

Interactive comment on “Spatial distribution and occurrence probability of regional new particle formation events in eastern China” by Xiaojing Shen et al.

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Shen et al. reported the spatial distribution and occurrence probability of regional new particle formation events in eastern China. Regional new particle formation play a profound role in the haze formation over North China Plain. The manuscript is well-written and easy to understand. I suggest that it can be accepted for publication as ACP paper. Here one question was concerned: The high concentration of pre-existing particles may scavenge the condensable vapors and impede the NPF occurrence. As we know, NCP region contains a city cluster. In the atmosphere of urban areas, the particle concentration may be higher than rural or regional background areas. As a result,

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the NPF may not take place in the urban atmosphere due to a higher condensation sink of condensable vapors. How the heterogeneity of NPF caused by the heterogeneous pre-existing particle concentrations over a large areas is considered in NanoMap? Response: Thanks very much for reviewer's comments. High concentration of pre-existing particles (high condensation sink) is not favorable for NPF events due to the competition between scavenging process and nucleation process of the precursors. Although the particle number concentration can be higher in urban site as expected, there have been several studies reporting high NPF frequency in urban sites. For example, Wu et al (2007) has reported that NPF frequency in Beijing was about 40%, which was close to the frequency of 36% at SDZ reported by Shen et al (2011). The pre-existing particle concentration was influenced by the air mass origin. NPF event showed higher frequency when clean and dryer air mass from northwest was dominated in Beijing and lower when polluted air mass from south. Wang et al. (2013) reported that the NPF event occurred simultaneously at rural site SDZ and urban site PKU, which located about 100 km apart and accounted for ~70% of the total NPF events at PKU site. The result showed the regional NPF event could be homogenous at least 100 km under the influence by the northwesterly air masses from Mongolia and with the synoptic of high-pressure system. Furthermore, the regional NPF events were also observed at TS and SDZ (500 km apart) simultaneously under the influence of homogenous surface high-pressure system and discussed in the text. It can be concluded that the homogeneity of regional NPF event related with the synoptic conditions. It has been clarified in the text that only regional NPF events, which can extend to hundreds of kilometers, were discussed by NanoMap method in the study. But it's true that we can't make sure that each regional NPF event is homogenies. Especially the start and end time of NPF event in a large regional scale would be heterogeneous and the uncertainty is hard to evaluate. In the section 2.3, we have clarified that we made assumptions when NanoMap is applied and we assumed the formation of particles is assumed to take place at the same time in a large area and is starting at the same time throughout the region. These uncertainties may mask local differences of NPF event in each ge-

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ographical position. But the long dataset can help to reduce the uncertainties and we have clarified that in the text.

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