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Biogeosciences Discussions

Interactive comment on "European emissions of isoprene and monoterpenes from the Last Glacial Maximum to present" *by* G. Schurgers et al.

Anonymous Referee #1

Received and published: 29 October 2009

– General Remarks:

The manuscript addresses a question of increasing importance: "In what way have emissions of biogenic reactive carbon species such as isoprene and monoterpenes changed in the past and what are the driving factors?" Answers to these fundamental questions are still too sparse but are crucially needed because they will significantly contribute to understand in which way the terrestrial biosphere and the non-CO2 carbon flux from the plants change in response to climate change. Understanding of these processes is vital because these processes impact atmospheric chemical composition and – via formation of secondary organic aerosol – the radiation budget of the atmosphere, in the latter case generally by exerting a cooling effect.

The authors apply a modelling approach to study the changes in isoprene and terpene

emissions over the outlined period from the LGM to the present. They discuss both the methods and the underlying uncertainties comprehensively and sufficiently, noting that our current understanding is still very limited for various reasons (lack of observations and understanding of the physiological processes involved). They compare their results to results obtained with other methods by other groups explaining both common grounds and differences. The results obtained are significant and will help to improve our knowledge on biosphere-atmosphere-climate interactions. The data material provided is sufficient and well presented. The fact that the study has been restricted to a certain region rather than aiming for a global assessment is not a limitation. Observational data for the chosen European domain seems comparatively plenty compared with most other parts of the world. Moreover, if the model is successfully validated for one region extrapolation to other areas of the globe gain confidence because the process-based algorithms applied here retain their validity.

Therefore, I recommend that this manuscript should be published in BG after the following very minor revisions have been carried out.

– Specific Remarks:

Could you add a sentence or two either in the introduction or both the abstract and introduction commenting on the impact of increasing surface ozone levels and the consequent damage to leafs and the photosynthetic processes. Increasing BVOC emissions do, as you rightly point out, contribute to ozone formation and higher levels of ozone will damage the leafs and, consequently, limit the amount of terpenoids produced. The impact of BVOCs on ozone and other oxidants largely depends on the NOx regime into which they are emitted, as was indeed mentioned in the text. It would add to the manuscript if you could hypothesize on this interrelation between the biosphere and atmospheric chemistry.

In the description of the simulations on pages 8811 and 8812 I would like to have a bit more detail on the time slice experiments. It is not clear, at least to me, how these

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were conducted. They are carried out at every 1000 year interval, roughly, but over how many years was each one of them taken and did you apply a spin-up for each one of them, etc. Please add a few sentences explaining the time slice experiments in more detail.

– Technical Remarks:

I have checked that all citations in the text appear in the reference section but not the other way round. There might be orphaned refrences in this list. Worthwhile giving it a quick check.

p. 8806, lines 8 to 11: For readability split the sentence, for instance: "Here we assessed changes in emission patterns across Europe since the Last Glacial Maximum with a dynamic vegetation model. This model reproduces European tree species distribution and includes a process-based algorithm for terpenoid formation in plant leafs."

pp. 8837 to 8840, Table B1: merely for consistency please add the units also to the isoprene emission capacities column, it may be redundant to have them three times in there but I think it would be better to do so.

p. 8841, Fig. 1.: in the caption add "transient" to the sentence "Continuous lines are as applied for the interglacial **transient** simulations". Also, maybe replace "Continuous" by "Solid" reading "Solid lines are...".

Interactive comment on Biogeosciences Discuss., 6, 8805, 2009.