

## ***Interactive comment on “Simultaneous measurements of new particle formation in 1-second time resolution at a street site and a rooftop site” by Yujiao Zhu et al.***

**Anonymous Referee #2**

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General Comments: In this work, Zhu et al. presented new particle formation (NPF) events observed at both a street site and a rooftop site using two TSI 3091 FMPS during both spring- and winter-time. The authors reported two major findings: 1) NPF was enhanced at the street site during wintertime due to seasonal street canyon effects; 2) Photochemically oxidized biogenic organics might contribute significantly to the growth of >10 nm particles. Overall, the manuscript is fairly well written and the subject of the research is certainly within the scope of Atmospheric Chemistry and Physics (ACP). The unique feature of this work is the high time-resolution (1Hz) observations of particle number size distribution (PNSD). It does provide an advantage in NPF research. This is an interesting study but the reviewer feels that there are several issues needed to be

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further addressed before the manuscript can be considered for publication in ACP.

Specific Comments: 1. L27: I do not have too much confidence that the authors can draw a conclusion of “seasonal effects” from several days of NPF events. It is more like a case study. After all, there were no summer and autumn observations.

2. L30: “The oxidation of biogenic organics...apparent growth.” There is no clear evidence of strong biogenic VOC emission at the sites. The authors may want to look into the anthropogenic VOC emissions, such as traffic-related VOC emissions.

3. NPF event consists of both nucleation and the ensuing particle growth. It would be more reasonable to replace “NPF rate” with “nucleation rate”.

4. L235-240: The authors used “25% minimum coefficient of variation (CV) of particle number concentration” as an indicator to eliminate vehicle emission spikes from the NPF dataset. If possible, I suggest the authors also use NO<sub>x</sub> as an indicator of vehicle-emission plumes. For example, did the particle number concentration spikes show any correlation with NO<sub>x</sub> time series?

5. As described by the authors that the street site was “18 m away from the curb of a heavy traffic (Chengfu) Road at the northwestern area in Beijing”, it would be necessary not only to remove spikes of vehicle emissions but also to take into account the small particles transported from further down the road, which may be not as distinct as the spikes caused by passing by vehicles but would certainly raise the background level of ~10 nm particles.

6. L280-290: Ambient temperature changed substantially from spring to winter as indicated in the experimental section. The authors may also want to consider the role of weather in affecting the nucleation rate.

7. L285: In northern China, SO<sub>2</sub>, especially during wintertime, may also come from domestic heating, which can substantially increase SO<sub>2</sub> emission. The authors may want to include this possibility.

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8. Section 3.5: Clear particle growth observed at a ground site is often associated with a regional NPF event. The short burst of nucleation events reported here may indicate that the air parcels were frequently disrupted by the urban micrometeorology conditions, which should be further investigated.

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