The authors directly estimate NO_X emissions and lifetime for fires by using an exponentially modified Gaussian analysis of tropospheric NO_2 columns observed by TROPOMI. The authors firstly correct the low bias of TROPOMI retrieved NO2 columns by replacing the *a priori* profile of NO2 with the GEOS-CF simulated profile at a finer resolution of 0.25. Representative NOx emission factors for six fuel types are derived by using the observations of fire radiative power from MODIS. The authors also discussed the uncertainties and capabilities of the method thoroughly. The scope fits ACP and the scientific idea is new. I recommend the paper be published after the authors address the following comments.

Major comments:

1, A better result is expected after the authors used *a priori* NO_2 profile with 0.25 to replace the one used by the operational product. However, this spatial resolution is still much coarser than TROPOMI's, which implies that nearby pixels use the same profile shape. As the authors presented in the paper that fire events normally take place locally. How much uncertainty can it contribute?

2, This plume-based method works only when the wind speed is not small, that is the plume exists. The authors keep every case even with very low wind speeds (< 2m/s). Should these cases be removed for the scientific reason?

3, The authors argue that the difference between TROPOMI and OMI derived is mainly due to the *a priori* NO_2 profiles, which is not accurate. The VCDs of TROPOMI are found to be lower than OMI's over many places, which is mainly caused by impropriate surface albedos or cloud pressures. Please give more solid proof if the authors want to draw this conclusion (i.e. section 4.4).

4, Section 3.4 is long and complicated. A flowchart is helpful to explain the procedure or moving this part to the supplementary.

5, The authours intend to derive representative NO_X emission factors for six fuel types. However, satellite observations are available once per day, and some fire events can last for several days. In these cases, the fire intensity and the chemical condition also change. The authours, at least, should give an example to explain how to consider the emission factor for a certain fuel type.

Specific comments:

1.   Line 11: "behaviour" should be "behavior". "occur" should be "that occur".

2. Line 15: The sentence is a little confusing. I think the authors recalculate the NO_2 VCD of every pixel with the GEOS-CF simulated profile not only over the fire plumes?

3. Line 24 and 27: Please list enough examples when you give examples.

4. Line 42: "the fire detection".

5. Line 44: "has a finer spatial resolution".

6. Line 46: "spatial resolutions"

7. Line 57 and 64: Please cite recent and more relevant studies about TROPOMI.

8. Line 83: "afternoon global" is quite obscure, please specify the overpassing time is around 13:30 local time.

9. Line 86-93: Do you use the S5P operational product that retrieved by KNMI? If so, you should cite van Geffen et al., (2019) when introducing the way of retrieval. Besides, you should also cite the validation paper (i.e. Tijl et al., 2021 https://amt.copernicus.org/articles/14/481/2021/) when discussing the underestimation of S5P.

    van Geffen, J. H. G. M., Eskes, H. J., Boersma, K. F., Maasakkers, J. D., and Veefkind, J. P.: TROPOMI ATBD of the total and tropo spheric NO2 data products (issue 1.4.0), Royal Netherlands Meteorological Institute (KNMI), De Bilt, the Netherlands, 2019.

10. Line 165: The format of the reference is "Laughner and Cohen, (2019)".

11. Line 203: Not very clear to me why "3 to 30 days before and after the fire day" is 56 days in total.

12. Line 206: "filter" should be "filters".

13. Line 224-225: Please give specific examples to explain "We also exclude fires in which TROPOMI NO2 line densities are monotonically increasing or decreasing within the region."

14. Line 241: "10000 MW" should be "10,000 MW"

15. The resolution of Figure 2 is too low. It's better to start with the original TROPOMI NO_2 data before (a).