

Wu et al. conducted a set of ambient measurements from which they calculated size-dependent hygroscopic growth factors (HGF) of aerosols in Beijing. Two primary results are reported. First, the hygroscopicity parameter calculated from HGF ( $\kappa_{\text{HGF}}$ ) increases with increasing particle diameter. Second,  $\kappa_{\text{HGF}}$  of the organic aerosol fraction is correlated with the corresponding oxygen-to-carbon (O/C) ratio that is used as a surrogate for the aerosol oxidation level. The authors hypothesize that the increase in  $\kappa_{\text{HGF}}$  with increasing particle diameter is associated with condensational aging processes that increase the hydrophilic fraction of the aerosol. New particle formation events are found to be responsible for aerosols with higher  $\kappa_{\text{HGF}}$ . Overall, this manuscript addresses an important research topic regarding the influence of particle composition on hygroscopic properties. It extends previous laboratory and field studies with related measurements in an area that is subject to severe pollution problems. I would support publication in ACP after consideration of the following comments.

## COMMENTS

1. P11497, L25: Several other studies have investigated the relationship between hygroscopicity and chemical composition of laboratory and ambient organic aerosols, including but not limited to: Massoli et al. (2010), Wong et al. (2011), Lambe et al. (2011), Moore et al. (2012a), Rickards et al. (2013), and Suda et al. (2014). None are referenced or discussed in this manuscript. In particular, Massoli et al. and Rickards et al. characterize water uptake under subsaturated conditions as is done in this work, and Suda et al. characterize functional-group-dependent trends in aerosol hygroscopicity at a specific O/C ratio. The introduction should be expanded to include discussion of prior work that is relevant to the current manuscript.
2. In the abstract, the authors report median  $\kappa_{\text{HGF}}$  values ranging from 0.15 to 0.29; these values should be cited somewhere in Section 4.1 because as far as I can tell they are not mentioned anywhere except the abstract.
3. I think it would be useful to compare results that are presented in Figure 2 with related measurements such as those presented in Moore et al. (2012b). This comparison could help to generalize the observations detailed in this work. Further, it would aid in the interpretation of other field measurements where chemical composition data may not be available.
4. **P11505, L3-5:** The growth factor probability distribution function is an important result. In my opinion the campaign average GF-PDF should be shown as a figure. It might also be interesting to contrast multiple GF-PDF's during events that are dominated by specific sources or aging processes.
5. **P11507, L27 – P11508, L5:** For the reasons that are mentioned in the text, it is not appropriate to compare  $\kappa_{\text{HGF}}$ -versus-O/C trends observed here with  $\kappa_{\text{CCN}}$ -versus-O/C parameterizations from other studies that are referenced in the Figure 5 caption (Bhattu and Tripathi, 2015; Chang et al., 2010 and Mei et al., 2013). I suggest modifying Figure 5 and related discussion by removing the  $\kappa_{\text{CCN}}$  parameterizations

and instead comparing with other  $\kappa_{\text{HGF}}$  measurements. Some suggested studies for comparison include Jimenez et al. (2009), Massoli et al. (2010), Rickards et al. (2013), Pajunoja et al. (2015).

6. **P11508, L3:** The authors state: “We should also note that the different aerosol formation ways in different environments could also be an explanation for the different relationship between  $\kappa_{\text{org}}$  and O:C.” Other studies also suggest that O:C does not encompass changes in detailed chemical composition that are responsible for changes in hygroscopicity (e.g. Mei et al., 2013; Rickards et al., 2013; Suda et al., 2014). However, AMS spectra obtained in this study are not discussed aside from the O/C ratio. This claim it should be supported by presentation of representative AMS spectra. Further, it would be useful to discuss what unique features of the Beijing aerosol chemical composition lead to different hygroscopic behavior relative to other studies.

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