



## Comment on acp-2021-222

Anonymous Referee #2

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Referee comment on "Trifluoroacetic acid deposition from emissions of HFO-1234yf in India, China and the Middle East" by Liji M. David et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-222-RC2>, 2021

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The authors present a modelling study of deposition of trifluoroacetic acid (TFA) resulting from emissions of HFO-1234f in India, China and Middle east. The HFO-1234f emissions are expected to increase in these regions in the future and such study is of significance to the atmospheric community. GEOS-Chem and WRF-Chem models were used. The models were characterized systematically, and I think the overall conclusions are scientifically sound and the paper is publishable in ACP. Below are few questions and comments I have for the authors:

-TFA rainwater concentration is dependent of the frequency of rain. I assume that the rainfall pattern will likely change in the next 20 years. Could the authors comment on how this will impact TFA rainwater concentration over the middle east region? A graphical relationship between amount of rainfall and TFA rainwater concentration for each region would be helpful for the readers

-TFA rainwater concentration in China using WRF-Chem is significantly different (factor of 2) compared with the results from GEOS-Chem and previous study by Wang et al. (shown in Figure 4). However, the percentage of wet deposition seem relatively similar in China for GEOS-Chem and WRF-Chem. Could the authors explain this difference?

-Recent study by Holland et al. ACS Earth Space Chem. 2021, 5, 849-857 suggest Criegee intermediates in forested region can significantly decrease the lifetime of TFA. The GEOS-Chem simulations in this study show that the overall significance is small except for the forested regions in south east Asia. I wonder if this contribution will be higher in these regions during the dry seasons.

-Is there any reason why the loss from reaction with Criegee intermediates is relatively higher in the India region in Figure 14 b) compared with 14 a)? Is this because of seasonality in rainfall?

Minor comments:

-The dashes in the figures are hard to see. Please put bigger gaps in between the dashes to make them obvious.

-In the kinetic scheme, could the authors label the phases of all the fluorinated species. I also suggest labelling each step and then citing them in the following paragraph.

-dissociation coefficient in line 288 should have unit of mol l<sup>-1</sup>

-Change 'the' to 'they' in the last line of caption for figure 8

-It is difficult to see some of the datapoints in Figure 9 and 10. I suggest using panel with one column and scaling the vertical axis better