The discussion paper presents a comprehensive picture of this specific pollution episode in Beijing including local and regional meteorology, boundary layer depth and horizontal transport that led to the air stagnation condition associated with the episode. Concentrations of gas and particulate chemistry and size distribution are compared, analyzed and discussed.

Comments and suggestions regarding the presentation and discussion.

Figure2.
The transport distances of trajectories 1 through 5 look, as an estimate, to be about 2000km. By contrast what is the average transport distance of trajectories in cluster 6?

The geographical range of cluster 6 is so limited that it is not possible to see it on the scale of the map. A magnified inset showing only cluster 6 would be useful. Such an expanded inset would fit nicely in the upper right of the overall map. Alternatively, a sentence (along with the transport distance above) stating the size of a circle or rectangle encompassing the cluster 6 trajectory path would suffice.

Figure 3.
Do the cool, blue colored soundings correspond to the time period of trajectory cluster 6?
It is worth a sentence or two of discussion regarding limited horizontal motion as well as vertical mixing with respect to the limited dilution during the stagnation and pollution episode.

Figure 5.
dN/dlogDp does not serve well to illustrate the several modes you discuss. Consider adding a second panel to figure 5 showing dV/dlogDp or better, assuming the density of 1.5 from the literature, show dm/dlogDp.

The same consideration applies to figure 6 showing the modal number concentrations vs. time. A panel showing time series of modal mass concentrations would be useful.

Figures showing mass concentrations from the particle size measurements then support the following discussion of AMS <u>mass</u> concentrations of specific chemical species.

Figure S4, panel 1 would fit better with the chemical mass distributions if it were plotted as dm/dlogDp also.

Page 23384, line 25
After the coagulation process, ….

There are many processes involved here, not only coagulation. Some mention of dilution should be made. As is often the case it is meteorology can drive major changes in pollution levels, gas and particulate parameters. Its hard to tease out the aerosol dynamics processes alone.

Page 23385 line 4
Chemical compositions, mass fractions, O:C ratio and m/z 44 of NR-PM1 are presented in Fig. 7a–c.
A brief discussion of the importance of m/z 44 in the AMS spectra and how it relates to organic particulate compounds would be useful for the general reader. Also, this would support your discussion of SOA on the next page.

Section 3.6.1

I do not understand something in this section that is important to the discussion and your interpretation of the data.

"During the measurement period, the atmosphere was stable with low wind speed (2.5ms−1). We calculated the aerosol scattering hygroscopic growth factor with elevated relative humidity and fitted the scattering growth curve as shown in Fig. 11. The RH was divided into eight bins, and the average scattering coefficient in each RH bin was calculated."

In the methods section you say:
"An integrating nephelometer (Model 3563, TSI Inc., Minnesota, USA) was used to measure the total light scattering and hemispheric back scattering coefficients (for angles between 7–170, respectively) of **low RH aerosol** at wavelengths of 450, 550 and 700 nm, no size-selective inlets were used."

What was average value of the "low RH" in the neph? Was is controlled in any way?

Are the RH values discussed here and shown in figure 11 the RH in the nephelometer or are they ambient RH?

Were the calculated f(RH) values of the ambient aerosol based on the Improve model, eqn. 6 rather than the nephelometer measurements?

If, in fact, the light scattering measurements were made by the nephelometer where its sensing volume was at low RH, and the fit is light scattering vs. ambient RH, then what is shown is not actually f(RH) but the relation of ambient RH to the scattering efficiency or size distribution of the aerosol resulting from rapid atmospheric ageing via processes such as gas to particle conversion, coagulation, uptake of gases by highly hydrated particles, etc.

The RH at the surface, figure S1, is in the range 60 to 80% during the latter period of the episode. Given the lapse rate in the boundary layer, the RH at the top of the

boundary layer must be 100%. Was the boundary layer cloud topped? What was the average boundary layer RH? The boundary layer RH is important for hygroscopic growth, liquid water content of the aerosol and water uptake of soluble gaseous pollutants. Its also important for slant range visibility which impacts aircraft operation and safety.