

Interactive comment on “Seasonal changes in the tropospheric carbon monoxide profile over the remote Southern Hemisphere evaluated using multi-model simulations and aircraft observations” by J. A. Fisher et al.

Anonymous Referee #1

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Overall, this is a well written manuscript with clear goals. While I'm typically left disappointed by model intercomparison (MIP) papers, I appreciate the authors' efforts to disentangle the influence of differences in model chemistry and transport on the simulated vertical structure of CO in the southern hemisphere. I have no major concerns, only minor comments.

Minor Comments

I found it frustrating that Zeng et al. (2014) was referenced repeatedly, but it wasn't

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available to me: Zeng, G.,: Multimodel assessment of the influence of uncertainties in biogenic emission estimates on the distribution of CO and HCHO in the Southern Hemisphere, in preparation, *Atmos. Chem. Phys. Discuss.*, 2014. Ideally, the two articles should have been submitted simultaneously. I really would have liked to seen the model evaluation with observations, including satellite observations.

The abstract reads a bit like a laundry list. I suggest that the authors clearly articulate the importance of this paper. What is new and exciting? Why should anyone want to read this paper? I wasn't too intrigued by the abstract.

First paragraph of Introduction: Line 12. CO levels in cleaner areas of the remote SH are often simply determined by the methane-CO-OH cycle. Methane oxidation is an important source of atmospheric CO. Possibly you mean the variations in CO levels are primarily caused by transport.

Fourth paragraph of Introduction: Are there any Japan Airlines data and MOZAIC aircraft data of use? These are longer records, but mainly in the UT. However they do provide gradients across the equator.

Why don't you show the vertical structure of OH between the four models over the SH?

I think a global and SH CO budgets for each model would be most helpful.

Section 4.3: It seems that a better or additional experiment would be to use one model (e.g., GEOS-Chem) to run 4 tracer simulations (i.e., tagged CO), each one with one of the models' OH fields. This would remove each model's transport as a complicating factor.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 14, 27531, 2014.