The analysis of aerosol properties over the North China Plain during the intense polluted event of January 2013 is a very interesting subject suitable for the publication on Atmospheric Chemistry and Physics. The paper is well written and the analysis is performed clearly and satisfactorily. I suggest only some minor revisions:

1. Pag 29688 from lines 19. Among the others ground based networks, authors should mention also the SKYNET network consisting of about 70 sun-sky radiometers installed worldwide (http://atmos.cr.chiba-u.ac.jp/, Takamura, T., and T. Nakajima (2004), Overview of SKYNET and its activities, Opt. Pura Apl., 37, 3303–3308).

Response: It has been corrected in the revised version. And the reference has been added.

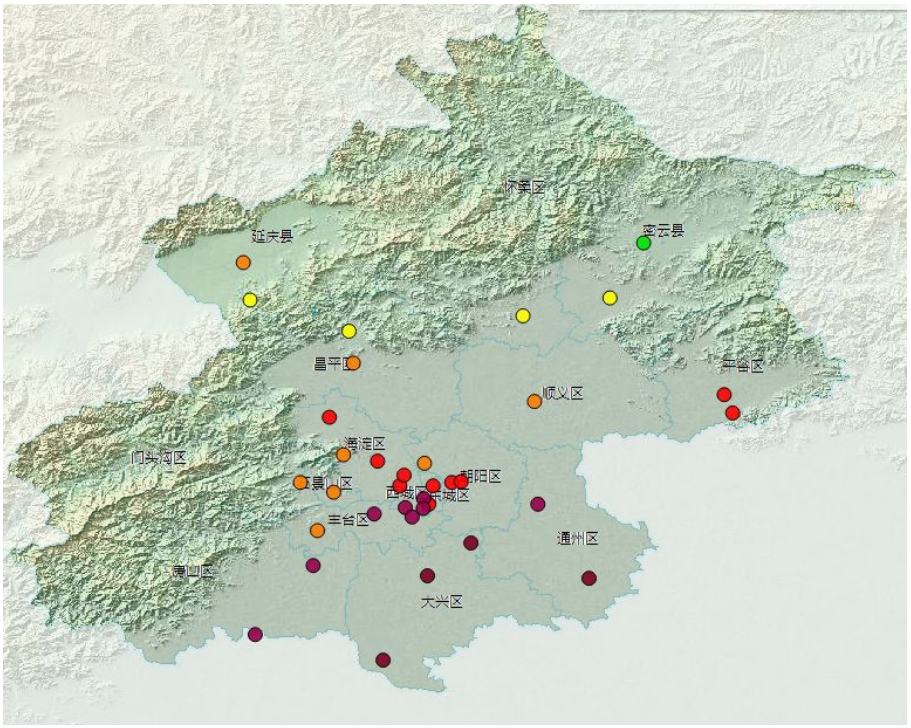
2. Page 29692 lines 12-13. Authors state that CARSNET sky radiance measurements are analyzed using a “retrieval processing method. . .very similar to the Version 2 AERONET Algorithm”. Who developed this methodology ? Are there any references? What are the difference between this methodology and the AERONET’s one?

Response: CARSNET sky radiance data processing include two parts: 1. Creating suitable input data of Cimel measurements for Dubovik et al. (2006) inversion, this part was established by Dr. V. Estelles and modified by Dr. X. Xia & H. Che; 2. Processing the input data according to Dubovik et al. (2006). The difference between the two methods including: (1) the surface albedo. AERONET method assumes of a dynamic spectral and spatial satellite and model estimation of the surface reflectivity (SR), including the bidirectional reflectance distribution function (BRDF), in the place of an assumed surface reflectivity (Dubovik et al., 2000). It is more reasonable than CARSNET one. CARSNET method just uses the MODIS MCD43C3 8-day WSA data. (2)

Observation time. It needs about 7 minutes to execute the almucantar measurements for Cimel sunphotometer. AERONET used middle time when the instrument executes almucantar measurements at 1020nm. While CARSNET method just used the time when the instrument execute right almucantar measurements at 440nm (ALR at 440nm). There are about 4 minutes' difference. (3) Asymmetry judgement between the left and right almucantar measurements. In CARSNET method, if the left and right radiances at one scattering angle differ larger than 10% at any wavelength, then the radiance for all wavelengths will be deleted during creating suitable input data. This is too strict. Those radiances with difference less than 10% between left and right almucantar were ignored. While the AERONET method just delete the radiance at that wavelength with difference larger than 10% between left and right almucantar and keep the other wavelengths' radiance data. This is more reasonable than CARSNET.

3. Page 29693: line 6: which of the 3 stations of Beijing is located close to the site were PM2.5 are collected? Should this site be representative of the entire Beijing, or it is expected that number of particles and their chemical composition change going from the north to the south part of the city?

Response: The PM2.5 data were from the China National Environmental Monitoring Centre (http://www.cnemc.cn/). There are about 30 stations located in Beijing (see the Figure following). The PM2.5 mass concentration in this study is the average of all these stations, which could be representative of the entire Beijing.



4. Page 29693: line 8: change Figure1 with Figure 2.

In the line 8: The mistake has been corrected as Figure 2.

5. Page 29693: line 18: “on the pollution days, the relative humidity usually exceeded 50%” . Have the authors any comment about the reason why the increase of RH and PM2.5 are correlated in the North China Plain?

The reason of increase of RH and PM2.5 are correlated in the North China Plain have been added as following:

The formation of secondary aerosol species such as NO_3^-, SO_4^{2-} and secondary organic compounds could be enhanced under high-humidity conditions similar to the in-cloud process (Hennigan et al., 2008 GRL).

Hennigan, C.J., Bergin, M.H., Dibb, J.E. and Weber, R.J. (2008). Enhanced Secondary Organic Aerosol Formation due to Water Uptake by Fine Particles. Geophys. Res. Lett. 35: L18801.

6. Page 29694 line 14: please add “spatial and temporal variation of AOD

at 500 nm". Moreover, in which way AOD was calculated at 500 nm? Using the Angstrom exponent? Lines 20- 24: here, but also in other parts of the text, the variation of AOD or other quantities is expressed as (for example) " varied by about 0.15-2.60": what this two numbers indicate? The minimum and maximum variation? It could be also interesting an indication of percentage variation.

Response: the word "temporal" has been added. The AOD at 500nm in this article was not calculated by using Angstrom exponent. All Cimel instruments in this study have 500nm filters to measure the AOD at 500nm. The variation of AOD (Lines 20- 24) and other quantities mean the daily averaged values during January of 2013. And the minimum and maximum mean the instantaneous minimum and maximum AOD or other parameters during the whole January of 2013.

7. Page 29695 Line 3: "AOD at 440" why not at 500 nm?

Response: "AOD at 440" is from the literature and in that reference there are no AOD at 500nm.

8. Line 21: how many volume distributions do you have for each day?

Response: The effective volume distribution data number depends on the raw almucantar measurement quality. In this article, there are 1 to 8 volume distribution data which could be obtained each day. Usually, there are volume distribution data about 3-5 times on each day at RADI, CAMS, and Nanjiao stations during January of 2013.

9. Figure 5: are the volume distributions for Nanjiao retrieved using the CARSNET methodology, instead of the AERONET inversion? (see my comment at point 2)

Response: Yes. The volume distributions for Nanjiao and CAMS were retrieved using the CARSNET methodology in Figure 5.

10. Page 29702 line 17. During the most intense pollution, the volume distribution is 3-modal. How much is the modal radius of this mode, respect to the other two modes? Is this mode included in the calculation of the fine modal radius?

Response: The 3-modal data show obvious 3 peaks at the radius about 0.15, 0.30-0.50, and 1.10-1.20 μm during 10th – 16th January, 2013 at 3 urban sites of Beijing. While usually there are only 2 peaks at the radius about 0.10-0.20 and 1.20-1.40 μm during other periods. Yes, the mode with the radius about 0.30-0.50 μm is included in the in the calculation of the fine modal radius.

11. About Figure 1, please increase the character of the sites' name. Moreover add a legend of the color used in the wind rose plots. Concerning the other figures, label of x and y axis should be in a larger character.

Response: All the figures have been re-figured as the reviewer's comments.