

Comments to the manuscript

**Variability of air ion concentrations in urban Paris**

Submitted by Dos Santos et al.,

In my opinion this study has potential to yield valuable results in the ion-nucleation study. The author stress that the NPF was a source of ion/aerosol particle and therefore contribute to both air quality degradation and climate. A lot of measurements have formerly carried out in Europe, USA, China and recently started that India. Their measurements have great scientific value. It will be very good if you put graph of  $dN/d\log D$  for ion and particle combined hourly for event days (one day only), I wanted to see how the variation looks like. Characterization of ions should be follow on some old paper, in general for all the AIS measurement and see Mirme and Mirme also paper all are followed by Horrak's and Tammet's, even though Helsinki groups they all are following the same, Characterization of ion by Prof. Tammet. It will good if follow the same pattern and will be easy for comparison.

I also find many places cited only the Hirsikko et al., 2011- Review paper, that is fine, but original paper may also be cited.

You have data for longer period- data collected at different seasons-right, how much temperature variations you have been noticed, it may be some time negative value of temperature, We may ware that mobility of ions depends on temperature- please comments

Some recent reference may be cited here e.g. Garcia et al., 2014, ACP; Kecorius, S. et al., 2015. Nocturnal aerosol particle formation in the north China plain. Lithuanian J. Phys. **55**: 44-53; Kolarz P, Gaisberger M, Madl P, Hofmann W, Ritter M, Hartl A. 2012. Characterization of ions at Alpine waterfalls. Atmos. Chem. Phys. **12**: 3687-3697. doi:10.5194/acp-12-3687-2012.

I have one strong feeling that your results should be compare with model work also.

It will be very good if the author calculate the formation rate ( $J_5$ ), because we can say something about the formation of particle and compare with other worker's results.

Appendix E and F is not essential, not getting any significant, author can remove it- if they wish.

The manuscript is worth to be published with minor revision in ACP.

Page 2, lines 2: Define here the types of ions.....Author defined the air ions lines 7-8, page 2- I think atmospheric ion or only ion you can say...This line may be shifted in line 2 along with mobility ranges (also diameter).

In the abstract please mentioned the name of instruments. Also abstract may be shortening, give only whatever essential.

Page 3, lines 5-7; With some condition secondary aerosol particle can grow? Or all aerosols can grow upto CCN, I do not think. As our knowledge they can grow up to CCN or even beyond with the suitable condition.

Page 3 lines 26-32; Some original work may be cited here.

Page 3, lines 31; Kamsali et al., 2011 delete—this not dealing the ion-ion-recombination- Please see work done by Prof. Hoppel and suitable reference may be cited here.

Page 3, lines 27-30. Sources of ion are mentioned limited. May be add more sources—for example- combustion, raindrop splashing, braking ocean waves, corona discharge and tree branches below the thunderstorm. For the combustion please see Gopalkrishnan et al., 2015 (GRL) or any other, on the waterfall some paper by Helsinki group etc.

Page 4, line 10; As mentioned in abstract also, study period was 26 June 2009-4 OCT Oct, 2010 (16 months)- how you are going to address climatic related issues with limited period of data. Comment?

Objection of the manuscript is clear to me- Pleases clarify.

Section 2.1- Description of the site.

More site description is requited around the measurements site- it will be very good if author can put closed view of the site in figure 1 (In the legend author are mentioned "estimated location, what is meaning of estimation?). Inlet photograph of both the instrument is more useful. Some information of met parameter is more useful to understand about the source of the particles- as author mentioned that anthropogenic sources of the particle.

Page 5, lines 24-25. How you converter the mobilities to diameter of ion? Are you consider during conversion single charge or multiple charge ions- Please see

the Tammet, 1995 or Horrak et al., 2003. Asmi et al., 2009 is not appropriate here.

Section 2.2.1 and 2.2.2

Please shorten this section. Detailed is not required. Put the website or refer.

Section 2.3

Page 7, lines 5-8; Please correct the diameter range of respective mobility, Please see the Horrak et al., 2003, also you can find in Siingh et al., 2013. Intermediate ion size range up to 7.4 not 7. Similar mistake in Small and light large also. Similar changed may be made in table 1 also.

Page 8 lines 1-3; Please write name of the Months. Not short.

Section 3; Results and discussion

Page 8, lines 27-28; Why you are getting more negative number concentration, it is because of electrode effect? Or something else.

Page 9, line 23-26; I agree but more concentration for large particles not for intermediate ion, generation of intermediate ion are different.

Page 10, lines 9-17; What is significant of correlation- please clarify.

Page 10, lines 20-21, Morning peak may be some other region- like solar activity? Please investigate the possible sources, If possible- only traffic I am not agrees. Is any change in wind direction? May be one of the factor- if not then leave these comments. Please also explore the nocturnal activities and give some suitable reference.

Page 11, line 14; at your place sunrise time different at different months. Please comments- That why I want more and detailed information about observation site- then we can say some local source or not.

Page 12, line 20; how you can say? Do you have any measurement?

Page 13, lines 3-4, it is obvious, environmental condition are different at Puy de Dôme mountain and your site.

Page 14, lines 2-17, In India other than Pune and Kanpur e.g. Himalayas region also getting NPF is more in spring/summer.

Page 15, lines 12-13, Agree! Horrak et al., 1998 already suggested that during the NPF burst of intermediate ions. This finding is not new.

Page 16, lines 23-26, Do you have any support- like air mass back trajectory - please show from air-mass back trajectory analysis.

Page 18, lines 3-4, What is Kelvin effect and Nano-Köhler effect? Please define in short, general reader may not be knowing.

Summary and conclusion: Heading should be "conclusion" Conclusion should be focused based on the study only and compact. Please rewrite the main conclusion only.

It is requested that Editor/Technical Editor may kindly see grammatical error or any technical issued.