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Atmospheric
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Interactive comment on "Response of the Nevzorov hot wire probe in Arctic clouds dominated by very large droplet sizes" *by* A. Schwarzenboeck et al.

Anonymous Referee #2

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The authors present the analysis of the response of the hot-wire Nevzorov LWC and TWC sensors to a cloud environment with a variety of size distributions. One of the merits of this study is that the characterization of the hot-wire sensors has been performed in natural clouds in which size distributions are quite different from those generated in wind tunnels. This allows the results of this study to be directly applicable to the airborne in-situ measurements. The manuscript is well written, focused, and has just right length - concise enough not to be a tedious read. I found a few minor issues, which should not be a problem to fix. The paper undoubtedly should be published in the AMTD after addressing the comments listed below.

Comments:

1. Title: The title "Response of the Nevzorov hot wire probe in Arctic clouds dominated by very large droplet sizes" suggests that the results of this study are applicable only to Arctic clouds. In my opinion, the results of this paper have a much broader impact and can be applied to mid-latitude and tropical clouds as well. I did not find any specific features in liquid Arctic clouds described in the paper and specifically shown in Fig.4 which could not be found in other geographical regions. I suggest removing the word Arctic from the title of the paper, since it is misleading and artificially narrowing the applications of the results of this paper.

2.I would like to express my concern regarding the misuse of terminology related to the description of the droplet sizes. This refers to the title of the manuscript and the entire text. The cloud physics conventional terminology depending on the droplet size uses the following terms: "cloud droplet", "drizzle", "rain drop". Figures 1and 4 clearly indicate that the maximum size of the drops in the studied clouds is limited by approximately 500um, which should be referenced as "drizzle". This is the first time that I have seen in the cloud microphysical literature the term "very large droplet" applied to drizzle size drops. The authors should use commonly accepted terminology when describing droplets sizes in the text and the title of the manuscript.

3. Introduction: The paper by Biter et al (Biter, C. J., J. E. Dye, D. Huffman, and W. D. King, 1987: The dropsize response of the CSIRO liquid water probe. J. Atmos. OceanicTechnol., 4, 359-367.) describing the response of the hot-wire LWC sensors to large drops should be referenced here.

4. Page 1295, lines 6-15: The statement: "integration of particle image data from Forward Scattering Spectrometer" should be modified, since the FSSP does not register particle images. I also suggest making this paragraph more generic and including other 1D (e.g. CDP, PDA, etc) and 2D (e.g. CIP, OA-2DP, PIP) probes. When describing evaporators, please reference the pioneering works of this technique: Ruskin

(1976, Atmosph. Techn.) and Nicholls et al (1990, JTECH) .

5. Section 3: Please, describe the installation of the Nevzorov probe on the Polar 2 and its proximity to the fuselage or any other parts of the aircraft which may affect the droplet trajectories and therefore measured LWC.

6. Page 1299, last sentence: I understand that you skip two efficiencies related to ice, but not to liquid, as indicated in the text. Please, correct the text.

7. Equation 8: Typo: either remove the second power in the left part of the equation or the square root sign in the right side.

8. Figure 6: I found the interpretation of Figure 6 confusing. "It turns out that, plotting 1.595×Vˆ2 LWC against Vˆ2 TWC for all liquid cloud data does not necessarily produce a slope of 1. The TWC sensor signal Vˆ2 TWC is in general dominating the LWC signal 1.595×Vˆ2 LWC, which means that the liquid water recovery from TWC sensor is definitely higher than the recovery from LWC sensor (Fig. 6). Merely at lower values of raw signals it nevertheless happens that the LWC signal slightly dominates the TWC sensor signal (data points above the theoretical line of equal LWC and TWC sensor efficiencies with respect to water). These data points signalize a higher efficiency for LWC sensor as compared to the TWC sensor". Since epsilon_TWC(D) and epsilon_LWC(D) are different functions of D, their ratio should not necessarily be equal to 1. Moreover, the left side of Eq.9 is a unique function of D, whereas the right side is a function of LWC, which is not a unique function of D. Therefore, the speculation regarding domination of one sensor signal over another do not make much sense here. What Figure 6 shows, is the response of the Nevzorov sensors to the specific ensemble of the clouds sample during the ASTAR project. In my opinion, the authors should either modify the related text, or remove Figure 6.

9. Equation 14: The last term in the denominator {2ˆ(1/a3)-1} looks a bit confusing and it can be replaced by a constant.

10. Page 1307, line 3: Change WC to IWC.

11. Figure 1: The perception of this figure could be improved and made more straightforward if the images associated with the noise are removed.

Interactive comment on Atmos. Meas. Tech. Discuss., 2, 1293, 2009.