

Interactive comment on “Isoprene and monoterpene emissions in Australia: comparison of a multi-layer canopy model with MEGAN and with atmospheric concentration observations” by Kathryn M. Emmerson et al.

Anonymous Referee #1

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Overview:

The paper by Emmerson and co-workers investigate the ability of two models to calculate isoprene and monoterpene biogenic emissions in Australia. Emissions calculated by the Australian Biogenic Canopy and Grass Emissions Model (ABCGEM) and by the Model of Emissions of Gases and Aerosols from Nature (MEGAN) are compared, and the total uncertainty in biogenic emissions for the Sydney Greater Metropolitan Region is estimated. Each of these biogenic emission models is then used online with the CSIRO chemistry-transport model in order to calculate isoprene and monoterpene

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atmospheric concentrations to be compared with field data collected over several campaigns in Australia using a PTR-MS instrument.

This paper addresses a key question in biogenic emission modeling, with the on-going need to reduce the uncertainty associated with these emissions. In this aim, model inter-comparisons and evaluations with data, such as the work presented here, definitely help to determine the strengths and weaknesses of emission schemes. The paper is therefore of true scientific interest, and is well written and clearly presented. Yet, I believe that several sections should be improved in order to clarify some of the objectives and methodologies of the work carried out, before to be published in Atmospheric Chemistry and Physics.

General comments:

The choice of the investigation strategy has to be clarified and reinforced. Indeed it is not totally obvious why in the first place the authors wouldn't build on the work presented by Emmerson et al. (2016), trying to investigate deeper the MEGAN weaknesses but would rather go for an “old” model which has not yet been published. I am convinced by the interest of this work which I am not questioning at all here but I think the reasons for such a choice should be better explained. Why is the ABCGEM so interesting for such regional applications? Is ABCGEM meant to be the model used eventually for air quality studies in Australia? Does it incorporate specificities for the region investigated? etc.

Some of the information given in the supplementary material should be moved or also given in the main core of the paper. Indeed before diving into the results, it is important to have a clear idea of the main common and different features between ABCGEM and MEGAN. This is the case of the table given in section 2 of the supplementary material. Biogenic VOCs considered in each model should also be listed in the core of the paper, together with the number of vegetation classes considered.

In section 2.1, I would enjoy reading more details regarding the campaign duration (to

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better assess the representativity of data used) and the site characteristics regarding vegetation (which vegetation types? mostly vegetative surfaces or not? LAI value?).

In the last paragraph before section 4.5, typical values for the isoprene/monoterpenes ratio should be given again and the original source of this reminded. Are there any explanations for such specificity in Australia compared to other places in the world? Do we have any idea of the plant processes and sensitivity that would support such a behaviour in plant emissions?

As the light-dependency considered in MEGAN for monoterpenes is questioned, it would be interesting to have one test carried out changing such characteristic in the MEGAN model (i.e. changing the light-dependent function) to quantify the impact on ABCGEM-MEGAN discrepancies, even run as a simple test.

Specific comments:

When used, replace “inline” by “online”

Throughout the paper, “emission factor”, “emission rate” and “emission flux” are several times used alternatively, while they do not represent at all the same quantity. Indeed “emission factor” represents the emission capacity of one plant species estimated in standard conditions, “emission rate” is generally used when related to an emission calculated per quantity of dry matter, and “emission flux” represent the overall quantity of compound emitted per ground surface unit, what is calculated eventually by biogenic emission models such as MEGAN or ABCGEM used here. This should be therefore corrected or clarified in the paper (for instance section 4.2 describes emission fluxes and not emission rates) and in the supplementary material.

Tables and Figures:

In figure 5, titles on the figures are particularly small and hard to read. They could be enlarged for instance without rewriting on many of them “average emission rates during SPS1”.

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