Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2019-772-RC2, 2019

Atmospheric Chemistry and Physics Discussions

Interactive comment on "A Machine Learning Examination of Hydroxyl Radical Differences Among Model Simulations for CCMI-1" *by* Julie M. Nicely et al.

Anonymous Referee #2

Received and published: 3 October 2019

Nicely et al. (2019) attributed OH differences among CCMI models into a number of parameters using a neural network approach. They found the major drivers for the decline in methane lifetime are tropospheric O3, JO1D, NOx, and H2O, with CO contributing to the OH interannual variability. It is a very interesting study with very popular machine learning technique. The manuscript is in general well written and well organized. I recommend acceptance of the manuscript after addressing below questions.

Neural network setup

As described in the manuscript, one NN is trained for each model for each month and

Printer-friendly version

Discussion paper

all the training is performed for year 2000. So how is it applicable for the input with a lengthy period? Some variables would undergo significant changes from the 1980s to 2010s. What if the NN trained for year 2000 is not suitable for 1980s or 2010s?

There is one concern that when you substitute a single input taken from one model into another. Would this affect the original chemical regime or atmospheric condition? Would there be some "relaxation" in the system to approach original condition? In that sense, it could reduce the sensitivity of OH to the differences in the input.

Lastly, it is more of a broad question. To what degree that the trained NN can realistically represent the non-linear chemical system. In this work, there are a number of variables are input to the NN. The weighting factors can be adjusted during the training process, but if there are more inputs or different inputs, the weighting factors could be different? Would this affect conclusion? How to deal with this issue?

Specific comments:

Page 4, 121-125, is water vapor nudged for all the REF-CISD simulations? If not, what are the REF-C1SD simulations that nudge water vapor?

Page 8, line 244, but also over tropical ocean?

Page 9, line 261-264, could you elaborate "buffering effects"?

Page 9, line 278-282, this is similar to "relaxation" that mentioned in the general comments.

Page 11, line 326 &ff, Figure 5, the impacts of temperatures are small due to the specified dynamics in the model. What about water vapor? If specified water vapor is also imposed, are the impacts of water vapor still large? You may want to check the models with the specified water vapor.

Page 11, line 336-378, what do you mean by "reminder term"?

Page 16, line 487-489, are you talking about latitudinal gradient or vertical distribution?

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2019-772, 2019.

Printer-friendly version

Discussion paper