This paper presents extensive comparison between satellite measurements and COCCON measurements at two high-latitude Russian cities, St. Petersburg and Yekaterinburg. A method of scaling CAMS model data to COCOON observations is developed, for a better comparison with the satellite measurements. I have several main concerns, which should be addressed before this paper can be published in AMT.

1. When comparing the satellite products with COCCON measurements, have you considered different averaging kernels for the satellite data and the ground-based remote sensing measurements?

2. For the regression plots shown in this paper, how are the R2 values determined? I understand that the fits are forced to go through origin. However, the reported R2 values are all very high, and I can not see how a R2 = 0.9999 is possible for the middle plot of Fig. 19, where there is no correlation between the scatter points and the regression line, and how in Figure 10 the top left and bottom left plots can have the same R2. Please check your regression algorithm.

3. You use a co-location criteria for satellite and ground-based measurements of up to 200 km. Have you checked whether there are emission sources in between? I doubt that the comparison can be objective if the distance is so large.

Further suggestions:
1. One map (maybe in appendix) regarding the locations of their measurements (up- an downwind sites) and the potential emission area which you assume to contribute the enhancement (details in Line 170, page 8). It is quite hard to imagine if someone is not familiar with the geographical information for your study.

2. Eq. 1: please explain "DT" and n

3. Eq. 2: please explain "t", which is usually referring the continuous time.

4. Line 538: "This discrepancy might be due to the COCCON observation during winter". So do you think COCCON measurements are not representative for the monthly mean?

5. All the legends: 'xCO2' should be big 'X'

6. In Figure.5, there are lots of solid vertical lines. Is there some special meaning regarding them?

7. In Figure.7, the information is quite hard to get. The dates are not readable from x-axis and also not equally distributed. If only showing the information that 22 days are available, maybe you can use a table to show the dates and some features of the measurements, e.g., daily mean +/- std. If the tendency is the key, clarify the x-axis and show the information clearly.

8. In Figure.8(b), the unit of XCH4 should be ppb instead of ppm;

9. In Line 285-289: how are these three collection radius chosen?

10. In line 300, does 'with short-term enhancement' mean those small fluctuations within one month before 2019-08? Please clarify it further.

11. For Figure 8 (b) XCH4, is there any explanation regarding the rising signals observed from all products in 2019 from summer to winter?

12. Please change the order of the figures in the appendix to follow the main paper content

13. Figure 16 and 17, XCO2 from CAMS-COCCON are bias-low compared to the values from GOSAT and OCO-2. It looks like a constant bias. Have you looked into the reason behind?

14. Line 210: you could consider to include the two following references mentioning the permanent network MUCCnet, which is a typical example of continuous deployment and a measurement campaign in US using COCCON spectrometers: https://amt.copernicus.org/articles/14/1111/2021/ https://acp.copernicus.org/articles/21/13131/2021/acp-21-13131-2021.html

15. Figure22(e), 'Delta XO' in x-axis should be 'Delta XCO'

16. Line 37: here is the first time when the abbreviation 'GHG' appears. The full name of GHG should be explained here, instead of the next line. Additionally, the information demonstrated in Line 37-38 (two sentences) is somehow repeated. Could you rewrite it?

17. Line 45: "on that regard" → "in this/that regard". Additionally, a comma should be added.

18. Line 48: "in 2005" instead of "on 2005"

19. Line 70: "column" instead of "columnar"?

20. Line 226: Schneider et al., (2020) instead of Schneider et al., 2020

21. Line 459: "showing RMSD as a function"

22. Please check your reference list. Some of the references are missing there.