Response to Alexei Korolev (Referee #2)

Thank you very much for your constructive feedback and your suggestions for improvements. We revised the manuscript and adapted the changes that you proposed. You find our reply to each of your comments below:

1. "One of the problems of microphysical measurements in icing wind tunnels is the spatial nonuniformity of sprays across the test section. This may result in biases of MVD and/or LWC measurements conducted by different instruments if their sampling volumes are positioned at different locations. To mitigate this problem, researchers usually attempt to mount instruments in the same location when conducting comparisons of different instruments or calibrations. The authors briefly mentioned this problem. However, it is not clear what was the of the spatial inhomogeneity of the wind tunnel sprays and what was its effect on the biases of the Nevzorov measurements. Did authors attempted to estimate LWC biases between the LWC, TWC8 and TWC12 Nevzorov sensors due to the sensors spatial separation, by moving the Nevzorov sensor up and down (right and left)? Do you have any estimates of spatial inhomogeneity for each wind tunnel? Such discussion would be beneficial for the paper."

We generally attempted to measure the droplet spray at the same position with all sensors. However, as you mention, this is not possible for all the Nevzorov sensors, due to their spatial separation. At the BIWT, we therefore performed traverse measurements to find an area with a homogeneous spray distribution. The area that we determined (which extended from the lowermost Nevzorov sensor to the uppermost Nevzorov sensor) had an LWC homogeneity of ±3% in bimodal conditions. Collins also provided information on its tunnel inhomogeneity which shows that within the area spanned by the Nevzorov sensors, both the small droplet spray and the FZDZ spray are uniform within ±10%. For RTA, uniformity measurements presented in Breitfuss et al. (2019) and further internal tunnel calibrations show that LWC deviations in the center of the tunnel cross section where the Nevzorov sensors were positioned are no larger than ±5% for both FZDZ and FZRA conditions.

2. "It would be relevant indicating that the sensor head employed in this study was designed by the Environment and Climate Change Canada (ECCC) and manufactured by SkyPhysTech Inc. This sensor was tested by ECCC in the NRC AIWT wind tunnel and then used during the InCloud ICing and Large drop Experiment (ICICLE) flight operation for characterisation of icing cloud environment."

We agree that information on the manufacturer and testing prior to our study is important and we added the provided information to the manuscript.

3. "It appears that the authors refer to the LWC sensor as "Hotwire" throughout the text. In fact, "hotwires" are a class of sensors/instruments used for measurements of condensed water content. However, the term "hotwire" is equally applicable to the 8mm and 12mm cone TWC sensors as well. For that reason, statements, like "…*for the Hotwire and the 8 mm cone*…" sound confusing. It would be reasonable to use conventional names of the hotwire sensors, i.e. "LWC sensor" when applied to a cylindrical hot-wire sensor, and "TWC 8mm (or 12mm) cone" when talking about the TWC 8mm (or 12mm) hotwire cone sensors."

We agree that the name "Hotwire" is misleading and replaced the term by "LWC sensor" throughout the text.

4. “Line 178: Korolev at al. (1998a) was focused on studies of the formation of diffraction images of spherical particles in OAPS. However, it did not discuss size corrections of out-of-focus droplet images. This problem was studied in Korolev (2007). Therefore, Korolev at al. (1998a) should be replaced by Korolev (2007). (Korolev, A. 2007: Reconstruction of the Sizes of Spherical Particles from Their Shadow Images. Part I: Theoretical Considerations. *Journal of Atmospheric and Oceanic Technology,* **24**, 376–389. https://doi.org/10.1175/JTECH1980.1)”

Thank you for pointing this out, we changed the reference according to your suggestion.

5. “Page 6: It is worth mentioning that the average value L*=2580 J g-1 in Korolev et al. 1998a was obtained for a different set of ranges of temperatures and pressures as compared to this study.”

We added a sentence that explains that the value of 2580 J/g was derived for aircraft measurements where different temperatures and pressures prevail.

6. “It is worth providing a brief geometrical description of the Nevzorov TWC 8mm and 12mm cones, i.e. inverted cones with the apex angle 60deg and the depths of the cones (~7mm and ~10.4mm).”

We added a figure which details the dimensions of the new Nevzorov sensor head.