Reply to reviewer #2

General comments:

This study provides an updated version of global NOx point source emission inventory using TROPOMI NO2 data. The key idea of the approach is calculating NOx advection to detect point source, and integrating it in a defined area to obtain emissions. Compared with the previous versions, the main improvement includes AMF correction, new spatial derivative calculation, topographic correction, new spatial integration of emission estimate, and lifetime correction. The manuscript is well written. I have a few specific comments.

We thank the reviewer for his/her positive feedback. Below, we refer to the specific comments one by one.

Specific comments:

1. Line 113-114: What is the criteria used for removing cloudy pixels?

   Clouded pixels are removed by the applied filter of the qa value with the threshold of 0.75, which is recommended in the TROPOMI NO2 ATBD (https://sentinel.esa.int/documents/247904/2476257/sentinel-5p-tropomi-atbd-no2-data-products). The qa value is a combination of quality checks performed in the operational processor, and ranges from 0 (pixel cannot be used at all) to 1 (no issues). One of the considered criteria is the cloud radiance fraction – if it is larger than 0.5, the respective qa value is lowered by a factor of 0.74, such that these pixels are not considered in our study.

   We have extended lines 113-114 accordingly:
   "… removing cloudy pixels (cloud radiance fractions above 50%) as well as anomalies (like solar eclipses) in the TROPOMI NO$_2$ dataset."

2. Section 3.2: Could you show more details of AMF correction? This study assume a plume at 500 m above ground; so what is the shape of final NO2 profile used for calculate new AMF?

   The assumed profile shape for the excess column is a delta peak at 500 m agl.
   We have extended the respective section in the revised manuscript as follows:
   Hence, we apply an AMF scaling factor $c_{AMF} = AMF_{plume}/AMF_{PAL}$, where AMF_{PAL} is the tropospheric AMF applied in the PAL product, and AMF_{plume} is calculated from the AK based on a delta-peak profile at plume height. I.e., c_{AMF} reflects how much higher the plume AMF is compared to the a-priori value.

3. Line 120: What is "ab initio"?
   "ab initio" is a latin term meaning "from the beginning". In order to avoid confusion, we modified the text to *"Only high latitudes … are skipped directly."*

4. Line 421: "IN Appendix ??". Please correct.
   We corrected line 421 to *"Additional tables … are provided in the Supplement."*

5. Line 616: ": American Meteorological ……".Delete ":".
   We corrected the reference accordingly.