

Interactive comment on “Characteristics of regional new particle formation in urban and regional background environments in the North China Plain” by Z. B. Wang et al.

Anonymous Referee #2

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This manuscript investigates atmospheric new particle formation (NPF) and its influences on cloud condensation nuclei concentrations and aerosol light scattering over the North China Plain. The paper is scientifically sound, relatively well written and easy to follow. I have a few minor issues that should be considered before accepting the paper for publication. More specifically, I am not entirely happy about the way the authors discuss the potential problems, or possibilities for misunderstanding, in their analysis in lines 5-22 on page 20543.

In terms of cloud condensation nuclei (CCN), the authors should more clearly point out the existence of the following three different sources: 1) primary particles able to act as

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CCN, 2) CCN resulting from NPF and subsequent particle growth, 3) primary particles that cannot originally act as CCN but become CCN after ageing (growth and addition of hygroscopic material) in the atmosphere. In analyses as the one performed in the paper, it is extremely difficult, sometimes impossible, to distinguish sources 2 and 3. In practice, this means that the reported some unknown fraction of the reported CCN enhancements due to NPF is, in fact, due to ageing of primary particles. The authors should bring up this issue explicitly in the paper and discuss it shortly.

In terms of aerosol light scattering enhancement due to NPF, I am even more skeptical that particles formed originally in the atmosphere would make a dominant contribution in areas influenced heavily by anthropogenic sources. My main argument here is that particles giving the dominant contribution to the light scattering coefficient tend to be larger than 200-300 in diameter and particle formed in the atmosphere do not usually grow that large. The fact that increased light scattering follows NPF could simply be due to more active secondary aerosol formation that involves existing primary particles. The authors should check out carefully which size range really contributes to light scattering and whether newly-formed particles are really able to reach this size range. In case they do not, the authors can simply reformulate their findings by stating something like "aerosol light scattering was increased as a result of secondary aerosol formation following NPF".

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 20531, 2013.