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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Formation and evolution mechanism of regional haze: a case study in the megacity Beijing, China" *by* X. Liu et al.

Anonymous Referee #1

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The authors use a suite of measurements to determine spatial propagation, boundary layer heights, gas-phase speciation, and PM2.5 mass concentrations. The analysis is mostly fine and publishable, but the conclusions are too broad and unhelpful and the authors should present the haze event as having anthropogenic origins for this one-week observation period, but not extend their results to a set of general policy recommendations.

The main issue is the generalizations made from a week's worth of measurements. How would the power law with RH vary when the source of PM2.5 is not urban air pollution as in this week's case? The coefficients are valid for PM2.5 for similar chemical composition, which is not to be consistent throught the year. For instance, what about Asian dust events in the region? From a perspective of frequency, it is diffi-

cult to recommend that the government regulate anthropogenic sources of PM2.5 for reasons of haze if dust and aged transported to the city is more frequent annually or inter-annually (or if the meteorological conditions favorable for anthropogenic pollution evens described in this manuscript is not frequent). Also, the chemical speciation is not specific enough to make over-arching recommendations for PM mitigation when the sources are not known. Even if SO2 is responsible for nucleation, What is the source of SO2 in the region? If the nucleation mechanism is ternary, are there not possibly more effective measures for reducing the occurents of these events? Even after nucleation, condensational growth is an important part of growth which contributes to increase in size and light-scattering; could not the sources of organic aerosols regulated instead if they are anthropogenic? The authors' recommendation to control "industrial factories" and reduce vehicle usage is based on too little information, too general, and not insightful.

The hygroscopic growth factors are less than expected for ammonium nitrate or sulfate if they are the hypothesized to be the primary components contributing to the regional haze. And they appear to be mostly dry below 50% RH, which is not consistent with the presence of ammonium nitrate or bisulfate. Temperatures in Figure 6 would indicate that much of the nitrate will be in the gas-phase during the daytime, at least during this period. This question leads back to the question of whether the hygroscopic model is as general as the authors claim.

Fig 8: keep same axis units as Figs 1, 2, and 6.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 16259, 2012.