PA..." – Suggest to rather write "wet and seasonally dry forest of Amazonia"; in addition, are you going to present data from any other region of the Amazon? Manaus is located in the same latitude of Santarem and therefore still wet forest; these two sites differ in the length of the dry season...

Ok! Text changed at Pg 4, L20.

12. P4L14-17: Are you not saying the same thing, but with different words in these two sentences?

Ok! We changed the phrase. P4, L21-23.

13. P4L19-22: What is the objective of this work? It is not clear whether the authors want to assess the influence of clouds and aerosol particles on NEE or to test and validate the AOD derived from MODIS in Amazonia...

We changed the text to make it clearer. Pg4, L 24-31.

14. P5L1: "... -18 and -8 kgCha-1day-1..." - Suggest to remove the operator to not confound the reader that is not used to the convention used by micrometeorology.

Ok. We changed. Pg5, L27-28.

15. P6L8: "... of 23.5 0C and 31.0 0C, respectively" – Typos.

Ok. Done. Pg6, L28.

16. P6L15: "2.2.2 Meteorological and flux measurements of CO2" - Suggest reviewing this section as there are many inconsistencies regarding instrumentation and data acquisition systems. In addition, it is recommended to separate the meteorological from turbulent measurements.

OK. We have reviewed trying to make it more easily readable. Pg7, L5-30.

17. P6L24: "... wet and dry bulb thermometers (± 0.1 °C),..." - Do the thermohygrometers from Vaisala have dry and wet bulbs?

We removed from the text useless information such as this, because we have not used them in the manuscript. Pg7, L18.

18. P6L24-25: "... anemometers with a minimum wind speed of 0.3 to 0.4 ms⁻¹ and..." – I sense that this information is not relevant here as wind speed is not the focus of this research and are not mentioned in Table 1; furthermore, these minimum wind speeds values are not correct (please, refer to the manuals to check them).

We removed from the text useless information such as this, because we have not used them in the manuscript. Pg7, L19.

19. P6L25: "... rain gauge with accuracy of ± 0.2 mm." - This is not right; this is the resolution of the rain gauge.

We removed from the text useless information such as this, because we have not used them in the manuscript. Pg7, L19.

- 20.** P6L28: "... eddy covariance system similar..." - Now you are using the correct term. Note that most of the time you have been using the term eddy correlation that is not correct, to describe the technique that has been used to measure and calculate the fluxes you are using for your analysis.
OK. Thanks for the reminder.
- 21.** P6L29: "... sonic anemometer (~ 10.4Hz)..." - This is not right. Sonic anemometers usually operate at 20 Hz, but in most cases about 1/2 of data is collected because the turbulent signal is still present within this sampling frequency.
We removed unused information. The AltEddy software version 3.1 used in the study takes care of these details. Pg7, L23.
- 22.** P6L31-32: Please, review this table as it contains several information that are either not correct or not updated.
Ok, we have reviewed. Pg36, Table 1.
- 23.** P7L14-15: Are these periods correct for every site?
YES. All HDF files from MODIS explicitly mention the exact passage over each coordinate for each site. Pg8, L14-16.
- 24.** P8L10: "CO2 turbulent flow" – Did you mean CO2 turbulent flux?
OK. Correction done. Pg9, L9.
- 25.** P8L10: "... the eddy correlation system..." - Please, review the use of eddy correlation and eddy covariance throughout the text. It is confusing.
OK. Done all over the manuscript. P9, L9, L12.
- 26.** P8L11: "... CO2 concentration..." – CO2 (there are many other typos like this throughout the manuscript).
OK. Done all over the manuscript. Pg9, L17.
- 27.** P8L12: "...profile at discrete levels z_i of Δz_i thickness..." - If you mention the discrete levels, than you should have written them mathematically in the equation 1...
Ok! Done. Pg9, Equation (2).
- 28.** P8L12: "... the soil surface..." - Looking at Table 1, the nearest level to the soil surface is 5.6 m; may it be considered soil surface?
OK! We have reviewed the Table1, Pg36, Table 1. The nearest level to the soil surface is 0.5 m (K34) and 0.05 m (RB J). We added a text saying "from close to the soil surface" to make the point more clearly. Pg9, L11.
- 29.** P8L16: "... following Albinet et al. (2001)..." – "...following Aubinet et al. (2001)..." (there are some typos like this throughout the manuscript, please review other citations too).
Ok. We have reviewed all the citations on the paper and they are corrected in revision. The correct name is Aubinet. Pg9, L15.

30. P8L19: "... C is the..." – Typos, lower case.
Ok! We have changed both citations to capital letter. Pg9, Equation (2), L17.
31. P8L19: "... the [CO₂] (μmolmol⁻¹)..." - Have you introduced this term before? If you are going to use it to represent CO₂ concentration, please be consistent with the symbols you are using throughout the text.
OK. We replaced for "CO₂ concentration" and removed the bracket. Pg9, L17.
32. P8L21-15: You are anticipating the results and discussion here, in a section that is dedicated to show the methods; suggest moving this paragraph to the right position in the text...
Ok, we have moved this paragraph to the "Results and Discussion" section. We have created a new section to do this. From Pg9-10, L20-11 to Pg15-16, L23-13.
33. P8L27: "... atmosphere (respiration greater than photosynthesis)." - There is no photosynthesis at night...
OK. We have deleted the sentence (respiration greater than photosynthesis). Moved to P15, L30.
34. P9L19: "... the words "cloud" or "cloudiness" was..." – Did you mean "...the words "cloud" or "cloudiness" were..."?
Ok! Done. We changed to: "were". Pg10, L18-19.
35. P11L29: "... find kt*: First, it was plotted values of kt against time of the day." - I sense that I know what you mean, but you need to rephrase this sentence.
Ok! We have replaced the sentence to: "First, values of the kt were plotted against time, during the day." Pg11, L29.
36. P12L1-2: "Finally, the values of kt found along the mornings and afternoons clear-sky selected were..." - This sentence is quite confusing consider rephrasing it...
Ok, replaced to: "Finnally, the values of the Kt selected during all mornings or afternoons were plotted against the solar zenith angle again to check if the clear-sky days selected met the two criteria set out above." Pg12, L2-4.
37. P12L9: "... solar zenith angle calculated Gates (1980)..." - Is this sentence right?
Yes, that's right. However, we changed the sentence to: solar zenith angle calculated (Gates, 1980). Pg12, L12.
38. P12L26-27: "... carbon flux (%NEE) by way of the following relationship..." - Confuse, reorganize the wordiness.
Ok. We changed all the sentence to: "...The changes in the observed NEE relative to NEE with clear skies (%NEE), were used to determine the percentage effect of aerosols and clouds on the NEE. The %NEE was calculated by the following relationship: ...". Pg12, L28-30.

39. P13L1: "... given condition sky..." – Did you mean sky condition?

Ok, that's right. We fixed to: "sky condition". Pg13, L4.

40. P13L5-6: "... parameter f , it was initially analyzed and grouped data at intervals of solar zenithal angle between 10-20° and 20-35°." - I sense that I know what you mean, but this sentence is confusing...

Ok, we have reviewed this paragraph, changed to:

In order to largely eliminate the interference of solar elevation angle on the analysis of changes in NEE or %NEE, versus K_t or f , we grouped the data into intervals of solar elevation angle of approximately 15°. This interval was small enough to minimize solar elevation effects during the day and to represent changes in NEE with K_t or f only in response to changes in the ecosystem resulting from aerosols and/or clouds. Moreover, this interval provides sufficient sample size for statistical analyses. P13, L7-12.

41. P13L9: "Therefore, a 10 to 35° elevation angle were chosen..." – Suggestion "Therefore, an elevation angle ranging from 10 to 35o was chosen..."

Ok. Done! P13, L18.

42. P13L14: "... are satisfactory in view of the measurement sample size..." - Rephrase this sentence, I know what you mean, but it is not grammatically correct.

Ok! Replaced to: The statistical parameters R^2 and p-value (Fig. 4a and b) were statistically significant considering the measurement sample size. P13, L23.

43. P13L15: "The coefficient of determination R^2 ..." - This is text book knowledge; there is no need to explain what R^2 stands for...

Ok! We have removed. Pg13, L26.

44. P13L18-19: Do the coefficients for RBJ obtained in this study differ from that published by Oliveira et al. (2007) for the same site and almost for the same time period reported here? Why you refer only to Tapajos National Forest? Please, explain.

The data sets for RBJ from the study of Oliveira et al., 2007 and this study are not exactly the same considering the clear sky days, because of the different methodology employed in each study. The criteria used to find clear days throughout the year, in the Oliveira et al study was based on calculations from SBDART radiative transfer, while in our study it was based on the methodology from Gu et al., 1999. This was done to avoid radiative transfer modeling that requires detailed physic aerosol properties that are not available trough the whole study period. The fact that the data sets are different means that the coefficients could not be exactly the same. But, they are statistically compatible within 95% confidence interval. We updated this information on Pg13, L22-31.

45. P13L23-27: This is redundancy. Remove this paragraph from the text as you will discuss them in the next section...

Ok! We have removed this paragraph. Pg14, L1-5.

46. P14I2: "... radiation PARf..." – Delete PARf as it is going to be introduced after the Equation 9.
Ok! Done. Pg14, L11.
47. P14L5: "... and $q = (S_f / S_e) / kt...$ " – You should write this as Equation 10, rather than writing it when explaining the terms of Equation 9; in addition, how have you measured the diffuse radiation and what the term S_e stands for?
Ok, we have reviewed this paragraph and also inserted the Equation 10, explaining the terms of equation. We expanded the explanation of the equation 10 terms to explicitly mention what are each equation parameters. Pg14, L11-22.
48. P14L7: "... Earth's surface ..." - This is not scientific writing...
Ok, changed. P14, L20.
49. P14L7-9: Suggest reorganizing this sentence. As it is, confuses the reader as out of blue you introduce the terms LUE and D_f .
Ok, we have reviewed the sentence. Pg14, L16-26.
50. P14L12: "As there are no direct measurements of skin temperature of the canopy at either study sites..." - Have you checked whether surface temperature measured by infrared thermometers are not available?
Unfortunately there are NO surface temperature measurements available, as we stated in the manuscript. Pg15, L4-5.
51. P14L13: "... around 15-20m high inside the canopy on..." - Are you sure you meant high inside canopy here? Rather, you meant "height above the canopy..."?
We corrected the expression. P15L3-4.
52. P14L14: "... long wave radiation from the surface (L_{\uparrow})..." - This is not what is written in Equation 11...
Ok, was fixed the error in equation 11. Pg15, Eq11.
53. P14L23: "This section presents and discusses the main results of this study." – Remove it from the text.
Ok. Done! Pg15, L17.
54. P14L23-24, P15L1: "The first task was to validate MODIS AOD estimations with the AOD measurements from the AERONET sun-photometer network." - Are we finally talking about the objectives of this work? This should have been made clear before (at introduction)...
We changed the text on the objectives in the last paragraph of the introduction to make clear that our intent was to analyze the effects of aerosols and clouds on NEE for two different sites in Amazonia. The task to validate MODIS AOD estimations from AERONET data are part of methods, and not an objective of this work. Pg4, L22-29.

55. P15L4-5: "... parameter (f), during the biomass burning season at both sites." – "Only now you are giving the reader a chance to know that you will concentrate your analysis during the burning season; this should have been warned anywhere, for instance either in the introduction or section 2.2..."

All our analysis was done through the year, including wet, dry and transition seasons. We have changed this sentence, because it was not wrote clearly in the text. We have changed the sentence to make this very clear. We also added in the abstract a text with this info. Pg15, L22-23.

56. P15L24-25: "...show values around 5-10% higher than AERONET measurements, are considered acceptable (Chu et al., 2002)." - Revise the wordiness of this sentence; it is confusing...

Ok! We have reviewed. The revised text reads "The systematic errors (Mean Absolute Error - MAE) of the estimates of AOD with MODIS, show values around 5-10% higher than AERONET measurements. This difference is considered acceptable in similar AERONET-MODIS comparison (Chu et al., 2002)." Pg 16-17

57. P15L28-30: It seems like you are anticipating the conclusions...

Ok! We agree. We moved the text to the conclusions section. It was at Pg 17, L11-12. And moved to Pg 22, L13-14.

58. P16L3: "In the present study, the impact of..." – Change to "The impact of..."

Ok, done! Pg17, L16.

59. P16L4: "... budget is assessed..." – Change to "...budget was assessed..."

Ok, done! Pg17, L17.

60. P16L9: "... with a R^2 , ~ 0.22 (K34)..." – Change to "...with a R^2 of about 0.22 (K34)..."

Ok, done! Pg17, L23.

61. P18L15: "For each ZSA..." – Change to "For each Zenithal Solar Angle (ZSA)..."

Ok, done! Pg19, L31-32.

62. P20L8: "... the canopy forest and..." – Change to "...the forest canopy and..."

Ok, done! Pg21, L24.

63. P20L20: "... produced an increase in VPD of..." – Is this right, an increase in VPD? Did you mean a decrease in VPD?

Ok! Sorry for our mistake. We have replaced to: "... produced a decrease in VPD of...". Pg22, L5.

64. P21L1: "... satisfactorily quantity the reduction..." – You meant "...satisfactorily quantify the reduction..."?

Ok, that's right. We have replaced to: "...satisfactorily quantify the reduction...". P22, L20.

65. P21L7-8: “Aerosols from biomass burning produced up to a 50% reduction in the amount of total incident solar radiation and...” - How did you take aerosol and cloudiness apart? Did I miss this in the text?

It is not possible to fully separate the effects of aerosols from the cloud effects. Both increase diffuse radiation and attenuate direct flux, having similar effects. We added a text in the abstract and also in the conclusions to make this point clear. Pg22, L25-27.

66. P21L17-19: Figure 11 does not support what is being said here; you have not discussed leaf or canopy respiration in the results and discussion section and out of blue adds this speculation about reduced rate of respiration.

Figure 11 shows the relationship between the VPD and the clearness index for 10°–35° intervals of solar zenithal angles (SZA). VPD tends to decrease as the clearness index decreases. Similar patterns were also found for other solar zenithal intervals (data not shown). The decrease in VPD induces stomatal openness and thus enhances leaf photosynthesis. [Collatz et al., 1991; Freedman et al., 1998]. Our original statement was not really supported by our data. We rephrased completely the sentence. You are right, and we corrected the text. Pg22, L7-9.

67. P21L21: “... on CO2 fluxes difficult.” – You meant “.....on CO2 fluxes is difficult.”?

Ok, Thanks. We have replaced to: “...on CO2 fluxes is difficult.”. Pg23, L5-10.

Equations

1. Equations 4 to 9 do not seem to have been written with a formula editor...

Actually, all the equations were made with a formula editor. We have included in the LaTeX version of the manuscript to ACPD in the revised version.

Tables

Table 1:

Vertical profile of [CO2] and water vapour [H2O]:

1. Correct the lower case for CO2 and H2O;

Ok! We have changed the lowercase to the correct form. Table 1, Pg.36.

IRGA PP Systems CIRAS SC

2. Are you sure that this was the only IRGA used at these towers during the time period you have used the data set?

We double checked the info on Table 1, and the Licor 6262 closed path IRGA was the only model used over these years on the two sites. Nowadays, others IRGA models like the open path or Picarro are being used, but not at the time of this study.

Measurement height at K34

3. *These are not correct;*

There was a problem in reporting wrong heights at RBJ. The paper where we got this info reported heights above the CANOPY at RBJ, not from the ground. We corrected in the revised version all heights of instruments with distances from the ground.

Relative humidity: Vaisala thermohygrometer (HMP35A) and (HMP45AC) /PT100 resistors

4. *Are you sure PT100 are used to measure relative humidity?*

We correct the info. The temperature measurement is based on resistive platinum sensors (PT100) inside the HMP35A.

u, v e w (wind vector):

5. *Measurement height at K34 – Are you sure that these heights are correct?*

We corrected and double checked all heights.

***Height above the canopy top (~35m)**

6. *This is somewhat confusing. What is the height of the canopy top at K34 flux tower site?*

The average height of the forest canopy is 35 meters. This info is below the table 1.

Table 2:

7. *Suggest removing it, as it was barely used in the manuscript.*

Done! Table 2, Pg37. Please, note that we have organized the numbers off all other tables accordingly.

Table 3:

8. *Afternoon – Typos (afternoon)*

Ok, Done! Table 3, Pg38.

Table 4:

9. *Suggest deleting it, as regression coefficients may be plotted together with Figure 5.*

We find these coefficients important to be used by the modeling community. This is the reason we included them clearly in Table 4. This also make Figure 5 more clean.

Figures

Figure 3:

10. “Scatter plots and regressions between clear-sky clearness index and the cosine of solar zenithal angle...” - This is not what is shown as Y-axis label. Instead, it is shown NEE... In general, I suggest reviewing the number of figures to reduce them to a number of 6-7 at most.

We have replaced the Y-label of figure 3. It was done when we submitted the Final Typesetting File to ACPD on 05/Nov/2013.

Referee Comments #2

General comments:

The effect of atmospheric aerosol particles and clouds on Net Ecosystem Exchange in Amazonia acp-2013-698. The manuscript presents results for an elegant analysis of the effects of clouds and seasonal aerosols from burning activities in radiation properties and the concomitant effects on the net exchange of CO₂ in two types of tropical forest in the Amazon. Although the results are not particularly novel or unique as it is noted from the cited literature, the authors make a good use of different techniques and analytical schemes to consolidate their story. I for example found of value the validation of the MODIS OAD product (MOD/MYD-04L2) against ground data and the demonstration of use to study surface processes such as NEE. Overall, I believe that the work represent a contribution to the iLEAPS initiative and fits in the scope of ACP/BG. However, two important arguments that can complement this manuscript would be related to the effect of the aerosols on totalized NEE values by seasons (wet vs. dry, fire vs. non fire season) or over the studied years (the data set is long enough to permit a discussion for interannual variability).

We thanks for the suggestion on the analysis of interannual variability. We have done a detailed analysis of fire counts, average AOD and average NEE for daily averages from 1999 to 2009 to get the interannual variability. This analysis was not included in the manuscript because of size limitations, and because the results are NOT really conclusive. Water stress, cloud cover, radiation fluxes, aerosols, etc, all influences carbon uptake simultaneously. In 2005 there was a very strong drought in Amazonia and recent papers shows that water stress influences significantly NEE in Amazonia (Gatti et al., 2014, Mercado et al., 2009). We have included a discussion on this important issue. This is now included in the revised version at the end of section 3.6, and reads like:

“It was also analyzed the yearly variability of the relationship between observed AOD, fire counts and NEE for the long time series of 10 years at K34. A significant year to year variability was observed, and some stronger NEE in days with high fire counts. But, hydro stress also plays a major role in carbon update (Gatti et al., 2014) that confounds the effects of aerosols on NEE in terms of attribution. More studies are necessary to address the interannual variability. “

Furthermore, the authors nicely present percentage changes in total and diffuse radiation and as aerosols play a role under different atmospheric conditions, but the net effect on total carbon gains is not discussed (i.e. potential effect on C budgets). This element is important because it can potentially widen the scope of the discussion since both forests have important differences on the seasonally and variability of NEE and an important contrast on land uses.

We would love to do that, but the problem is how to extrapolate from measurements in TWO towers the change in NEE for an area of 5.5 millions Km². The two towers are really not fully representative for the whole Amazon forest. AOD varies significantly over the area, as well as biodiversity, soil nutrients, hydro stress and many other variables. We did not feel confident at this study into model this effect. It will certainly be done by other groups after the manuscript is published.

Specific comments:

On the structure of the paper I would recommend some minor changes for clarity:

1. Page 28823L25 to Page 28824 L2. Please integrate these lines in section 2.2.1 but avoid redundancy.

We have integrated. Pg7, L5-8.

2. Page 28824 Line 3 to 16. Please merge this information at the corresponding site description in sections 2.1.1. and 2.1.2.

Ok, we merged these informations at the corresponding site description in sections 2.1.1. and 2.1.2. Pg5-6, L24-L1 e Pg6, L11-18.

3. On section 2.2.1 Please present the information from Table 1 earlier so the reader can find the details presented in such table as the instrumentation and measurement details is presented in the text.

Ok, we have reviewed. Pg36, Table 1. We removed from the text useless information such as this, because we have not used them in the manuscript. Pg7, L5-30, Section 2.2.1.

4. Page 28829 L1 to 21. This paragraph are mostly results and not methods, please merge on section 3, considering a new numbering sequence for table 2.

Ok, we have moved this paragraph. We have created a new section to do this. Pg15-16, L26-17.