

Review of “A simplified isoprene oxidation mechanism for fast global chemistry transport modeling and emission inversion,” Oomen et al., ACP (2026)

Summary

This paper describes an optimized mechanism for representing the connection between isoprene and formaldehyde, which allows for faster inversions of isoprene emissions from HCHO satellite retrievals. The paper describes the development process, validates against the larger mechanism, and shows an example inversion. The paper is ready for publication after considering the following minor comments.

General Comments

Would this mechanism also be appropriate for inferring isoprene emissions from isoprene satellite retrievals, or for joint isoprene-HCHO retrieval inversions?

Specific Comments

L77: What is the justification for filtering low HCHO columns? Does this also mean you are filtering negative values? This would lead to a high bias in the average and is not appropriate when the variability is due to precision (e.g., spectral fitting).

L121: Does this procedure inherently assume that the entirety of model-measurement difference is driven by emissions? If so, could errors in chemistry, particularly at low NO_x, be misinterpreted in the cost function and lead to erroneous emission estimates?

L148: Does the model use this weighted average everywhere? Or is the model implementing a temperature-dependent isomerization rate?

L168: The inclusion of monoterpenes is confusing and introduces semi-buried assumptions: namely, that monoterpenes are behaving like isoprene and the molar ratio everywhere matches that in Amazonia. Relative emissions vary widely by phenology and environmental drivers. Please provide some justification for this decision. What would be the consequences of excluding monoterpenes here?

L192: are optimized parameters sensitive to initial guesses?

L198: given the high number of tunable parameters, this agreement is not surprising.

L248: decomposing PAN would also lead to HCHO via CH_3CO_3 reactions.

Technical Comments

L127: anyone printing in black and white won't see the blue font.

Figure 2: green and orange lines are probably not colorblind-friendly.