Biogeosciences

Discussions

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Interactive comment on "Technical Note: A simple theoretical model framework to describe plant stomatal "sluggishness" in response to elevated ozone concentrations" *by* Chris Huntingford et al.

Anonymous Referee #2

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General comments

The Authors present a well-defined theoretical framework for inclusion of the effect of ozone-induced stomatal sluggishness in modelling systems. The concept is based on the results of empirical studies showing that the stomatal response to environmental conditions such as drought is sometimes delayed when plants are or have been exposed to ozone. The authors clearly explain and present references showing the importance of implementing this effect in modelling systems that aim to estimate the integrated effects of climate and tropospheric ozone on e.g. terrestrial carbon and water cycles. The framework is presented with the aim of aiding model development and

to provide empirical studies with relevant parameters for mapping their results. For this purpose the presented framework is interesting and useful. For the modelling community, the authors present a timely initiative for further development. However, given that the authors have not yet validated the presented the concept towards empirical data, no suitable parameter values are presented, which means that the framework in its current form serves more as a starting point for further development for the modelling community. The Authors do not suggest how the variations in sluggishness across plant species/plant functional types should be implemented in models, but do point out the need for empirical data for this. Given the limited data available for testing and validating the presented framework, the approach in its current form largely based on assumptions about relevance across plant types/ecosystems and as the Authors highlight, needs to be further developed before being implemented in models. However, as a first step towards a fully developed parameterisation the authors present an interesting approach with the potential to enhance future estimates of the effects of ozone induced damage to terrestrial vegetation.

Specific comments

P.1 lines 11-13: Consider moving this to the introduction.

P. 2, lines 22-23: Please explain the link between ozone events and blocking anticyclones, or insert reference.

P. 4, Eq. (1): The application of the sluggishness parameter is illustrated with two example values that are shown to fit with some selected results in the literature. Although interesting, the selected parameter values seem somewhat arbitrary, and are not linked to other factors presented as being relevant, such as ozone levels (as ambient concentrations or accumulated fluxes) or vegetation types. The examples would be more relevant to the community if they were put in context with corresponding conditions.

Please provide reference or other explanation for the choice of parameter values in these examples. Are they particularly relevant for certain types of vegetation? How do

these values link to ozone levels? -Have these specific values been chosen based on the empirical data sets in the literature to which they are compared in the discussion? Please provide some context and/or reference for these example values in order to make them more relevant for the readers.

P. 6, lines 16-20: The concept of linking the sluggishness to accumulated exposure to ozone has already been explained, and if necessary can easily be explained again without the use of equations in the text. Mathematical expressions and integrals are not required at this point, but could rather be introduced earlier in the paper, for example in Chapter 2.

P.7, lines 9-13: Repetition, and strictly not conclusions based on results of this article. Perhaps better placed under discussion.

Technical corrections

P. 2, line 6: remove "is"

P.3, line 18: remove "and"?

P. 6, line 17: Remove parenthesis around the concentration based critical threshold.

P. 6, line 21-22: please rephrase for clarity.