

Interactive comment on “Different characteristics of new particle formation between urban and deciduous forest sites in Northern Japan during the summers of 2010–2011” by J. Jung et al.

Anonymous Referee #1

Received and published: 21 August 2012

1 General comments

The paper "Different characteristics of new particle formation between urban and deciduous forest sites in northern Japan during the summers of 2010–2011" by Jung et al. deals with the classical site-approach of the atmospheric new particle formation (NPF).

The study is based on two different field campaigns conducted during summer time in 2010 and 2011 at two different sampling sites: a urban area (2011) and a mixed deciduous forest (2010) on the Hokkaido island, Japan.

Authors compare NPF events in term of frequency, condensation sink, and growth
C5970

rates. The key point of the paper is that the two sites are nearly located (2 km) and thus that the forest site could be under the influence of a urban pollution plume depending of the wind direction. Using this specific configuration, authors suggest that the interaction between a pollution plume (sulfur-rich & organic-rich) and an environment enriched with isoprene which would lead to produce a NPF event in acidic conditions.

Another important point is that during urban NPF event authors pointed out the different role of sulfuric acid (nucleation) and organic compounds (growth).

The work presented in this paper is suitable to be published in ACP after minor revisions.

2 Specific comments

- p14046, l14 and further – Please include also in your analysis the work at high altitude site conducted by Boulon et al. (2010) and Boulon et al. (2011b)
- p14047, l0-5 – Author should also mention the work of Metzger et al. (2010) on organic & sulfuric acid nucleation experiments
- p14055, l14-15 – Having an GF of 1.1 – 1.2 is not exclusively the signature of organic aerosols. Actually a $GF \sim 1.2$ is also the fingerprint of "sulfate" aerosols. To my knowledge, organic aerosols may have very wide range of GF values according to the chemical nature of the organic vapor, from non-hygroscopic (e.g. alkane) to highly hygroscopic (e.g. carboxylic acid). Therefore, I think this statement is a bit speculative and need more details.
- p14056, l5 and further – Authors describe events at both sites, urban and forest

C5971

sites. Since SO₂ data are available, authors could use the statistical proxy from Mikkonen et al. (2011) to estimate the sulfuric acid concentration. Therefore, they could conduct a deeper analysis on the conditions that promote the detection of NPF at both site, at urban site only etc... It would allow to test whether or not sulfuric acid is enough to explain the observed growth assuming a kinetic regime or if another condensable vapor is needed to explain what is observed.

Also, it would be meaningful to follow the property of air masses at both site to track and confirm if the nucleation is triggered at the forest site when the polluted air mass from the urban area reach the forest measurement zone. Similar approach have been done to study the vertical extend of nucleation events in mountaneous area (see Boulon et al., 2011b)

3 Technical comments

- p14046, l15 – misspelling "Mout Norikura"

References

- Boulon, J., Sellegri, K., Venzac, H., Picard, D., Weingartner, E., Wehrle, G., Collaud Coen, M., Bütkofer, R., Flückiger, E., Baltensperger, U., and Laj, P.: New particle formation and ultrafine aerosol climatology at a high altitude site in the Alps (Jungfraujoch, 3580m a.s.l., Switzerland), *Atmos. Chem. Phys.*, 10, 9333 – 9349, 2010.
- Boulon, J., Sellegri, K., Hervo, M., Picard, D., Pichon, J.-M., Fréville, P., and Laj, P.: Investigation of nucleation events vertical extent: a long term study at two different altitude sites, *Atmos. Chem. Phys. Discuss.*, 11, 5625–5639, doi:10.5194/acp-11-5625-2011, 2011.
- Metzger, A., Verheggen, B., Dommen, J., Duplissy, J., Prevot, A. S., Weingartner, E., Riipinen, I., Kulmala, M., V. S. D., Carslaw, K. S., and Baltensperger, U.: Evidence for the role of organics in aerosol particle formation under atmospheric conditions, *P. Natl. Acad. Sci. USA*, 107, 6646–6651, doi:10.1073/pnas.0911330107, 2010.

C5972

- Mikkonen, S., Romakkaniemi, S., Smith, J. N., Korhonen, H., Petäjä, T., Plass-Duelmer, C., Boy, M., McMurry, P. H., Lehtinen, K. E. J., Joutsensaari, J., Hamed, A., Mauldin III, R. L., Birmili, W., Spindler, G., Arnold, F., Kulmala, M., and Laaksonen, A.: A statistical proxy for sulphuric acid concentration, *Atmos. Chem. Phys. Discuss.*, 11, 20 141–20 179, doi:10.5194/acpd-11-20141-2011, 2011.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 12, 14043, 2012.

C5973