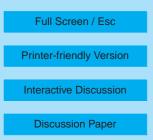**Atmospheric Chemistry and Physics Discussions**

Interactive comment on "Global isoprene emissions estimated using MEGAN, ECMWF analyses and a detailed canopy environment model" *by* J.-F. Müller et al.

Anonymous Referee #1

Received and published: 19 December 2007

Overview:

This paper uses a multi-layer canopy environment model coupled with a biogenic emission model to calculate isoprene emissions over the 1995-2006 period at half degree resolution in latitude and longitude, based on meteorological fields provided by ECMWF analyses. A comprehensive description of the canopy environment model MOHYCAN is given and the computation of radiation and leaf temperature, which are key drivers in isoprene emissions, through the canopy, is also described. The interannual variability of isoprene emissions over the period of interest is analysed and detailed evaluations over two types of measurements (local isoprene flux measurements

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and spaceborne measurements of formaldehyde columns) are performed. This paper is a step forward in the understanding of biogenic emission model uncertainties and constitutes a first and original work, by using a multi-layer canopy environment model. I strongly recommend this manuscript for publication in Atmospheric Chemistry and Physics after the authors have considered the comments and corrections given below.

General comments:

Section 2.1: The MEGAN EFv2.0 doesn't provide distinct dataset for the geographical distribution of evergreen broadleaf trees and deciduous broadleaf trees. Which dataset did the authors use for this purpose and was this distinction also made concerning emission factor allocation?

Section 2.2: Could the authors give a few words about the canopy environment model capacity to calculate radiation and leaf temperature? It is indeed important to make sure that by going into more detailed processes, we do not add more uncertainty on biogenic emissions.

Section 3.1: Considering the impact of soil moisture change on isoprene emission, the reduction in emission calculated in this study (20%) is much higher than the one calculated by Guenther et al. (2006) (7%). Different datasets are used in the two studies to provide soil moisture, which can explain the results. The approach used to calculate the soil moisture activity factor is strongly linked to the difference between the soil moisture and the wilting point, and to how this difference compares to 0.06 m3/m3. It would be interesting to know how the difference between the soil moisture and the wilting point compares to 0.06 m3/m3 for both studies and to discuss if this '0.06' limit can be used for any case or if it is not rather strongly dataset-dependent.

Section 3.2: Monthly climatological LAI, derived from MODIS LAI from 2000 to 2006, are used over the 1995-1999 period. Could the authors specify how this could affect the interannual variability calculated for isoprene emissions and estimate how much of the emission variability is linked to the LAI variability? Is the MODIS LAI characterized

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by a strong interannual variability over the 2000-2006 period?

Specific comments:

Page 15375, line 4: replace 'a decreased oxidizing capacity' by 'decreased oxidizing capacity' and 'a substantial contribution' by 'substantial contribution'.

Page 15376, line 11-12: replace 'the MOHYCAN (...) model, including' by 'MOHYCAN (...), including'.

Page 15376, line 15-16: replace 'Secondly, this model coupled with MEGAN is used to calculate' by 'Secondly, this model is coupled with MEGAN to calculate'.

Page 15378, line 7: replace 'The number of layers is taken to' by 'The number of layers is set to'.

Page 15381, line 15: replace 'till' by 'until'.

Page 15382, line 25: replace 'is neglected in the calculations' by 'is neglected'.

Page 15383, line 4: check the emission reduction when the impact of soil moisture change is considered (20% given in the abstract and conclusion and 25% given in the text).

Page 15385, line 18: replace 'campaigns measurements' by 'campaign measurements'.

Page 15388, line 9: replace 'data from a satellite' by 'data from satellite'.

Page 15392, line 21: replace 'for better constraining' by 'for improved constraining'.

Figures: in figures 1, 2 and 3, use a lighter-colored purple so that it appears more clearly on the map, especially in the figure 1.

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