

# ***Interactive comment on “Comparison of formaldehyde tropospheric columns in Australia and New Zealand using MAX-DOAS, FTIR and TROPOMI” by Robert G. Ryan et al.***

## **Anonymous Referee #3**

Received and published: 5 August 2020

This paper presents a comparison of HCHO columns from MAX-DOAS measurements in Australia and New Zealand against ground-based FTIR and satellite measurements. The ground-based measurements consist of two novel MAX-DOAS stations located at Broadmeadows and Lauder. The MAX-DOAS measurement period consists of more than 2 years of observations, which provides information of HCHO amounts on these regions. The comparison of MAX-DOAS and FTIR at Lauder station result in a linear correlation of 0.81, while the comparison of MAX-DOAS and satellite observations at Broadmeadows and Lauder result in correlations of 0.95 and 0.61, respectively. This study provides results of HCHO at southern hemisphere where long-term observations of VOCs are missing. In addition, this study demonstrated the improvement offered by

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high spatial resolution of TROPOMI measurements in comparison to previous satellite instruments.

The topic of this work fits well within the scope of AMT, the main findings are well described, the paper is well structured.

I recommend acceptance to AMT after addressing few specific comments below.

Page 4, line 93, it would be nice to have a summary table of the retrieval settings used in the HCHO retrieval

Page 4, line 100, why only these two fitting windows were selected for comparison? What is the impact of O<sub>3</sub> absorption on the selection of HCHO fit window?

Page 5, figure 2, how is the fit error estimated?

Page 7, line 144, a parenthesis is missing after “2018)”

Page 8, line 171, what is the impact of the selection criterion of collocation distance around the station (~10 km) in the comparison?

Page 9, line 181, why OMI use a distance of about 25 km and not 10km as TROPOMI? Would it explain the poor agreement between OMI and MAX-DOAS measurements in Figure A4, more background is captured for OMI than TROPOMI?

Page 10, line 235, although the temporal agreement is good in overall, figure 6 shown large differences from 2018-10 to 2019-01 between both dataset. Would you please discuss the possible reason of differences on the temporal variability between both datasets?

Page 13, figure 7, it would be nice to add the latitude and longitude coordinates in the figure.

Page 14, figure 8, what is the impact of HCHO amounts from fire emissions in Broadmeadows? Although, the station is located on the city and HCHO, however in the

last years many fires have been observed in southeast of Australia, which could emit and transport HCHO from far location similar to observed in recent study for Canada wildfires.

Page 14, line 298, please replace “methods usec” by “methods use”

Page 21, figure A4, the low spatial resolution of OMI in comparison to TROPOMI could be a reason for the not variability of HCHO. Would you expect a similar result for instruments with morning overpass like GOME2 and lower spatial resolution than OMI?

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