

Interactive comment on “Exploring the atmospheric chemistry of nitrous acid (HONO) at a rural site in Southern China” by X. Li et al.

Anonymous Referee #2

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This paper presents the observation of HONO chemistry at a rural site in Southern China. In couple with other relevant measurements, the budget of HONO was analyzed and the photolysis of HNO₃ on ground surfaces was suggested being responsible for the high HONO observed during daytime. In general, this paper is well organized and the results are rather valuable to the chemistry of HONO. I'd like to recommend it to be published in ACP. The followings are some specific comments/suggestions that should be reconsidered or clarified in the revision.

1. Extremely high levels of HONO (~ 5ppb) were measured and suggested as a record for rural areas. However, as mentioned by the authors, the abnormally high HONO was due to the influences of a cable-burning event. Thus, I think the data of that episode should be excluded from the analysis for “urban atmospheric chemistry” or, at least,

should not be highlighted as a record. 2. Elevated HONO/NO₂ ratios were observed during afternoon in this study, whereas previous studies indicated high HONO/NO₂ in night time. This finding should have very important implications for the daytime budget of HONO. Unfortunately, the authors did not make further discussions, i.e. why the high HONO/NO₂ in PRD occurred during daytime. 3. Weak correlation between aerosol surface density and HONO/NO₂ ratio was observed and, accordingly, the formation of HONO on aerosol surface was suggested to be small. However, as shown in Figure 6c, the correlation is rather obvious and the low r^2 value is due to the interferences of some data points. I'd like to suggest dividing the data into groups and rechecking the aerosol effects. 4. The surface density of soot was estimated as $(1-w) \times S_a$ (p27609). Considering that the single scattering albedo of aerosols is affected by a lot of microphysical properties like size distribution and mixing state of BC and scattering components, I disagree with such an approximation. This could also be one of the causes for the unreasonable gamma values. 5. Strong correlation between Pm and HNO₃ was revealed. In addition to gaseous HNO₃, will nitrate aerosols also go through the reaction (R7)? In this case, considering the high levels of nitrate aerosols in PRD region, the contribution of nitrate could also be significant.

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