Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., referee comment RC1
https://doi.org/10.5194/gmd-2021-149-RC1, 2021

Comment on gmd-2021-149

Anonymous Referee #1

Referee comment on "The Simplified Chemistry-Dynamical Model (SCDM V1.0)" by Hao-Jhe Hong and Thomas Reichler, Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2021-149-RC1, 2021

Overall, I find this paper well-written and clear and find that SCDM adds a unique element to the dry dynamical modelling hierarchy, allowing for examination of the feedbacks between interactive stratospheric ozone and circulation.

My main comment is that given that the original Teq includes the climatological effects of ozone, it would have been nice to see how this version of the model differs. For example, it would have been interesting to compare SCDM with just climatological ozone versus SCDM with interactive ozone and compare the SSW diagnostics. This would have provided some proof-of-concept that interactive ozone can cause differences in SSW evolution, for example.

Minor Comments:

1. Line 32: I think several other papers using the dry dynamical core have employed realistic topography (e.g. Wu and Smith, 2016)

2. Figure 3b: Is it possible that the diabatic heating differences between MERRA2 and SCDM in the tropics are related to an unrepresented QBO? This was noted in the text regarding the tropical zonal wind differences.

3. Figures 9 and 10: The authors suggest that the lack of gravity wave representation may play a role in the differences in SSWs, but these figures may also suggest that the relaxation times in SCDM are not tuned quite right. Do you think that the Newtonian and/or chemical relaxation times need to be adjusted for this configuration of the model? Did the authors test retuning the relaxation times?