Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-836-AC2, 2016

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Effect of mid-term drought on *Quercus pubescens* BVOC emissions seasonality and their dependence to light and/or temperature" *by* Amélie Saunier et al.

Amélie Saunier et al.

amelie.saunier@imbe.fr

Received and published: 19 December 2016

The authors would like to thank the Editor and the Reviewers for very careful and detailed review of our manuscript and providing of comments and suggestions to improve the quality of the manuscript.

RC2: This manuscript presents BVOC emission data from the drought tolerant Quercus pubescens using PTR-TOF-MS techniques. The authors study a suite of BVOCs (isoprene, methanol, acetone, acetaldehyde, formaldehyde and MACR+MVK+ISOPOOH) at 3 points over a year, under both natural and amplified drought conditions. They compare observations with model algorithms and report 2 types of emission responses: 1) light and temperature dependent and 2) it dependent during the day and only temper-

Printer-friendly version

Discussion paper

ature dependent at night.

RC2: General Comments English grammar problems are numerous throughout the manuscript. AC: The manuscript was corrected by a bilingual person.

RC2: Your two types of responses can be more easily summarized throughout the manuscript, “All six BVOCs monitored showed daytime light and temperature dependencies, while three BVOCs (methanol, acetone and formaldehyde) showed nighttime temperature dependencies as well.” Figures 4 and S3 show that the models do accurately simulate the emission burst for methanol as well as the formaldehyde deposition, albeit the models both show a slight lag in the hour of the day in just the autumn natural drought conditions. AC: The burst of methanol is observed only in spring and summer between 6am and 8am. For exemple methanol emission reach almost 0.8μgC.gDM-1.h-1 during the burst contrasting with the previous emission (less than 0.01). The graph shows that none of the model (yellow and dotted lines) fit this burst. Concerning formaldehyde deposition (S4), even if the models follow the same emission pattern than the observations, they don’t show any negative emission and so can’t accurately allow to estimate the deposition.

RC2: Specific comments L13 and throughout manuscript: use plural form “BVOCs” when speaking about more than one compound. AC: We did the modifications throughout the manuscript.

RC2: L19: “. . .especially in the Mediterranean. . .” AC: We did the modifications throughout the manuscript (line 18).

RC2: L22: “. . .a drought tolerant. . .” AC: We already deleted this point as suggested by the other reviewer.

RC2: L51 – 53: You write: “Several models, already existing (Guenther et al. 2006; Guenther et al. 2012; Menut et al. 2014), predict BVOC emissions according to the type of vegetation, biomass density, leaf age, specific emission factor for many vegetal

species, as well as the impact of environmental factors." Please separate references for accuracy. For example, MEAGAN models (Guenther 2006 and 2012 references) do not include vegetation species specific emission factors nor account for leaf age or biomass density. AC: We did the modification (line 52).

RC2: L70: ". . .IPCC predicts. . ." AC: We did the modification (line 76).

RC2: L85: "60 km North of Marseille, France. . ." AC: We did the modification (line 89).

RC2: L93: You write, ". . .drought (300m2) and an amplified drought (232m2)." Better indicate what the values in parentheses represent. AC: We have corrected this point as follows: "A rainfall exclusion device (an automated monitored roof deployed during selected rain events) was set up over part of the O3HP canopy (232m^2 surface) to exclude 30% of raining according to the worst scenario of climate change (Giorgi & Lionello 2008; IPCC 2013). This surface, thus, formed the amplified drought plot which was compared to natural drought plot (300m^2 surface) where trees grew under natural conditions with no rain exclusion." RC2: L93 – 101: This wording was difficult to understand. How did you determine the extent of drought? How do you know this was indeed a drought stress? AC: To answer to this point, we have added a new graph showing the ombrothermic diagrams for the 2 plots used. The drought periods were presented in this graph showing the recurrence and length of drought periods for every years. Drought stress occurs when the temperature line is above the precipitation bars in ombrothermic diagrams (Emberger et al. 1963).

RC2: L95 – 97: "During the first year of experiments (2012), 35 % of natural rain was excluded and, afterward, 33.5 and 35.5 % were excluded (2013 and 2014, respectively) corresponding for three years, to 2 months for natural treatment and 5 months for amplified treatment of drought period." This text should be rewritten to clearly describe the differences between the natural and amplified drought treatments in terms of rainfall exclusion and periods of application, i.e. what 2 month period? What 5 month period? AC: We have rewritten the paragraph to be clearer. Together with the ombrothermic

diagram, we hope that the experimental precipitation exclusion is better explained (lines 93-105).

RC2: Was there any sampling conducted prior to the experiment or during the experiment on non-drought stressed trees for comparison? AC: There was no sampling conducting prior to the experiment on non-drought stress trees. Indeed, we have two treatments: one where trees are submitted to natural rain (and so natural Mediterranean summer drought) and a second one where trees are submitted to amplified drought (more or less 30% according to climatic models) during the tree growth period.

RC2: L229 - 231: Nevertheless, our results suggested that methanol emissions responded strongly to light and temperature during the day whereas, during the night, they responded to temperature. See General Comments for suggested clarification. AC: We better structured the manuscript by introducing: “All six BVOCs monitored showed daytime light and temperature dependencies while three BVOCs (methanol, acetone and formaldehyde) also showed emissions during the night despite the absence of light under constant temperature. Âż in the beginning result section (lines 212-215).

RC2: L261 – 262: “Moreover, some phenomenon, such as the burst in early morning (methanol and acetaldehyde) or the deposition/uptake (formaldehyde), were not modelled by L+T or T algorithm.” Figures 4 and S3 show that the models do accurately simulate the emission burst for methanol as well as the formaldehyde deposition, albeit the models both show a slight lag in the hour of the day in just the autumn natural drought conditions. AC: As we said above: “the burst of methanol is observed only in spring and summer between 6am and 8am. For exemple, methanol emission reach almost 0.8μgC.gDM-1.h-1 during the burst contrasting with the previous emission (less than 0.01). The graph shows that none of the model (yellow and dotted lines) fit this burst. Concerning formaldehyde deposition (S4), even if the models follow the same emission pattern than the observations, they don’t show any negative emission and so can’t accurately allow to estimate the deposition”.

Emberger L., Gaussen H., Kasas M. & DePhilippis A. (1963). Carte bioclimatique de la zone méditerranéenne. UNE SC OF AO, Paris, carte et annexes.

Giorgi F. & Lionello P. (2008). Climate change projections for the Mediterranean region. Global and Planetary Change, 63, 90-104.

IPCC (2013). In: Contribution of working group I to the fith assessment report of the intergovernmental panel on climate change. Cambridge Univeristy Press Cambridge.

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-836, 2016.

Printer-friendly version

Discussion paper