We thank for the constructive comments and suggestions. We revised our manuscript according to the comments and suggestions. The changes in the revised manuscript are yellow-highlighted. The following are our point-to-point responses to the comments.

1. In the first version of paper the method for conversion of NO_2 to NO was not mentioned. In the revised version the authors write that NO_2 is converted on heated molybdenum. It is well known that this type of converter produces artefacts which leads to an overestimation of NOx, e.g., (Jung et al., 2017; Steinbacher et al., 2007). Therefore, molybdenum converters should not be used at GAW sites for NO2 conversion (WMO, 2011).
In the paper, the authors should discuss possible interferences caused from this conversion method and their possible consequences with respect to the major findings of their paper.

References:

Jung, J., Lee, J., Kim, B., and Oh, S. (2017). Seasonal variations in the NO_2 artifact from chemiluminescence measurements with a molybdenum converter at a suburban site in Korea (downwind of the Asian continental outflow) during 2015–2016, Atmos. Environ., 165, 290-300, doi: https://doi.org/10.1016/j.atmosenv.2017.07.010.

Steinbacher, M., Zellweger, C., Schwarzenbach, B., Bugmann, S., Buchmann, B., Ordóñez, C., Prevot, A. S. H., and Hueglin, C. (2007). Nitrogen oxide measurements at rural sites in Switzerland: Bias of conventional measurement techniques, Journal of Geophysical Research: Atmospheres, 112, doi: https://doi.org/10.1029/2006JD007971.

WMO (2011). WMO/GAW Expert Workshop on Global Long-term Measurements of Nitrogen Oxides and Recommendations for GAW Nitrogen Oxides Network, Geneva, Switzerland, GAW Report 195

Response: Thanks for your kind suggestions. We have also noticed the drawback of this technique, but have to accept what has been available at the site. A favorable NO_2 measurement technique based on cavity ring-down principle could be applied in the future. We discuss the possible interference in the revised paper. See page 5, line 146.

"It should be mentioned that the measurements of NO_2 was converted to NO by a molybdenum NO_2-to-NO converter heated to about 325 ℃, which suffered from the interference of other NOy compounds such as PAN and HNO_3 (Steinbacher et al., 2007; Jung et al., 2017). This implies that the measured NO_2 concentrations have to be viewed as an upper limit. However, it is not possible to quantify the overestimation due to the lack of other information. The interference might be enhanced with the increasing PAN/NOx ratios. Qiu et al. (2020) reported an increasing PAN/NO_X ratio from 2011 to 2018 at a background site in North China Plain, but it is not clear if there was similar increase in PAN/NO_X in the YRD. During the transport of air masses to the background site, HNO_3 should have been reduced by deposition and partitioning in the particulate phase and intercepted by filters before NOx is measured. The overestimation of NOx by partly conversion of NOz (NOy-NOx), which were produced by NOx transformation, in turn, might offset positively the difference between the concentration and emission of NOx when discussing their long-term

trends."

Reference

Jung, J., Lee, J., Kim, B., and Oh, S. (2017). Seasonal variations in the NO2 artifact from chemiluminescence measurements with a molybdenum converter at a suburban site in Korea (downwind of the Asian continental outflow) during 2015–2016, Atmos. Environ., 165, 290-300, doi: https://doi.org/10.1016/j.atmosenv.2017.07.010.

Steinbacher, M., Zellweger, C., Schwarzenbach, B., Bugmann, S., Buchmann, B., Ordóñez, C., Prevot, A. S. H., and Hueglin, C. (2007). Nitrogen oxide measurements at rural sites in Switzerland: Bias of conventional measurement techniques, Journal of Geophysical Research: Atmospheres, 112, doi: https://doi.org/10.1029/2006JD007971.

Qiu, Y. L., Ma, Z. Q., Lin, W.L., Quan, W. J., Pu, W.W., Li, Y.R., Zhou, L.Y., Shi, Q.F.: A study of peroxyacetyl nitrate at a rural site in Beijing based on continuous observations from 2015 to 2019 and the WRF-Chem model, Front. Environ. Sci. Eng., 14, 180-190, 2020, https://doi.org/10.1007/s11783-020-1250-0.

2. Line 380:

NOx Data from GAW station should be submitted to the global data archive. For nitrogen oxides data this is the World Data Centre for Reactive Gases (WDCRG) maintained by the Norwegian Institute for Air Research (NILU, https://www.gaw-wdcrg.org/). This is a general requirement for GAW stations; and stations that do not report data to the central database should not be termed GAW stations. On the other hand, I understand that there are different obstacles which take time to be overtaken. So, I can agree with the statement on data availability at this point. Still, I strongly recommend to foster the efforts to submit the data to the World Data Centre

Response: Thank you for your understanding. In fact, the data were shared through other ways, such as the participation in tropospheric ozone assessments. Anyway, we will intensify our efforts to consult with relevant authorities about the submission of data.

Other change:

We added the SO2 and NOx emission data in 2016. See figure 8 and highlight text in the corresponding context.