Atmos. Chem. Phys. Discuss., 14, C10034–C10041, 2014
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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Biomass burning related ozone damage on vegetation over the Amazon forest" *by* F. Pacifico et al.

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Response to Anonymous Referee #2 (acpd-14-C6162-2014)

1) The authors mention in the Introduction (page 19958, lines 1-5) that aerosols from biomass burning can impact the diffuse radiation and therefore, indirectly, NEE. Were these interactions included in the model simulations of this study? I would expect that some emissions from biomass burning (NOx, VOCs, CO) could impact ozone production in plumes, but that the aerosols could also impact this chemistry (by changing photolysis rates). Was this taken into account? Or any of the feedbacks to the meteorology? (e.g., boundary layer height, temperatures)? Along these lines, were the biogenic emissions changed with the different biomass burning scenarios, or were they

kept constant?

R: At page 19958, line 5 we have added: 'This study does not consider the effects of the changes in diffuse radiation due to biomass burning on photosynthesis, or the impact of aerosol on O3 chemistry via changing photolysis rate. That will be the focus of a separate study. Our specific aim is to estimate the effect of ozone-induced changes on vegetation productivity due to biomass burning.' The feedbacks of biomass burning emissions on meteorology (e.g., boundary layer height, temperatures) were not included. The idea was to focus on the biomass burning related O3 damage on vegetation. Biogenic emissions are calculated interactively (page 19960, lines 8-11), so they are not constant, but they are independent from the biomass burning scenario. At page 19970, line 5, we have added : ', and BVOCs emissions,'.

2) I would appreciate a bit more information about the fire emissions used in this study. Although the authors state the references from which they got the estimates, it woul be helpful to include a bit more information about them here. For example, are they monthly emissions included constantly throughout a month, or is there a daily and/or hourly variation in these emissions? Wouldn't this make a difference in the modeled ozone production and results? Could this potentially also help explain the discrepancies between the model and the measurements?

R: At page 19960 line 13, we have added: 'Given the difficulty in prescribing a diurnal cycle for fire emissions, these monthly mean emissions are kept constant during the day.' At page 19966 line 17, we have added: 'As stated earlier in the model description section, biomass burning emissions are prescribed as monthly mean and kept constant during the day, and this can have an impact on the hourly and day-to-day variation of surface O3. For example, O3 production will respond differently if biomass burning emissions occur during the day or at night, affecting simulated surface O3 mixing ratios. These issues can be improved by modelling fire and biomass burning emissions interactively. The inclusion of an interactive fire model in HadGEM is currently under development.'

3) The figures (particularly Figures 1, 2, 6) are very difficult to read. It would be very helpful to have them enlarged or simplified so that they are easier to see. R: We have improved Figures 1, 2 and 6.

Other comments: Page 19958, line 8: “where” should be “were” R: We have replaced ‘where’ with ‘were’ at page 19958 line 8

Page 19959, lines 18-21: Are biogenic emissions or anthropogenic emissions reduced due to deforestation, and why would this lead to an overestimation of ozone? This statement could include more details. R: At page 19959, line 21 we have added: ‘deforestation via burning, consequently reducing the amount of O3 precursors’.

Page 19960, lines 12-14: How were monthly emissions temporally included in the model simulations? R: At page 19960 line 13, we have added : ‘Given the difficulty in prescribing a diurnal cycle for fire emissions, these monthly mean emissions are kept constant during the day.’

Page 19962, line 24: Use “that” instead of “which” R: We have replaced ‘which’ with ‘that’ at page 19962 line 24

Figure 5: Label the graphs “a”, “b”, “c” R: We have labelled the graphs in Figure 5: “a”, “b”, “c”

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/14/C10034/2014/acpd-14-C10034-2014-supplement.zip

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 19955, 2014.

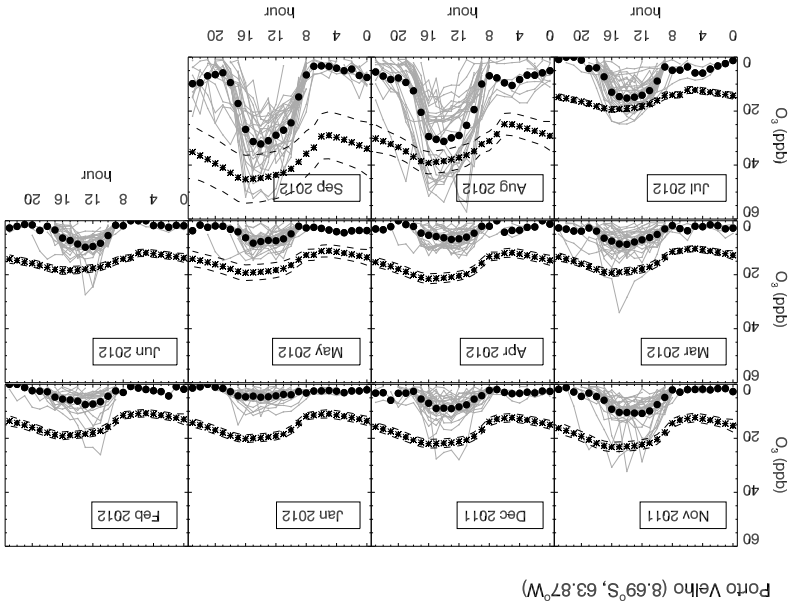

Fig. 1.

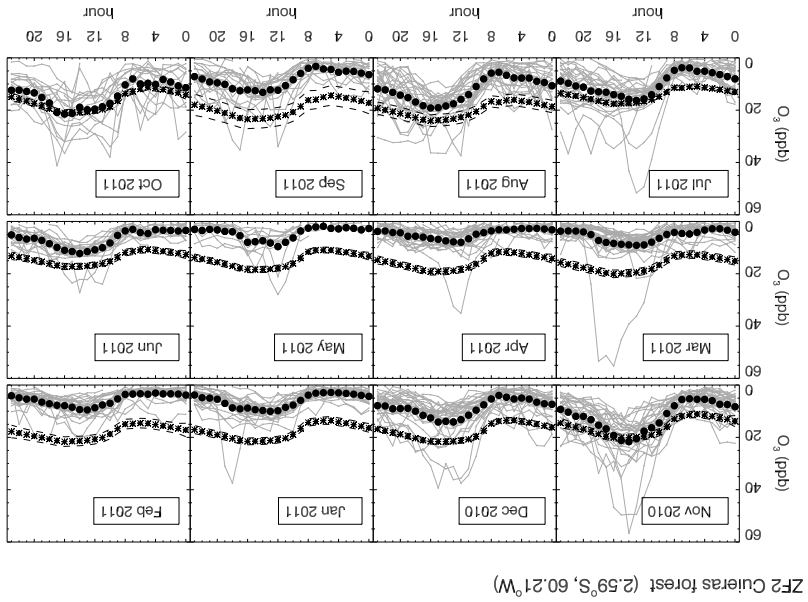
ZF2 Cuieras forest (2.59°S, 60.21°W)
Nov 2010
Dec 2010
Jan 2011
Feb 2011
Mar 2011
Apr 2011
May 2011
Jun 2011
Jul 2011
Aug 2011
Sep 2011
Oct 2011
O3 (ppb)
hour

Fig. 2.

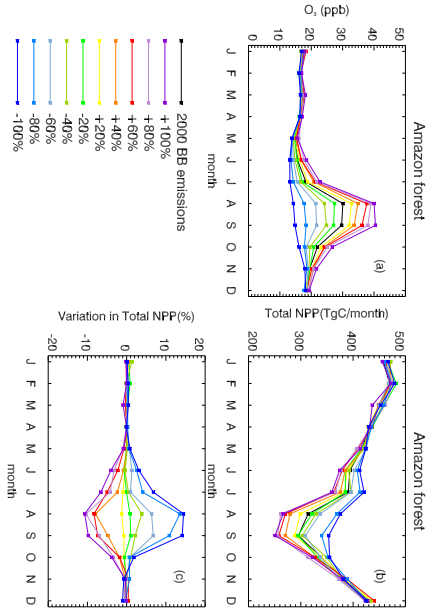
O3 (ppb)
Amazon forest
month
(a)
2000 BB emissions
-100%
-80%
-60%
-40%
-20%
+20%
+40%
+60%
+80%
+100%
Total NPP(TgC/month)
(b)
Variation in Total NPP(%)
(c)

Fig. 3.

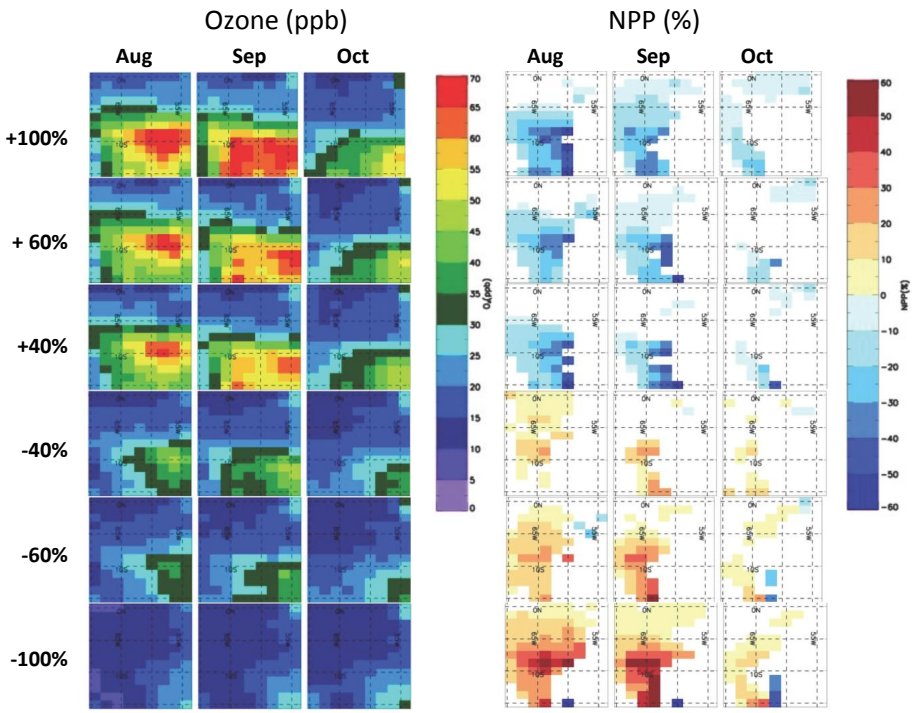
Ozone (ppb)
NPP (%)
Aug
Sep
Oct
+100%
+ 60%
+40%
-40%
-60%
-100%

Fig. 4.

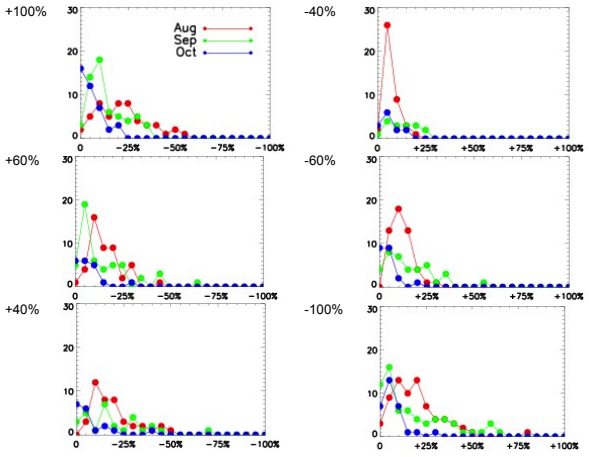
+100%
+60%
+40%
-40%
-60%
-100%
Aug
Sep
Oct

Fig. 5.