

Interactive comment on “Evaluation of a photosynthesis-based biogenic isoprene emission scheme in JULES and simulation of isoprene emissions under modern climate conditions” by F. Pacifico et al.

Anonymous Referee #1

Received and published: 16 December 2010

This paper describes the implementation of a process-based biogenic isoprene emission scheme into a land surface model and its subsequent evaluation against flux tower measurements under present-day climate. The paper is of particular value because it covers the full process from details of the implementation in the vegetation scheme used through to providing an estimate of annual global isoprene emissions. Given the important role of biogenic hydrocarbons in influencing the particulate and gas phase composition of large parts of the lower atmosphere, and the necessity of including these schemes in larger-scale climate models, this paper is appropriate for publication

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in ACP. While the paper does not provide great new insights, it is certainly an important contribution towards improving our understanding of the role of biogenic emissions and developing the tools with which to explore their impacts.

The paper is very well written, and is clear and well-structured in layout. The figures and tables are clear and appropriate. I have only a few suggestions for revisions, and these focus principally on minor clarifications in method and discussion. I believe that the paper will be suitable for publication once these issues have been addressed.

General Comments:

It would be very interesting to know how sensitive the results presented here are to the distribution of PFTs. How would the results change under different assumptions about the fractionation presented in Tables 2 and 3? Demonstrating that the results are robust for reasonable variations in this fractionation would strengthen the paper.

It would be good to highlight the strengths and value of the approach in the introduction to emphasize the contributions that this study makes to the field. In particular, physical process-based approaches as used here are self-consistent and are more appropriate for use with future climate projections where vegetation and its properties are also expected to change.

Specific Comments:

Title: 'modern' would be clearer as 'present-day'

p.28315: emphasize the novel aspects of this study here.

p.28318: equation 4: JT and Je not defined; stray equals sign.

p.28319: equation 7 is written in Fortran and might be clearer if expressed in conventional mathematical form.

p.28323, l.13: How was this 1-hour interpolation performed? Is this method also variable-specific?

p.28323, l.16: It would be helpful to add a sentence on how the conversions from IGBP to JULES PFTs were made. Is this based on a global averaging of IGBP data within each PFT type?

p.28324, l.1: This section (two short sentences) appears unnecessary, and could usefully be removed.

p.28326, l.4: Fu et al., 2007 indicate isoprene emissions of 56 Tg/yr with an uncertainty of 30 Tg/yr. This suggests that the comparison is actually better than stated here.

p.28326, l.5: Does the one standard deviation shown here describe the interannual variability? If this is the case, it would be helpful to state this.

p.28327, l.7: What are the differences with the study by Sanderson? Are the differences likely to derive from differences in meteorology or in the emission scheme used?

Figs 2, 3, 4: The individual plots making up these figures need to be labeled more clearly with the location. In addition, the difference between the second and third rows in these figures needs to be stated in the caption. The legend at the bottom of each figure needs to be corrected, as local IEF is represented with a square. The axes labels should be completed, e.g., 'model' replaced with 'modeled emissions' (and units).

Fig 5: The individual plots should be labeled to indicate the difference between them (2000 and 2002? The caption isn't clear), and the legend needs to be redrawn to define the solid and dashed lines more clearly.

Fig 6: Are the units here $\text{mgC}/\text{m}^2/\text{h}$ or $\text{gC}/\text{m}^2/\text{month}$? If time-integrated, then the label 'emission' needs to be distinguished from other figures where 'emission' is used as short-hand for 'emission rate'.

Minor corrections and typos:

p.28323, l.14: 'programm' -> 'program' or 'programme'

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p.28324, l.17: '(1 time step in the model)' repeated; can be removed

p.28326, l.4-6: units should consistent here (TgC/yr).

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 28311, 2010.

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