Anonymous Referee #2

This study reports on ambient f(RH) measurements in Beijing, China. The general topic of aerosol hygroscopicity is of interest to readers of this journal. This work definitely requires English editing if there is a subsequent version. The manuscript is sloppy with many writing errors that I did not fully outline below but should be fixed. The main issue of this work is the lack of novelty in the scientific findings. There is a general lack of depth in the analysis and the paper reads like a very brief lab report currently that still lacks many easily reportable basic descriptive statistics of their data. The paper is disorganized with an example of this being that Section 3.3 is disjointed from the rest of the paper. The authors are encouraged to review the literature better and to examine their dataset more deeply to find novel results that would be of broad interest to readers rather than being a quick report of values very specific to their region. In my view, to make this paper reach the level of quality ACP warrants, the authors should use the other datasets they advertised they would use in Lines 196-198.

Thank you very much for your valuable comments. These are very helpful for the revision of this paper. Based on your suggestions, for this paper, we mainly made the following modifications and adjustments.

(1) The observation of f(RH) by humidified nephelometer has been carried out worldwide for many years, making it possible to obtain the hygroscopicity of aerosols under continuous relative humidity. Previously, f(RH) data were mainly used to evaluate the hygroscopicity and radiative forcing of aerosols. Recently, f(RH) was also used to calculate the hygroscopicity parameter, the aerosol water content, and the number concentrations of cloud condensation nuclei (Kuang et al., 2017, 2018; Tao et al., 2018) based on multi-wavelength observations. However, the enhancement of light scattering or growth of size for aerosols under high humidity (>90%) has been seldom reported due to the difficulty in creating a stable high humidity and measuring it accurately. In previous observations, the temporal resolution of f(RH) observation was usually low, and the results of f(RH) could not be obtained stably and accurately for high humidity. In order to meet the urgent needs of evaluation and forecast for low visibility and aerosol radiative forcing under heavy pollution in the North China Plain, an improved high-resolution humidified nephelometer system was established to observe the f(RH) of $PM_{2.5}$ for a wide RH range between 30%-96%. It was the first high-RH f(RH) observation by the humidified nephelometer system in China. The f(RH) data itself and its fitting parameterization can be directly applied to relevant research and specific work in the NCP.

Thus, we carefully revised the words and rewrote many parts of this paper to highlight the key points and make the analysis more impactful.

(2) To enrich the content and enhance the depth of analysis, we added a new section into the text for analyzing the impact of hygroscopic growth under high humidity on light scattering of PM2.5 and emphasize the importance of high humidity data for the overall hygroscopicity of aerosols and the f(RH) curve fitting. We found that the

enhancement of light scattering for PM2.5 would be overestimated without the high humidity data. In addition, based on the MARGA data, we also evaluated the quantitative relationship between water-soluble components and hygroscopicity.
(3) In the revised version, the part of uncertainty analysis was placed at the back of the text as an appendix.
(4) We also rewrote the sections of abstract and conclusions to make them more focused and logical. Further, we asked a professional English editing website to polish the language.

Specific Comments:
Line 47: remove the word "the"
The word “the” was removed.

Line 64-66: Numerous techniques can measure g(RH) and not just the HTDMA. Authors should mention other techniques used to measure g(RH) in field studies.
The Humidifying-Differential Mobility Particle Sizer (Eichler et al., 2008; Meier et al., 2009) and the Differential Aerosol Sizing and Hygroscopicity Spectrometer Probe (DASH-SP) (Sorooshian et al., 2008), two instruments which are both based on the differential mobility of particles are added in Introduction.

Line 109: Remove "As we all know" since we all may not know as well as the authors about that region.
"As we all know" was removed.

Line 395: 16 pm doesn't make much sense. use military time
16 pm was changed to 16 o’clock.

Figure 1: too small to read anything in the panels.
Figure 1 was redrawn and enlarged.