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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Contributions of different sources to nitrous acid (HONO) at the SORPES station in eastern China: results from one-year continuous observation" *by* Yuliang Liu et al.

Anonymous Referee #1

Received and published: 28 May 2019

This paper reports year round measurements of HONO in Nanjing , Eastern China. The effect of direct emissions of HONO is calculated by looking at fresh plumes and production of HONO from heterogeneous reaction of NO2 on aerosol surfaces was speculated upon using nighttime HONO and RH measurements. A HONO budget was calculated, along with a missing HONO source. The effect of the measured HONO on the OH budget was also described. Understanding the role of HONO is crucial for the understanding of oxidation chemistry, especially in the urban environment therefore this study is important work that should be published. There are very few long term measurements of HONO in the literature, with most studies being done in short term campaigns. The analysis here is a reasonable attempt at understanding the role of

HONO, albeit with a fairly limited set of supporting measurements. It is within scope of ACP and I recommend publication subject to completion of the following modifications.

General comments: No OH measurements were available during the measurements period so the authors have calculated OH concentrations for their analysis (P7). They use the work of Rohrer and Berresheim that correlates OH with J(O1D). I find this a strange choice of literature to use as it was based on work in a very different environment. I believe there are numerous measurements of OH taken within the PRD that would be a more relevant way to infer OH concentrations for this study.

The authors present a calculation of the effect of HONO on OH formation and compare it to formation by O3 photolysis. This study needs expanding a little. OH production from the HO2 + NO reaction would likely be the largest source in such an environment as this study. If the authors want to look at HOx radical formation then they should also make some comment about the effect of other sources such as HCHO photolysis to form HO2 and O3 + alkene reactions. I realise they may not have the supporting measurements to do this accurately but some mention should be made of it.

Some comment should be made as to how much the 'missing HONO' source contributes to OH. This is important in terms of understanding how much models might be underestimating OH by not having all the HONO sources in them.

Following on from this, some mention should be made about how various air quliaty forecasting or regional models treat HOHO and how adding in the 'unconventional' sources might affect oxidation chemistry.

Minor comments: P5 line 150: Can the aithors justify that the measurement is 'interference free'? It was my understanding that the LOPAP instrument is subject to interference from other nitrate species. Please expand this.

P8 line 244: 'in the' should be 'at'

P9 Line 264: The authors describe HONO as an efficient reservoir of OH radicals. I'm

not totally convinced this is the correct way to describe it. A reservoir suggests a long lived species that enables transport of OH radicals. I would have thought the lifetime of HONO would be very short, maybe the authors could comment on this.

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