Answer to Referee # 1 (Previously Referee #2)

Key Comments:

The authors have well addressed my major points #1 and #3. Many thanks! They also provided a reasonable explanation to my major point #2. Nevertheless, here I strongly suggest that the authors add a short explanation (like their reply to my major point #2) to the paper why not the tropospheric NO2 VCD, but the total NO2 VCD is used in the study. Concerning my major point #4 I suggest that the authors use a linear correlation. I don't see a justification to use a logarithmic function.

Response to (Point #2)

→ We added a short description on the revised MS (L145 – 151) why not use tropospheric VCD and use total VCD on the other hand, such as

"From retrieved Pandora measurements, tropospheric and total (=tropospheric + stratospheric) vertical column densities are both available. However, it should be noted that appreciable uncertainties cannot be neglected in the tropospheric NO2 profiles obtained from Pandora instruments, particularly for the high aerosol-loading areas such as East Asia. In this background, we used total vertical column densities in the present study, and also confirmed that they have a high correlation with the tropospheric column densities observed in our study period with little change in stratospheric column density in space and time at the local scale." See Line 145 – 151 in the revised MS.

Response to (Point #4)

→ We replaced the Log-fitting by 1:1 linear fitting (see newly plotted Fig. 3 below), and have all REMOVED the Log-fitting and its relevant descriptions, such as correlation coefficients estimated from logarithmic function (L249-251, and L565-566 in original MS) and descriptions on y-interceptor from Log-function (L265-271 and L567-569 in original MS).

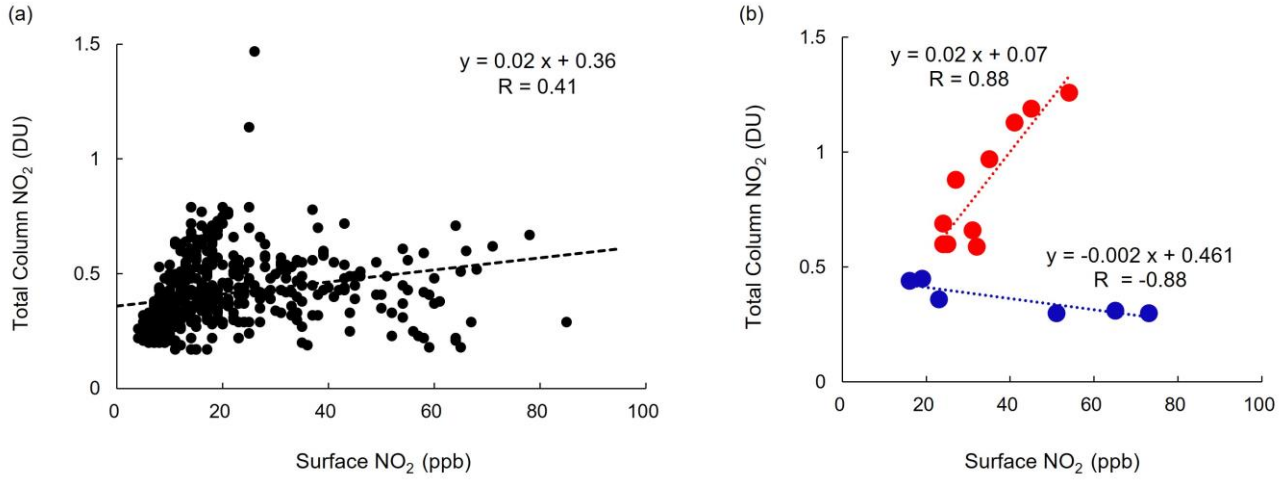

Figure 3. a) Pandora column (PC) NO_2 measurements as a function of surface *in situ* (SI) NO_2 observations at Pandora sites PA_1–PA_3 during the GMAP-2020 campaign and PA_4 during a 1-year period. A 1:1 linear regression model was used to evaluate the relationship between PC and SI measurements (black line). (b) Sample scatterplots of PC-NO_2 and SI-NO_2 for February 24 (red) and April 21 (blue), 2021.

We believe that revised manuscript has been much more strengthened, and we appreciate the reviewer's insightful comments.