

Interactive comment on “Towards the use of dynamic growing seasons in a chemical transport model” by A. Sakalli and D. Simpson

Anonymous Referee #1

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General comments

This is a well-written and clearly structured paper, describing a first attempt to use dynamic growing seasons in the EMEP chemical transport model. The authors have developed a new but still simple method to calculate the start of the growing season (SGS) of a deciduous tree species. The method provides more realistic growing season estimates compared to some other methods, as validated by comparing modelled estimates with observations (Fig. 4). The paper shows that and clearly explains why differences in SGS have a significant impact on two ozone metrics estimating the risk of damage to deciduous trees due to ozone. At the end, the authors highlight the need to also validate the new method for other types of vegetation and conclude that there is a strong need to include more realistic SGS in chemical transport models. Further

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improvements to the method will be required to provide also more realistic estimates of the end of the growing season (see Fig. 5).

Specific comments

P. 12155, line 16-18: The calculation of modelled $POD_{1,DF}$ is based on a generic deciduous tree species for which no critical level has been defined. $POD_{1,DF}$ can only be used to indicate the risk of ozone damage. However, a critical level of 4 mmole m^{-2} has been defined for beech and birch, based on parameterisations of the DO3SE model for beech and birch, which is different from the parameterisation for a generic tree species. Hence, a comparison between $POD_{1,DF}$ and the critical level for beech and birch should be avoided. Therefore, I suggest to delete the sentence currently in brackets.

P. 12155, line 20: Can the difference for southern Europe also be due to the fact that not many data from southern Europe are in PAN, hence the model might not be favourable for southern European growing conditions?

P. 12159, line 22: This sentence is misleading as a reduction of 50% mainly occurs in areas with low $POD_{1,DF}$ where relatively little risk of ozone damage can be expected. In areas with high $POD_{1,DF}$ and therefore a high risk of ozone damage, sometimes an increase has been observed, e.g. Portugal and the west coast of France. Therefore, the description by the authors should be more specific here (also the sentence should end with a full stop).

Figs. 8-10: For consistency and clarity, I suggest to use a similar colour scheme as in Fig. 6 and 7. That way at least the contrast in the (a) maps will be more pronounced (e.g. Fig. 10 (a) is now almost completely red).

Technical corrections

P. 12148, line 10: insert the word 'decline' after temperature.

P. 12149, line 11: replace the word 'extract' by 'extracted'.

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P. 12151, line 24; P. 12152, line 19 and 22: replace '2009' with '2010' and accordingly in the reference list. The 2010 version is the most up-to-date version and I assume this has been used here.

P. 12152, line 7: the 3 in DO₃SE should be written as subscript.

P. 12153, line 4: the st in AF_{st}Y should be written as subscript.

P. 12156, line 9: Start this sentence as follows: 'The prediction of the surface annual average O₃ concentration by using the EMEP. ...'

P. 12157, line 3: Start this sentence as follows: 'On the other hand, the annual average O₃ concentration itself. ...'

P. 12157, line 5: Replace the word 'experiments' with 'changes'.

P. 12157, line 8: semi-natural.

P. 12159, line 1: include the word 'this' after 'compared'.

P. 12160, line 5: replace the word 'to' by 'by'.

P. 12163: move the reference Loubet et al. up before LRTAP.

P. 12174, legend Fig. 4: the two stations marked in yellow do not seem to be visible.

P. 12180, legend Fig. 10: Change to ' Modelled values of (a) annual average O₃ concentration (units: ppb) ... in modelled O₃ concentration when using ...'

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