Reviewer comments and questions to
acp-2014-387-manuscript-version1

The impact of aerosol hygroscopic growth on the single-scattering albedo and its application on the NO2 photolysis rate coefficient

The manuscript presents an analysis of an intensive set of measurements of aerosol optical and physical properties from the HaChi experiment in the North China Plain of the PRC. The analysis, includes measured data and models based thereon to derive single scattering albedo values as a function of RH and applies the results to an estimate of the NO2 photolysis rate. This is a valuable and important extension to the wealth of data from HaChi that has already been published in the literature and ACP special edition.

Section 2.2

The conceptual model of your core-shell mixed aerosol is not clear and needs a better verbal description, mathematical description (see J. Seinfeld and S. Pandis) or illustration.

Given the difference in the models, the last sentence, that the ensemble mean kappa from Liu describes the core-shell mixed aerosol model is not clear. How do these two models, Liu's two-group, externally mixed model, and your internally mixed core-shell model converge? I'm not sure there is an explicit physical, chemical reason for this convergence but I do recall it has been shown to be true empirically for several earlier mixing models. Your core-shell mixing model which seems to allow all degrees of internal, external mixing is more complex.

Page 7, line 23
Do you mean g rather than f?
f appears in equation 7 and needs to be defined.
r also.

3.1 Overview
In your discussion it would be useful to refer to the excellent summary data in your table as well as to the figures. The tables are quantitative. Consider adding two more rows for each parameter giving the 10 and 90 percentile. Then, in the text you can refer quantitatively to the percent of the data within those percentages (or within one or two sigma of the mean) rather than "mostly" e.g. page 10 lines 21 and 22 and elsewhere.

You mention correlation of RH and scattering and absorption coefficients. It is difficult to see these by eye, ocular analysis, in your plots. A calculation of correlation coefficient and table would be useful if they are significant, and, or significantly different.

3.2

The decrease in scattering at about 85% RH that your show is not observed in the earlier literature nor expected based on models and theory. What is the reason for this?

Regarding Figure 3, the most common way of presenting hygroscopic growth of geometric diameter or optical properties based on RH dependent measurements, is to normalize them with reference to the low RH measurements. This may not be possible in your case if there was no relatively continuous measurement of low RH properties to match the elevated RH measurements and if atmospheric conditions changed during the RH scan period of the HTDMAs. You do have a continuous record of scattering from the nephelometer at 30% RH to test atmospheric time variability of scattering.

AVG-PRM needs to be explained when first used rather than later.

The numerical labels on the x-axes are confusing. Put them all below the individual plots. The plots would be easier to read and compare if all the JNO2 scales were the same, i.e., 0 to 0.25.