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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Process based inventory of isoprenoid emissions from European forests: model comparisons, current knowledge and uncertainties" *by* T. Keenan et al.

Anonymous Referee #2

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This paper is well suited for ACPD and should generate some worthwhile discussion. The study features a comparison of 3 models for isoprene emission and 2 for monoterpene emission for the period of 1900-2100 in Europe. An interesting and important finding is that, based on currently available knowledge of emission capacity and forest cover data, less than a dozen tree species dominate European isoprenoid emissions. Focusing future studies on these species will improve future European isoprenoid emission models and inventories.

The ability of the Niinemets model to simulate the mid-day decline in isoprene fluxes at the canopy scale in France is interesting and impressive. More discussion on the

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mechanisms and limiting factors behind this effect would be helpful. Were similar diurnal comparisons made between the models and the data collected from the Michigan, USA site? This would test the robustness of model and the increase the level of interest in the paper.

The time trends of isoprenoid estimates are most interesting for the period 2000-2100, when model estimates diverge. For isoprene, and probably light-dependent monoterpenes, the effect of isoprenoid "down-regulation" with increasing ambient CO2 is not apparently incorporated into the models. Monson and colleagues have recently found that this effect can at least offset isoprene emission increases due to rising ambient temperatures over similar time scales and ambient CO2 projections. Can this mechanism be incorporated into the Niinemets model? This could be investigated, or at least discussed, in more detail.

The CT,L functions from the Guenther studies were conducted under, and intended for simulating, short-term changes in light and leaf temperature. How comfortable are the authors with the assumption that they work for long-term annual changes over the course of centuries? Do the authors assume that no long-term adaptation will occur in the emission capacities?

It is difficult to tell if changes in forest cover and composition were included over the model assessment study period. European forest cover has changed dramatically (and probably will continue to do so until 2100?). Can the authors comment on this possible effect?

Reduced stomatal aperture appears to be cited here as a factor in reducing leaf-level isoprenoid emission, although some previous studies suggest that this is a minor factor. Can the authors comment on this with respect to this effect in the models?

Other comments:

Page 6156 line 3: "isopenoids" should be "isoprenoids".

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Page 6160 line 11: How were the inappropriate values of MA identified?

Page 6165 line 11: Can the authors better discuss why the mid-day emission decline occurs in more detail?,

Page 6167 line 14: Has the suppression of emissions during summer drought been observed in emission studies? Can the authors cite the previous work on this subject?

Bottom of page 6168 and Top of 6170: Can the authors determine why many of these large differences in emission potentials exist? Sampling issues in time and space? Analytical differences?

Literature cited: Do you need a bibliography for both the main text and Table 1 as well? Perhaps these can be combined to save space.

Figure 2. The R2 criterion alone may not be the best for comparing the model fit to measured emissions, the authors should consider also giving the root mean square error (RMSE).?

Figures 3 and 4. What do the error bars represent?

Table 1. Is MA is projected?

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 6147, 2009.

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