

Interactive comment on “Tropical troposphere to stratosphere transport of carbon monoxide and long-lived trace species in the Chemical Lagrangian Model of the Stratosphere (CLaMS)” by R. Pommrich et al.

Anonymous Referee #2

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General comments

The paper presents a new simplified chemistry scheme that allows performing relatively low computational cost simulations to study transport of CO and other long-lived species through the TTL. The overall characteristics of large-scale transport compare reasonably well with satellite and aircraft observations, although the simplified scheme is not able to reproduce the events of enhanced CO due to convection. The paper is well written and provides an important contribution to the model advance, which can lead to scientific advance in following works. It is recommended for publication in this

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journal after addressing a few comments.

- The main strength of the presented scheme is to reduce the numerical cost of the simulations, yet no quantitative measure of such improvement is provided in the manuscript. Please add this information.

- The authors mention the limitation of the model to capture enhanced CO linked to events of convection. In fact, the appearance of the tape recorder in CO is associated with convective rapid transport of seasonally varying emissions. What are the limitations of this model in reproducing the characteristics of large-scale vertical transport due to the lack of representation of convective processes? Could this model eventually be modified to provide a more accurate representation of such events? What is the importance of the lack of convection versus the tropospheric simplified chemistry and mixing for the misrepresentation of large CO values in the model as compared to the TROCCINOX data?

Technical corrections and specific comments

P5109 L13: variation in biomass burning emissions

P5109 L15: do not have sources strongly varying with season

P5109 L18: "and in-mixing from mid-latitudes" How is this the cause of the vertical gradients?

Fig.1 caption: as derived... through a trajectory technique

Fig.2 and P5103 L23-25: why are the values in the winter hemispheres so different in model and observations?

Fig.3: the differences between CLaMS and MLS are explained in the manuscript by the too strong vertical velocity in the reanalysis. However, the differences go beyond this effect and the patterns above ~70hPa look quite different. This should be at least mentioned in the text.

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- Why is Fig.3 shown in pressure coordinates and Figs. 7&8 in isentropic coordinates?
Would be better to uniformize or at least explain the choice.

- Fig.6: change x axis label to "CO measurements"

- Fig.6: change x axis label to "CO"

Interactive comment on Geosci. Model Dev. Discuss., 7, 5087, 2014.