Comment on acp-2021-928
Anonymous Referee #1

Referee comment on "Amplified role of potential HONO sources in O₃ formation in North China Plain during autumn haze aggravating processes" by Jingwei Zhang et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-928-RC3, 2022

General comments:

The article entitled “Amplified role of potential HONO sources in O₃ formation in North China Plain during autumn haze aggravating processes” by Zhang et al., is in line with several studies performed by the research group on this topic. North China Plain climate and atmospheric composition received higher attention in the last decade. The authors analyzed the impact of different HONO sources on the ozone concentrations by using the WRF-Chem model and performed investigations over various scenarios to study the effect of nitrate photolysis as the main HONO source.

The article is very well written and concise.

One main aspect regarding the complete evaluation of the present work has been related to missing supplementary material and the difficulties to understand the results and discussions despite the missing figures and text.

The comments of this review have been adapted and the eventual similar comments with the other reviewers have been removed to avoid double suggestions. However, some additional comments and suggestions remain to be solved.

Specific comments:

An important finding of the present work is the effect of the photolytic and “volumic” HONO sources on the ozone high concentrations. These findings are related to haze episodes in NCP. The NCP area is highly correlated with biomass burning events where a high amount of aromatics are released into the atmosphere. The aromatics can strongly influence tropospheric chemistry on a regional scale. Could aromatics and especially nitroaromatics, both present in gas-phase and particle-phase, through their direct photolysis explain partly the amount of HONO? Could nitroaromatics play partially the role of nitrate in this study? Including photolysis of nitroaromatics for the conditions discussed in the model would influence the HONO formation from the photolysis of nitrate. A chosen larger J(nitrate) would unbalance HONO sources from surface vs HONO sources from a higher altitude (“volumic”). Including similar sources with photolysis of nitrate could limit the J(nitrate)/J(HNO₃) values.

HONO is formed from NO and OH but HONO photolysis would produce back those
products. HONO formation by this source is a net production?

Table 3 has not been easy to understand since missing the definition of the metrics...

In figure 2 at the end of the haze period, it seems to accumulate significant precursors of HONO, other than those included in the 6S scenario. How could be explained the missing correlations of HONO between the observed and 6S on 15.10.2018 and 22-23.10.2018?

In this figure, the nitrate by 6S is overestimated constantly? Why? It is correlated with the NO2 overestimation?

In figure 2 the NO2 concentrations are constantly overestimated. Could you explain why the observations are constantly lower at maxima? It may be the reason for interferences in the NO2 measurements?

Could the authors add some information about the interferences which are related to each instrument measurements, especially for HONO, nitrate, and NO2?

It could be simulated a missing HONO source presence for additional contribution to ozone formation on vertical average over the J(nitrate)/J(HNO3)=30 ratio?

Line 39 and line 802: “one order of magnitude”

Lines 66-68: Please add more sources of HONO from homogeneous reactions ... For direct emissions and heterogeneous HONO sources are plenty of references and would be great for the consistent state of the art to include homogeneous HONO sources too, even if they have a lower contribution in comparison with NO + OH.

Again, I could not see the entire work and a general view of the paper since up to 9 figures in SM were missing. The work presented here adds interesting inputs for the effect of HONO sources on the concentrations of ozone, especially during haze events.