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Interactive comment on “Seasonality of ultrafine and sub-micron aerosols and the inferences on particle formation processes” by H. C. Cheung et al.

Anonymous Referee #2

Received and published: 30 September 2015

This manuscript reported the measurements of submicron and ultrafine particles in four different seasons in an urban area in Taiwan, and provided useful information on particle number size distributions, chemical compositions, source apportionment, and new particle formation events. The manuscript is overall well written and fits the scope of ACP. But the sampling periods, totally 84 days, were quite short in each season. Their representative for the whole season needs to be verified. I recommend some revisions before this manuscript can be published on ACP.

1. The representative of sampling periods for the whole seasons needed to be verified. In some seasons, the campaign was only conducted for about 2 weeks, which make

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it doubtful for the statistical significance of the results. Therefore, detailed information about the meteorology and pollution parameters is needed. E.g. Page 21811, line 11, the exact ozone concentrations are needed to define the strength of photochemical processes.

2. I suggest reconsidering the title of the manuscript.
3. Define the “long rang transport (LRT)” to distinguish LRT and Non-LRT.
4. Page 21804, line 6: define TARO.
5. Page 21804, line 9: particle size distribution is not an accurate definition. Please clarify it as particle number size distribution, or particle mass size distribution.
6. Page 21804, line 11: change “highest” to “lowest”.
7. Page 21805, line 4-5: there was not enough evidence to support this conclusion.
8. Page 21808, line 6: provide the detailed information of the size cutoff for each stage of MOUDI, and the sampling flow.
9. Page 21808, line 21: detailed sampling periods of MOUDI are needed.
10. Page 21808, line 25-26: at least one reference is needed to describe the instruments of PM10, NO_x, SO₂ and O₃.
11. Check and unify the effective digital for the all manuscript.
12. Section 3.2: It will be good to compare the particle volume size distribution (SMPS) and particle mass concentrations (MOUDI).
13. Page 21815, line 1: what is the reason of the high correlation of NO_x and accumulation mode particles in summer? NO_x is a tracer for primary vehicle emission, but accumulation mode particles are aged particles and rarely are emitted directly from vehicles.
14. Page P21815, line 8: the figure 6 should be figure 5.

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15. The author attitude the larger difference between observed PNCS in daytime and nighttime to the more intense photochemical production of particles. However, actually, pattern of particle size distribution in summer nighttime with weak photochemical activity was also obviously different to that in the nighttime of other seasons. Are there other reasons for the special difference between observed PNCS in daytime and nighttime?

16. Condensation sink is an important parameter for new particle formation. It should be calculated and provided in Table 3.

17. Figure 1: Given the influence of the regional transport from mainland China, it's better to add the map of southeast China in the figure.

18. Figure 3: Due to the Asian monsoon, it is generally accepted that the air pollution is more serious in winter than that in summer in Taiwan and Hong Kong. Can the authors explain why the max PM concentration appeared in summer? Was it identical with other studies?

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 21803, 2015.

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