Geoscientific
Model Development
Discussions

Interactive comment on "The description and validation of a computationally-Efficient CH$_4$-CO-OH (ECCOHv1.01) chemistry module for 3-D model applications" *by* Y. F. Elshorbany et al.

Anonymous Referee #1

Received and published: 4 December 2015

Modelling of chemical composition of the troposphere has been challenging in particular for the short-lived species, such as the hydoxyl (OH) and its feedback with the greenhouse gases (e.g., methane) and other air pollutants (e.g., CO). The authors show a simplified approach to get reasonable answers to these questions, which is a welcoming news for the community. The CH4-CO-OH system has now been implemented in the NASA GEOS-5 Atmospheric Global Circulation Model for chemistry-climate feedback related studies. However, the challenges remain on the validity of this simplified CH4-CO-OH approach as that is the case for the state-of-the-art full chemistry model. The manuscript is generally well prepared, and can be published after minor revisions. My specific comments are listed below.

C3196

p.9453, line 24-26: Agree, but the system is so non-linear that this simplification may bias the results in different ways!So I am not sure whether you can claim that CH4-CO-OH will be any better.

p.9454, line 19-21: Can you be a bit more specific here - are you talking about the global mean OH or also about the inter-hemispheric distribution or regional differences? If all, it would be useful for the readers to get some of your opinions on each of the issues. Also relevant for the paper for discussions later on.

p9458, line 6-7 : add 'et al.' to Lawrence. Also I think MCF is used as a proxy for OH since the 1990s by many others. Generally agree, but MCF has recently been used at quite good confidence for broad characterization of OH in the two hemispheres because uncertainties MCF emissions are now small compared its atmospheric burden.

p9458, line 18 : can you be a bit more quantitative here? what is quite?

p9460, line 5 : I think very few sites were in place in 1980s, thus this sentence is misleading. Can you not arrive at this conclusion by using only the sites with full data coverage?

p9460, line 14 : Please mention the time period of the data used

p9460, line 24 : I thought the base case doing well as seen in Fig. 5, and this problem is more serious in All Vary case

p9462, line 12 : Are those in the tropics or SH?

p9462, line 21 : But in your model, you see these biases also at the surface stations, in the previous para - right? So the uncertainties in remote sensing products may not be questioned in this context.

p9464, line 10 : The problem is how to say something meaningful out of this comparisons. Can we claim Voulgarakis et al. (2015) is right?

p9465, line 12 : I have some concerns when the MCF-inferred OH IAV is marked as

"Observation" in Fig. 15. A lot of assumptions has gone in this calculation, so I would recommend to change the legend as 'MCF-inferred" or something like that.

p9466, line 3 : The fires also emit a lot of ozone precursors. If O3 increases will there be more OH production under no/less cloudy conditions - how does those feedback works? Any perspective will be appreciated.

Interactive comment on Geosci. Model Dev. Discuss., 8, 9451, 2015.

C3198