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Atmospheric Chemistry and Physics Discussions

Interactive comment on "How does soil water availability control phytotoxic O_3 dose to montane pines? Modelling and experimental study from two contrasting climatic regions in Europe" *by* Svetlana Bičárová et al.

Anonymous Referee #1

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The results organization, the quality of interpretations and conclusions must be improved. Some parts are particularly confused and results cannot be easily interpreted. On several points it is unclear how the conclusions have been obtained. The inclusion of the French site includes a lot of inconsistencies and no added-value to the paper. I suggest submitting this paper under a journal with lower Impact Factor, removing the French site and updating the list of co-authors if need be.

++ Major opened issues need to be clarified.

PODy must be calculated from on-site data, not from data coming from distant stations. This issue is critical. Indeed, the ozone concentrations are measured at more than 15km from site FR-Alp and meteorological data from another station (> 20 km). The ozone pattern and meteorological parameters are heterogeneous, in particular in mountains. The SWP measurements are missing for this site. Which parameterization did you use, i.e. Continental Central European species for coniferous forests? Please clarify this issue.

Line 160: the maximum stomatal conductance (gmax) is based on the average above the 95th percentile of gsto measurements under optimum environmental conditions for stomatal opening. The stomatal conductance measurements ranged from 110 to 160 mmol O3 m-2 PLA s-1, how is possible to have a 95-pencentile of 110? Norway spruce median value 125 mmol O3 m-2 PLA s-1, range (87-140), is used for mature Norway spruce trees (CLRTAP, 2015) while you have specified a value of 160 mmol O3 m-2 PLA s-1 generally used in DO3SE model as a standard for coniferous tree species. This is false.

What is the validity of ozone-induced injury data? Who carried out the epidemiological studies? Trained experts (e.g. ICP-Forest experts)? Authors have to stress on the in-field data quality and on the importance to validate these data by experts for a better performance. How did you consider the data variations between surveyors? Did you find dwarf mountain pines in Mercantour park (table 3)?

The POD0 for FR-Alp (12.5 mmol O3 m-2) seems too low. Did you include SWP in PODy calculation for the French site? Line 260: did you test (statistically) the difference? On Figure 5, the both values FR-Alp for C+1 and C+2 appears as outliers. The large difference for the percentage of surface affected by ozone-induced injury between both regions can be due to the difference of field evaluation by surveyors. This point could be discussed.

As you have calculated PODy, differently (e.g. SWP inclusion), the comparison be-

tween both regions is inconsistent. The authors observed a lower percentage of visible ozone injury while higher POD0 were calculated. This conclusion must be carefully argued. Indeed, PODy must be calculated over the accumulation period started from the start date of the growing season until the day when the survey of symptoms was carried out. This was not respected, therefore PODy is overestimated. In addition, the ozone and meteorological data are from distant stations in France and SWP was not measured in France.

Line 305: SWP non-essential for the PODy calculation? Please explain this contradictory point.

Line 325: why did you mention "Different visible O3 injury response may be expected under natural conditions. . ."? You are under real world conditions.

++ A series of grammatical and typos errors, throughout the manuscript, must be taken into account.

The title is too long; the second part of the title can be removed. Y represents a detoxification threshold, rather than "threshold flux" (line 43-44), below which it is assumed that any ozone molecule absorbed by the plant will be detoxified. Line 47: what are the reasons to use POD0 rather than POD1?

Line 104: AOT40 is calculated for hours with a short wave radiation exceeding 50 W m-2 according to CLRTAP (2015), commonly the time window 8am-8pm is used at 45° latitude. The critical value of 5 000 ppb h was established for forest protection (line 105).

Line 106-114: gsto (mmol O3 m-2 PLA s-1) is estimated from functions describing the response of stomata to key species-specific and environmental variables. Please include the formula PODy, define fmin, what are the values rc and rb? What is the integrated time-window? The functions, not defined in this paper, are expressed in relative terms (between 0 and 1). Define the function fo3 correctly.

In the Mediterranean area, the functions of SWC and phenology are considered redundant. Why did you assume that fphen was 1 throughout the growing season, i.e. the PODY accumulation period? Line 116-121: move to section "Discussion". Where is the photosynthetically active radiation?

For the SWP, did you follow the "Part X: Sampling and Analysis of Soil" protocol (ICP-Forests manual) for field campaigns to measure Field Capacity and Wilting Point?

Line 134: what is the integration time for passive samplers (weekly, bi-weekly)?

Line 293: the difference of 10 mmol O3 m-2 PLA seems high.

Line 295: why the ozone uptake is lower? Line 308-309: this finding is not based on the current paper, please add references.

Where are values of PODy calculated from passive samplers? The method based on Loibl formula to describe the daily profile of hourly ozone concentrations has one major limitation, i.e. not suitable for high POD thresholds, and that accuracy of the measurements with passive samplers has to be strictly assured in order to finally obtain acceptable errors (Calatayud et al., 2016).

The difference for PODy, with and without SWC, increases with increasing Y (De Marco et al., 2016). The differences were lower for temperate species (Pinus cembra, Abies alba) than for Mediterranean species. SWC must be considered in PODy simulations and a low Y threshold should be used for robustness.

Missing references (e.g. line 90, section 3.2).

Figure 1 must be improved (North arrow, scale. . .). Table 2: please define acronym in caption. Why did you sum the global radiation? The R values seem too high at 45° latitude, please check. Table 4: for the site C1 the error is of 50%, not "acceptable" as specified within the manuscript (line 236). Figure 2: please name X-axis.

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