



EGUsphere, referee comment RC2  
<https://doi.org/10.5194/egusphere-2022-670-RC2>, 2022  
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## Comment on egusphere-2022-670

Anonymous Referee #1

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Referee comment on "Remote sensing of aerosol water fraction, dry size distribution and soluble fraction using multi-angle, multi-spectral polarimetry" by Bastiaan van Diedenhoven et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-670-RC2>, 2022

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This study provides a novel method to derive aerosol water volume fraction, dry size distribution, and soluble fraction of fine mode aerosol although some assumptions are needed. This exploration is encouraged to enhance people's understanding of aerosol physicochemical properties. This study is within the scope of the journal. I would suggest this paper be published, and I also have comments below for the authors to address.

Line 110. How low is the  $\delta_{\text{K}}$  and how small is the radii for ignoring the Kelvin term? What is uncertainty?

Line 125. The authors should indicate the uncertainty of aerosol hygroscopicity for 150 nm particles if omitting the Kelvin term.

Line 130. It is not reasonable to classify aerosol as soluble and insoluble particles according to whether the aerosol hygroscopicity parameter ( $\delta_{\text{K}}$ ) is 0. Actually, the  $\delta_{\text{K}}$  of many organics is larger than 0 but they are insoluble. Here can be considered hygroscopic ( $\delta_{\text{K}} > 0$ ) and non-hygroscopic ( $\delta_{\text{K}} = 0$ ).

Line 250. More information about RSP is needed, such as the instrument configuration, detection ability, measurement uncertainty, and so on.

Line 435. Whether sulfate is the principal chemical component. The authors can provide the mass fractions of aerosol chemical species measured by AMS.

Figure 3. According to the  $\delta \square \square_{ext}$ , the hygroscopicity of particles is very weak. If divided by 0.56 using Eq. 28, the  $\delta \square \square$  of most particles is below 0.1, indicating a large number of organics with weak hygroscopicity. It may be inappropriate for the author to assume that soluble components are represented by sulfate in Line 320.

Figure 5, 6, 9, 11, 12, 14. Some in situ data were used to compare, but the measurement instruments were not introduced in the paper. This information can be added to the supplement. What's the uncertainty of these in situ measurements?

Figure 8. The scatter is not well consistent with the model line in (a) and (b). What's the reason?

Technical advice:

Line 330. "Therefor" should be "Therefore"