

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2021-815

Anonymous Referee #2

Referee comment on "MAX-DOAS observations of formaldehyde and nitrogen dioxide at three sites in Asia and comparison with the global chemistry transport model CHASER" by Hossain M. S. Hoque et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-815-RC2>, 2021

This manuscript presents observations of HCHO and NO₂ at three sites over a multi-year period. The dataset has the potential to be useful, if errors in the data identified by Reviewer 1 are addressed. Presentation of a corrected dataset alone may merit a "Measurement Report" manuscript. However, the analysis component must be significantly strengthened for inclusion in ACP. Specifically:

1.) The HCHO/NO₂ ratio discussion is not particularly useful. The vertical profile arguments highlighted by Reviewer 1 are a major concern. Additionally, the Souri et al. (2020) reference cautions against using the ratio in the way that is used here, suggesting instead the use of a slope/intercept parametrization with fitting coefficients that are dependent on local chemistry. The known limitations of the ratio method are not treated seriously in this manuscript. The comparison with modeled ratios is problematic due to choice of model.

2.) The CHOCHO/HCHO ratio is also not particularly useful. There is insufficient discussion of uncertainties in the ratio. There are no uncertainties shown in Figure S1, or otherwise stated in the text. It is unclear what the reader is supposed to glean from the analysis. The conclusion of this section states that detailed analysis is needed – this reviewer agrees.

3.) The usefulness of the comparison with the CHASER model is very limited, given (a) the coarse resolution of the model (b) the outdated emissions inventories.