

Interactive comment on “Atmospheric transport and chemistry of trace gases in LMDz5B: evaluation and implications for inverse modelling” by R. Locatelli et al.

Anonymous Referee #2

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This paper discusses new developments with the LMDZ chemistry-transport model. The authors have tested their models using a shallow convection model, and dynamical/chemical tracers of different lifetimes. I find the approach very interesting. Until very recently, modellers were advised to carry out detailed analysis using single tracer, but tuning of models using single tracer may not work that well when another tracer with different emission pattern or lifetime is considered. Although the analysis is bit superficial for any given tracer, the paper is well written and justified for publication in Geoscientific Model Development. However, the comments need attention of the authors before publication in GMD.

p. 5007, line 27: How do you know "deep convection" actually occurred during these C1739

days, and it did not carry R_n up? Otherwise this statement is misleading, and this one of the examples why insufficient analysis may not be very helpful. As you noted in the paper site representation errors are a major issue when we compare model results with observations at the surface stations. Horizontal transport is very important too, and I am curious how the horizontal winds (synoptic and diurnal) are simulated by model at these sites.

p.5010, line 1-2: Please mention the source of SF6 emissions.

p.5011, line 13: I agree, that's a long standing problem for transport modellers. But if you can choose background air sampling conditions and as long as the same level is chosen for different model versions, you should be able to discuss NP-SP-TD differences for interhemispheric transport. You may also consider using aircraft measurements.

p.5011, line 25: I would argue for adjusting the values in reference to the southern most site - as is typically done in TransCom analysis, which I think reveal the IH differences well although care should be taken to define the offsets.

p5013, line 23: which emissions are used in these emissions, CASA monthly? or something diurnally varying? Such information are required to imagine the causes of model - observation differences.

p5020, line 10ff: What one could do is check the synoptic or hourly model-data difference for sites individually and then apply an appropriate observation error to each site at the time intervals of the assimilation windows. This may be updated continuously. Here we assume that longer term biases, compared to the assimilation window, are subject to correction. Do you have any recommendations?

p.5021, line 1: Why potentially?

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