General comments:

What are the wavelength and angular integration angles for the forward scattering visibility meter? How are forward scattering and visibility related in this study? Is that implicit in equation 1? The details should be explained. Clearly the forward scattering can be modeled via Mie theory and the PNSD but that is not necessarily visibility.

A common way of presenting visibility or extinction or scattering coefficient as a function of RH is to present it as a ratio, e.g. the extinction coefficient at a given RH divided by the low RH extinction. To some extent this has been done with $K_{ex\text{-}vol}$. However the effect of varying PNSD remains. It would be valuable to separate the RH effect from the PNSD effect.

The value of $K_{ex\text{-}vol}$ is theoretically related to the ratio of coarse to fine, or fine to PM2.5, or other volume or mass ratios. This has been shown in many studies. Clearly with the Vaisala meter data you cannot do size separation. You could do and present this from the PNSD and Mie results.

The results in this study should be compared to results of one or two previous studies of visibility or extinction vs. RH and aerosol mass or volume conc. It would be interesting to see if the relationships you observed in the N China Plain with its perhaps unique aerosol size, chemistry, refractive index, coarse fine ratio are similar to other locales.

Number concentration in general is not closely related empirically or theoretically to extinction or scattering unless limited to the optical subrange of diameters as you mention briefly. It is not used in the parameterization results and thus fig 2b could be eliminated.

There are numerous redundant paragraphs and sentences that could be eliminated or cleaned up to make the manuscript shorter and more readily readable.

Numbers given in the manuscript are not generally needed to more than two or three significant figures.

Specific comments by page and line number:
Abstract line 13
... with the parameterization scheme agree well with the **directly** measured values.

Page 31364 line 25
I suggest you limit the list of cities and PM2.5 to two or three in the NCP. Since visibility is the focus of the paper adding the average visibility values that accompany the PM2.5 averages would be useful.

Page 31365, line 11
Hygroscopic growth ~~would~~ increase**s** aerosol extinction coefficient by enlarging ~~the~~ particles ~~size~~ by uptake of liquid water. On the other hand, hygroscopic growth decreases

aerosol extinction ~~coefficient~~ by lowering the refractive index, since ~~uptaked~~ **the** water **that is taken up** has a smaller refractive index compared to other aerosol components.

Line 17
… nificant degradation in visibility, as ~~have~~ **has** been observed in some field campaigns …

page 31366, line 7
The discussion of the parameters that control light extinction or visibility reduction by particles needs to be presented more clearly and in order of priority. For a dry aerosol, its light extinction is;
1. first and foremost, related to aerosol mass loading (for a reasonable, average range of size distributions),
2. secondarily to the aerosol size distribution,
3. and then to refractive index, shape, density.
In the atmosphere, variable RH has a marked effect, on aerosol extinction through hygroscopic growth through uptake of water by the water soluble compounds commonly found in the aerosol. This effect is often as dominant as the size distribution effect. For a given, fixed size distribution extinction is directly related to mass loading of the aerosol in its dry state. Hygroscopic growth (and refractive index) are dependent on the chemical composition and mixing state of the aerosol.

Page 31368, line 3
State the initial RH value for the PNSD.
Hennig reference not in list.

Eqn 1
Visibility was **monitored** ~~detected~~ with a forward scattering measuring visibility meter (Model FD12.....
Give reference for eqn (1) and distinguish between visibility and visual range.
Middleton (Vision through the Atmosphere), see:
http://amsglossary.allenpress.com/glossary/search?id=visual-range1.

To match the ten-minute PNSDs data, one-minute meteorological parameters were also averaged into ten-minute averages when missing data less than 40 %.
I don't understand what is meant by: "when missing data less than 40 %."

Page 31369, eqn 3
Is "gf" the same as "f(D_p,RH)" in eqn 2?

Line 15
The discussion about determination of the hygroscopic growth factor is very condensed. A sentence relating to the method and reference to it should be included e.g., Novak (or more recent reference) who presents the cumulative size distribution estimate of hygroscopic growth.

Nowak, A.: Das Feuchte Partikelgroessenspektrometer: Eine Neue Messmethode Zur Bestimmung Von Partikelgroessenverteilung (<1 μm) und Groessenaufgeloesten Hygroskopischen Wachsumsfaktoren Bei Definierten Luftfeuchten, Doctoral Thesis, Leibnitz Institute for Tropospheric Research, Permoserstr. 15, D-04303, Leipzig, Germany, 2005.

Line 21
Give full reference year for Ma, 2011a or 2011b

Page 31370, line19
The formula for f is awkward. Better if spelled out e.g., f = 2.75 at 100nm and 99.5%RH for ammonium sulfate.

It is not clear how the growth factors shown in figure 1 at sizes greater than 10 or 2 um were obtained. The values seem large.

Page 31371, line1
… for determining the optical equilibrium refractive index for dry particles …
I don't understand the meaning of 'optical equilibrium'. Can those words be deleted with no loss of meaning?

Page 31372, line 7
The refractive index for pure water is … ~~(Seinfeld and Pandis, 1998)~~.
Reference not needed.

Page 31373, eqn 9
What are the integration limits? 20 nm to 10um? Use diameter rather than radius since diameter generally used in discussion.

Page 31376, line 3
.... the ambient **RH** PNSDs ...
Add RH just for clarity.

figure 3
Was the regression forced through zero?
More than 3 significant figures not needed in R^2 value.

Page 31378, line 10
.... are **less than** ~~within~~ 100 ....

Line 24
The crossed area ...
I don't see a cross hatched or otherwise marked area in fig 4,though I understand what you mean in the sentence.

Page 31379, line 20

... K_{ex} **per unit** ~~at unit~~ aerosol volume concentration ....

Page 313181, eqn 10
The (1-RH) term and similar empirical formulas for this relationship should be referenced. E.g., F. Kasten, P. Winkler, K. Carrico.

Page 31382, line 2
*I believe you mean to refer to the coefficients in **eqn 10** and table 3.*

Line 17
By my estimate one sigma of the values are distributed approximately ± a factor 0f 1.5 from the 1:1 line. I would put the result in quantitative statistical terms rather than "near".

Page 31392, tables 2 and 3
Round the numbers presented and limit to two or three significant figures.
Rearrange and add to the columns to provide more meaningful statistics.
Mean, median, std. dev., 10% and 90% values.
10% and 90% values are more valuable than maximum and minimum.
You can equally well choose 5% and 95% or ±1 or ±2 sigma values.
I suggest median as a measure of skewness of the data distribution. If the distribution is reasonably Gaussian you can say that in the text, page 31373.

Page 31393, table 3
Most statistical packages calculate a 90 confidence or one standard deviation value to fit coefficients. It would be valuable to add those to the table for the fit coefficients.