

Interactive comment on “Tropospheric methanol observations from space: retrieval evaluation and constraints on the seasonality of biogenic emissions” by K. C. Wells et al.

Anonymous Referee #1

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This study investigates the seasonal variation of methanol emissions in the mid-latitudes of the Northern Hemisphere using one complete year of satellite methanol columns from TES and IASI and the GEOS-Chem CTM driven by the MEGANv2.1 inventory for methanol emissions from vegetation. The main finding is that MEGANv2.1 is underestimated in the mid-latitudes during spring, and the maximum emission is observed 1-2 months earlier than estimated by MEGANv2.1. The authors put forward that emissions from new leaves are underestimated in MEGAN for mid-latitude ecosystems, and propose new values for the leaf age emission activity factors used in the MEGAN algorithm.

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The scope and relevance of the article is of interest to merit publication in Atmospheric Chemistry and Physics. Different ways to validate the results are considered. The results look correct and the conclusions drawn are robust. The manuscript can be accepted for publication after the following points are adequately addressed.

Comments:

1. p.3958-59 : The authors do not give any details about how the sensitivities shown in Figure 6 are used to determine the optimized emission factors. More explanations on the optimization method are required here.
2. p. 3959, l. 9 : Additional sources of methanol are invoked, leaf buds, soil emissions and snow melt, to explain the model/data discrepancy during the canopy expansion period. Is there any concrete evidence that soils and snow melt could be at the origin of methanol emissions?
3. p. 3959, l.14 : A main result of the paper is the derivation of optimized values for the age emission factors in mid-latitude forests. However, a quantification of the errors associated to these parameters is completely missing in the manuscript. A thorough estimation of the uncertainty on the proposed values should be addressed in the revised manuscript.
4. Regarding the comparisons shown in Fig. 10, the absolute model and in-situ values should be also plotted, or at least the mean year-round, and seasonal bias for each of these sites should be provided. Clearly, here and elsewhere in the paper, the calculated correlation coefficients and biases would be welcome in order to strengthen the conclusions.
5. Sect. 3 : Methanol sources other than biogenic are discussed very shortly. The global annual budget by emission source should be given, as well as the contribution of each source in the predefined five regions.

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